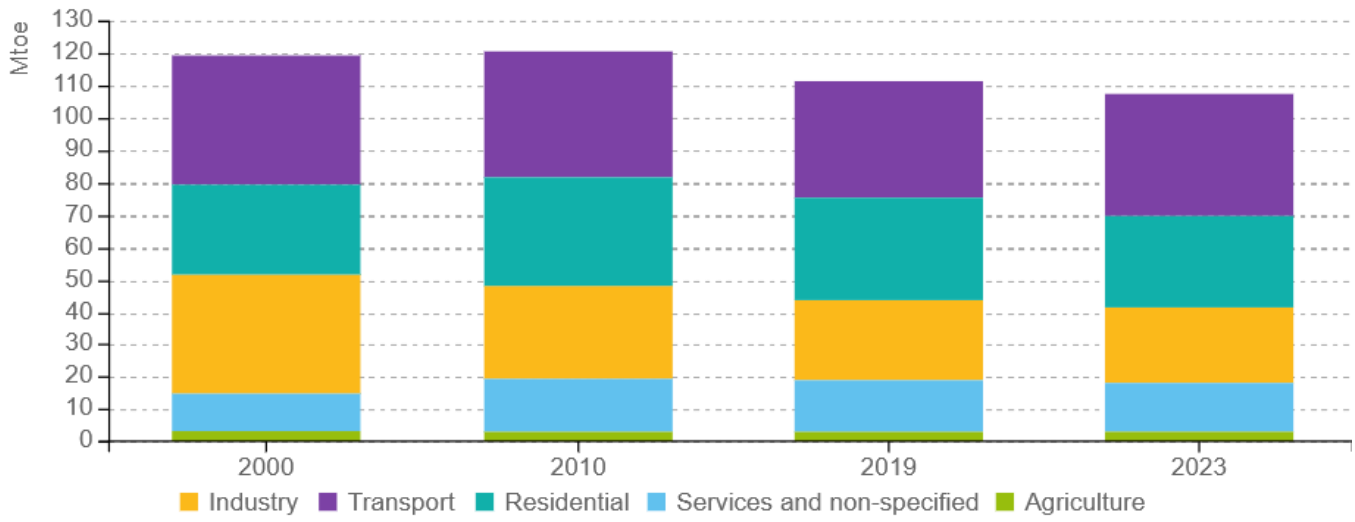
Energy efficiency trends and policies

Overview

Final energy consumption climate corrected in 2023 was 107.6 Mtoe, -1.9% compared with 2022 and -0.9%/year since pre-COVID-19 pandemic 2019. Transport sector was the largest consuming sector over 2010-2023, except 2019. In 2023, the transport sector absorbed 35% of total final energy consumption (+3 percentage points since 2010). In 2023, energy consumption in residential sector decreased by 7.4% compared with 2022: the share reduced by 2 percentage points since 2010. Services sector grew by 4% in 2023. Buildings represent 40% of total final energy consumption in 2023 (-1 percentage points since 2010). The share of industry decreased from 24% in 2010 to 22% in 2023 (-5.4 Mtoe).

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



Source: ODYSSEE

Energy efficiency of final consumers, as measured by ODEX, improved by 22% over 2000-2023 (1.1%/year). Efficiency improvements have been faster over 2010-2018 (1.4%/year) than since 2019 (0.8%/year). The highest progress in energy efficiency was achieved by industry: 1.6%/year since 2000, faster over 2004-2012 (2.6%/year). The transport sector improved by 23% over 2000-2023, it showed rapid improvements over 2013-2018 (3.0%/year) due to an increase in passenger traffic that was greater than energy consumption, and slow progress after 2018 (0.6%/year). The residential sector had slower energy efficiency progress since 2015 (0.8%/year) compared with the period 2010-2015 (1.7%/year).

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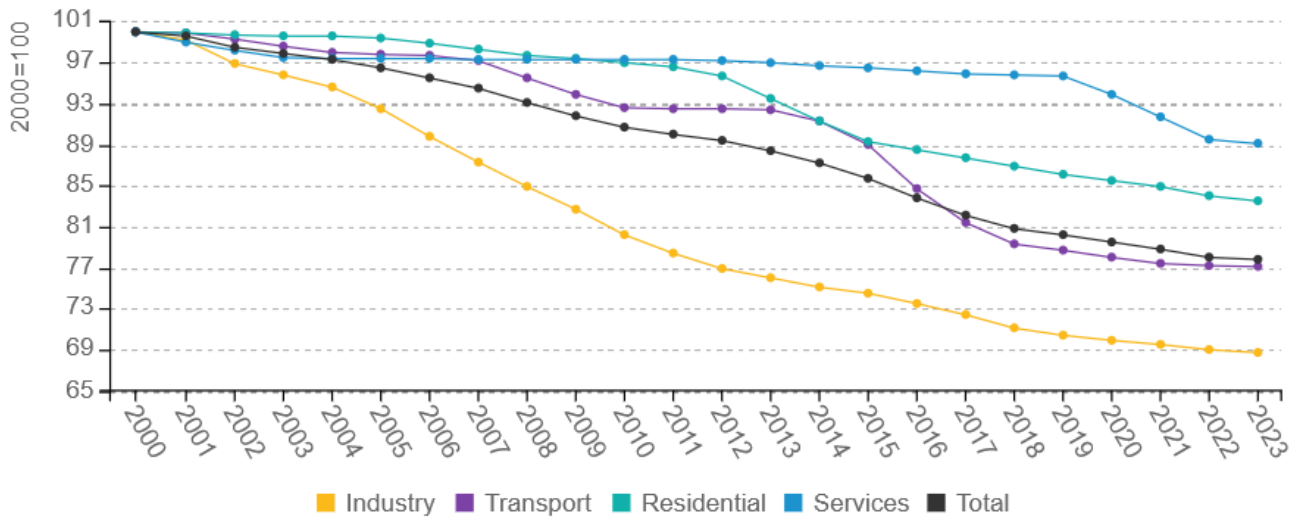
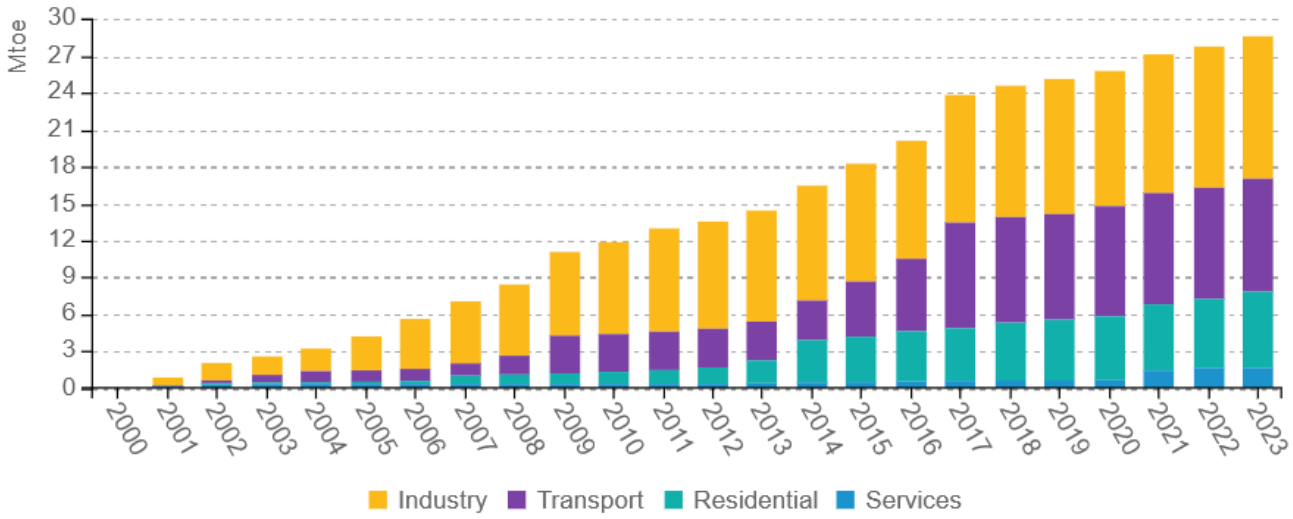
Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

Cumulated annual energy savings in 2023 were 28.7 Mtoe since 2000. Industry was the largest contributor with 11.6 Mtoe in 2023 (41%), followed by transport sector with 9.2 Mtoe (32%), by residential sector with 6.2 Mtoe (22%) and services sector with 1.6 Mtoe (6%). Over 2009-2017 annual additional savings have increased significantly.

Figure 3: Energy savings by sector



Source: Odyssee

Total energy supply decreased by 37 Mtoe from 2010 to 2023 (-22%). The drop was due to all its components: in particular, final consumption decreased by 18 Mtoe, consumption of power sector by 9 Mtoe, other transformation by 6 Mtoe and non-energy uses by 5 Mtoe. The largest contributor to this reduction is the final consumption, which accounts for almost 50% of the total decrease in primary energy consumption. The decrease

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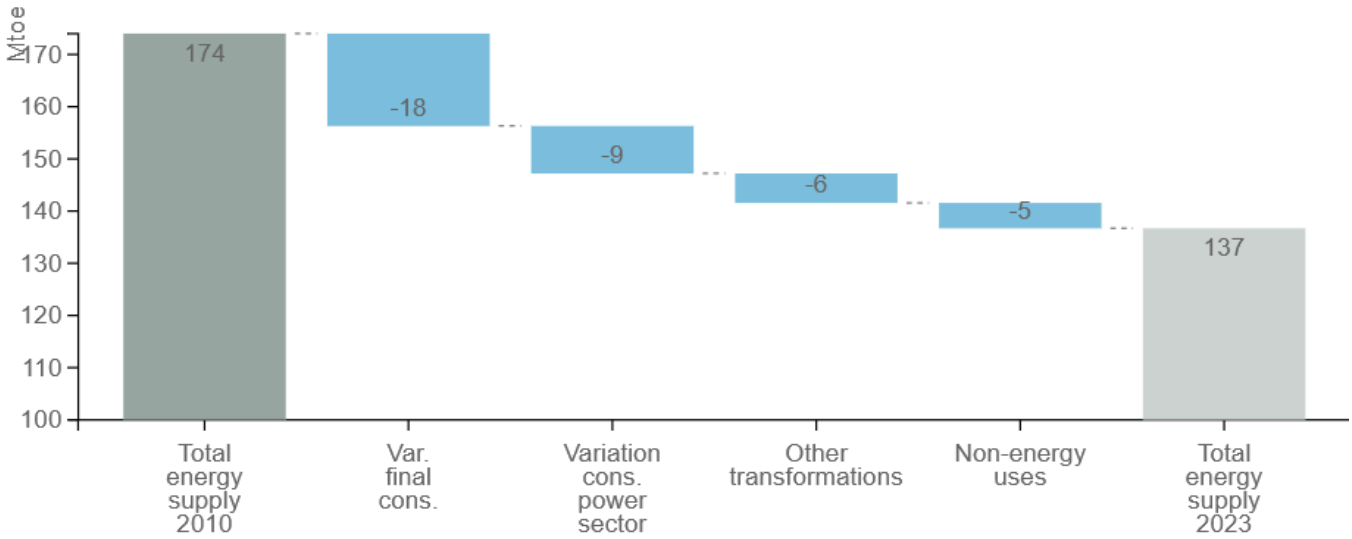
by net consumption of the power sector is mainly due to change in power mix (-5 Mtoe) and efficiency of thermal power plants (-4 Mtoe).

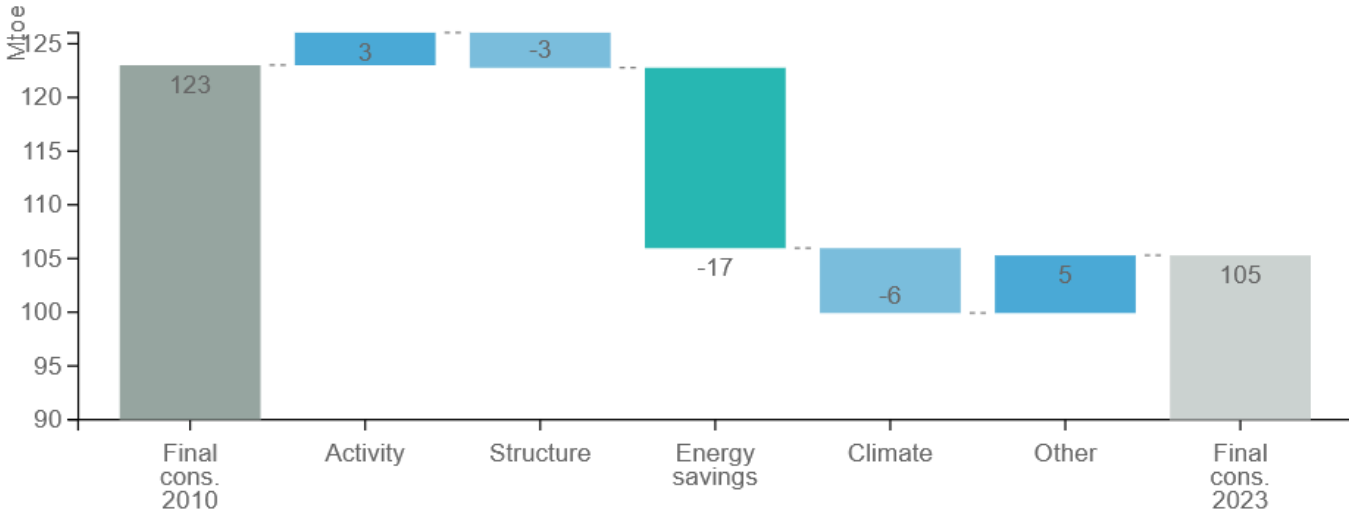
Figure 4: Main drivers of the total energy supply variation



Source: Odyssee

Final energy consumption decreased from 123 Mtoe in 2010 to 105 Mtoe in 2023. The drop of 18 Mtoe was principally due to energy savings that reduced the final energy consumption by 17 Mtoe. The activity raised final consumption of 3 Mtoe counterbalanced by structural changes in branches (-3 Mtoe). Climate effect cut energy consumption by 6 Mtoe counterbalanced by other effects for 5 Mtoe.

Figure 5: Main drivers of the final energy consumption variation



Source: Odyssee

In July 2024, Italy submitted the final update of the NECP with a significant reduction in primary and final energy consumption due to the planned measures: in particular, increase in the rate of renovation of buildings (in line

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with Directive (EU) 2024/1275) with the electrification of consumption, insulation of dispersing surfaces, and heat pumps as the main heating system. Tax incentives will be revised to take into account investment priorities and effectiveness in terms of improvement. The Plan estimates overall energy savings over the period 2021-2030 equal to 73.4 Mtoe. L.D. n. 73/2020 transposes the EU directive 2018/2002 on the Energy Efficiency First Principle into the Italian regulatory framework. The L.D. provides incentives for SMEs for the implementation of energy management systems ISO 50001 and for energy audits every two years until 2030, extends to 2030 the National Energy Efficiency Fund and Programme for the Energy Renovation of the buildings of the Central Public Administration (PREPAC). Ministerial Decree 10 August 2022 allocated 2 billion euros for the Fund for development and cohesion (FSC 2021-2027) to finance investments to help decrease direct GHG emissions through electrification, the use of renewable hydrogen instead of fossil fuels, and the reduction of energy consumption.

Table 1: Sample of cross-cutting measures

Measures	NECP measures	Description	Expected savings, impact evaluation
National Energy Efficiency Fund	Yes	The Fund is aimed at promoting the financing of interventions necessary for the achievement of national energy efficiency targets, promoting the involvement of financial institutions and private investors, based on adequate risk sharing. The Fund supports energy efficiency measures carried out by companies, including ESCOs, and by the Public Administration, on buildings, plants and production processes.	32.00 TJ
Subsidies to Municipalities for energy efficiency and sustainable development	No	The 2020 Budget Law (Law n. 160/2019) grants the Municipalities for the years 2020-2024 a maximum of 500 million Euros per year to carry out one or more public in energy efficiency and territorial development. The grants assigned to the Municipalities vary from 50,000 Euros to 250,000 Euros according to their population. The municipality benefiting from the subsidy is required to start the works by 15 September of each reference year of the grant.	4.61 TJ
Integrated national plan for energy and climate 2030	No	Integrated National Plan for Energy and Climate 2030, prepared in implementation of Regulation (EU) 2018/1999, is the instrument identified by the Italian Government towards decarbonisation through a new energy policy that ensures the environmental, social and economic sustainability of national territory and accompany its energy transition. The objective is to achieve and exceed EU targets in energy efficiency and security renewable sources consumption integration of the national energy markets in the	13.84 TJ

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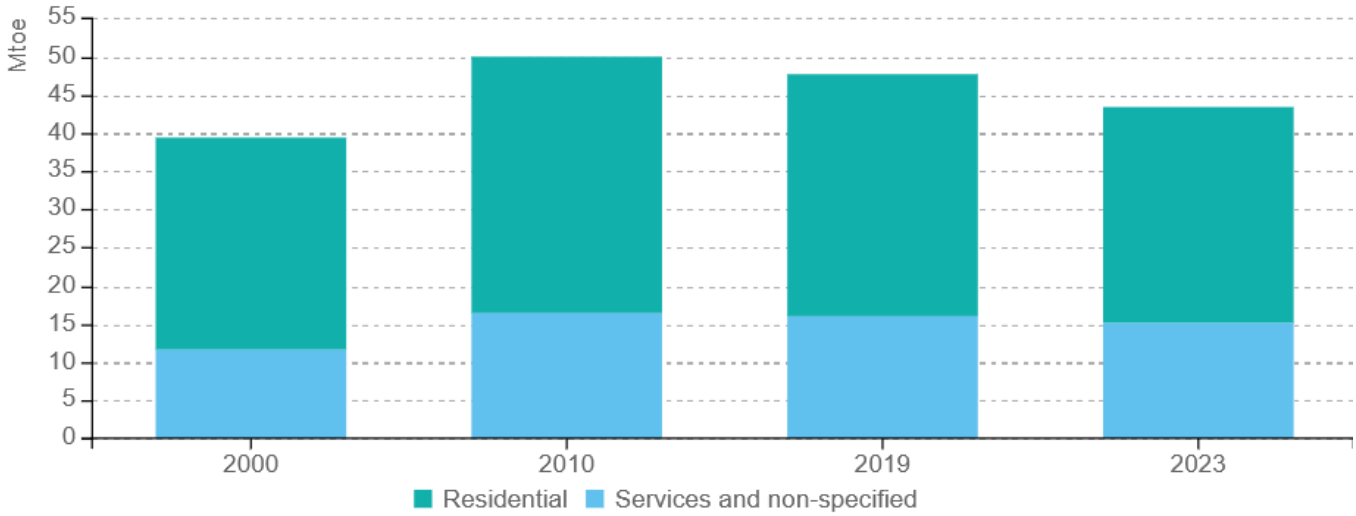
		Single Market and competitiveness.	

Source: MURE

Buildings

Energy consumption of building (with climatic corrections) was 43.4 Mtoe in 2023, -4% compared with 2022. Consumption raised significantly at +3%/year over 2000-2008 (50,5 Mtoe in 2008): this growth was mainly due to services sector (+5%/year). Building consumption decreased since 2018 (-3%/year): residential buildings contributed more than other buildings. Residential buildings accounts for approximately 65% of final energy consumption in 2023.

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



Source: Odyssee

Energy consumption of households (with climatic corrections) decreased since 2010 at -1.2%/year. All end-uses reduced consumption: space heating at -0.9%/year, water heating at -3.1%/year, cooking at -0.5%/year and electrical appliances and lighting at -1.7%/year. Air-conditioning increased at 5.2%/year but it's only 2% of consumption. The structure of consumption by end–use is quite stable: space heating accounts approximately 70% of consumption.

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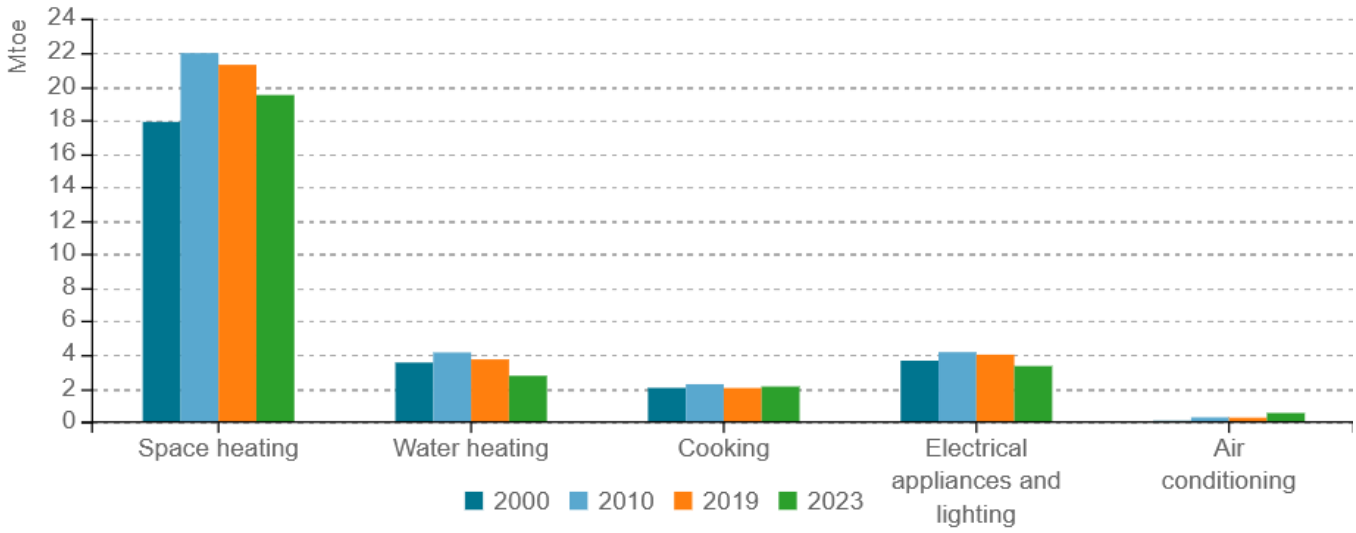
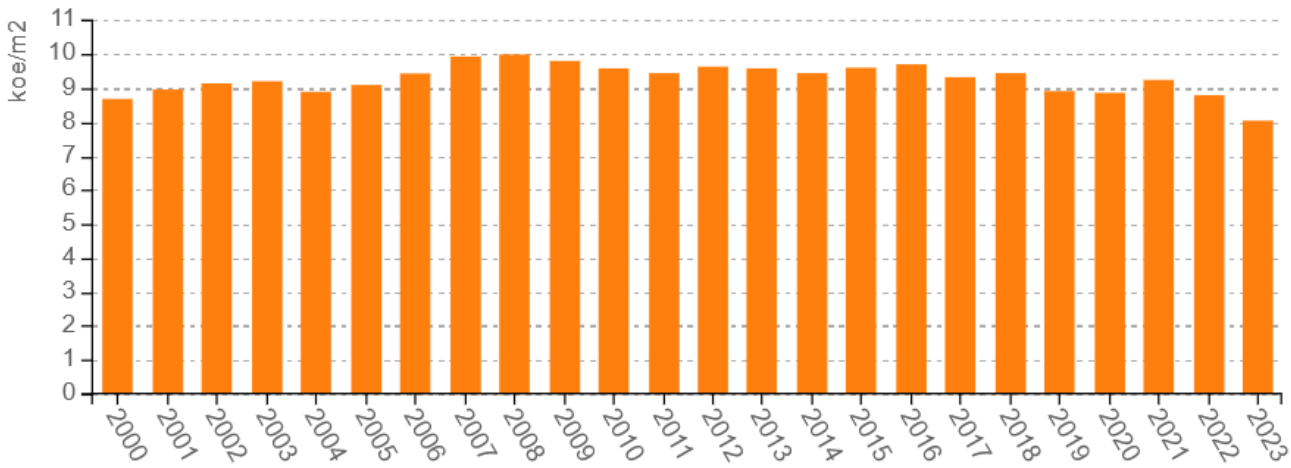
Figure 7: Energy consumption by end-use of households (with climatic corrections)



Source: Odyssee

The households energy consumption per m2 for space heating (with climatic corrections) has reduced by 1.5%/year since 2008 from 10 koe/m2 to 8.0 koe/m2 in 2023. Since 2021 the decrease is faster, 7%/year. The reduction is probably due to the mild climate and to the change to a more efficient heating system.

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



Source: ODYSSEE

Energy consumption per dwelling decreased from 0.45 toe/dw to 0.34 toe/dw over 2010-2023 (-2.1%/year). Consumption reduced for all end-uses, except air-conditioning: -3.6%/year for water heating, -2.2%/year for electrical appliances, -1.0%/year for cooking since 2010. In 2023 electrical appliances absorbed 38% of consumption (stable from 2010), water heating 32% (-6 percentage points), cooking 24% (+3 points) and air-conditioning 6% (+3 points).

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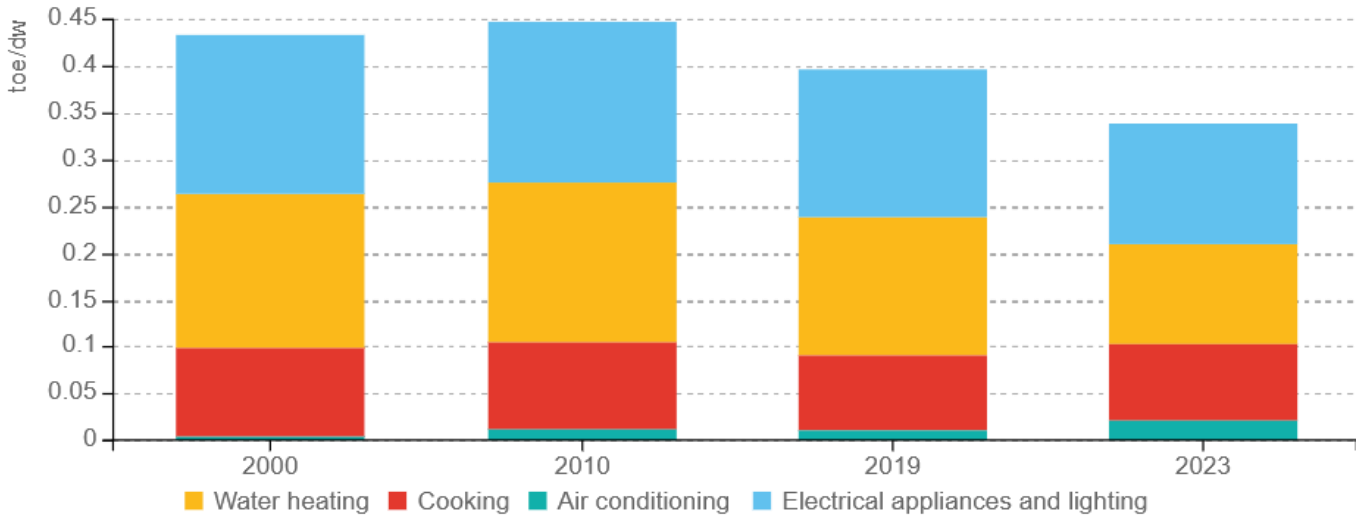
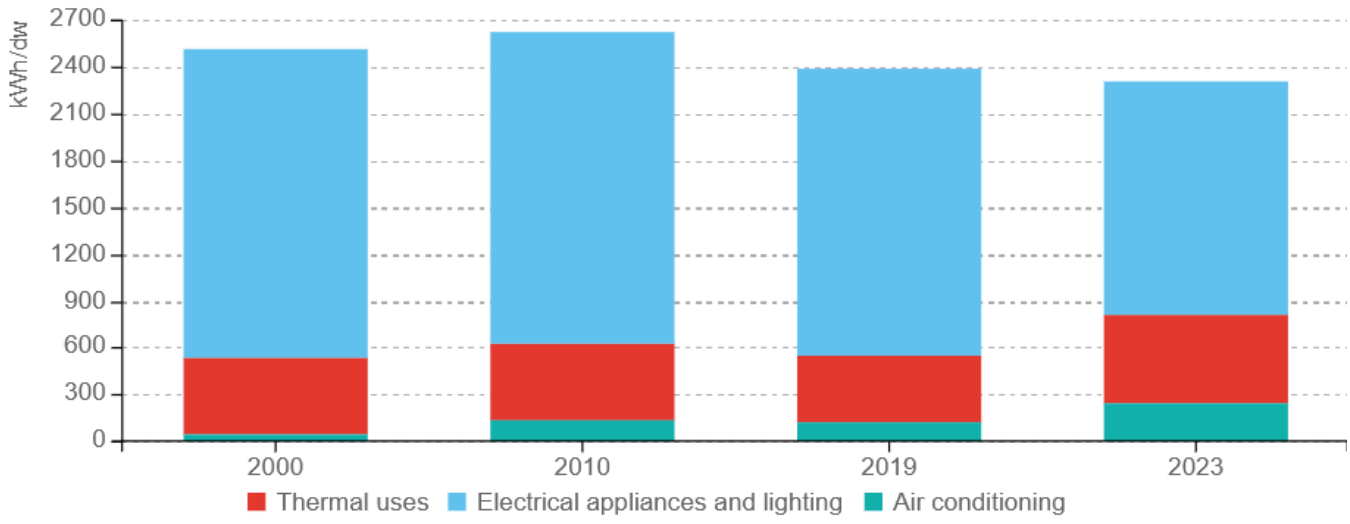
Figure 9: Energy consumption per dwelling by end-use (except space heating)



Source: ODYSSEE

Over 2010-2023 electricity consumption per dwelling (with climatic corrections) decreased by 12% from 2626 kWh/dw to 2310 kWh/dw at -1.0%/year. Electricity is mainly used for electrical appliances and lighting but the share is decreasing: the share reduced by 11 percentage points from 2010 (76%) to 2023 (65%). On the other hand, thermal uses and air conditioning are increasing: in 2023 thermal uses accounted for 25% (6 percentage points increase since 2010) and air conditioning for 11% (+6 percentage points).

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



Source: Odyssee

Energy consumption of households decreased by 8.7 Mtoe over 2010-2023. Main drivers of this reduction are energy savings (-5.2 Mtoe), climate effect (-4 Mtoe) and large homes (-0.5 Mtoe). More dwellings and more

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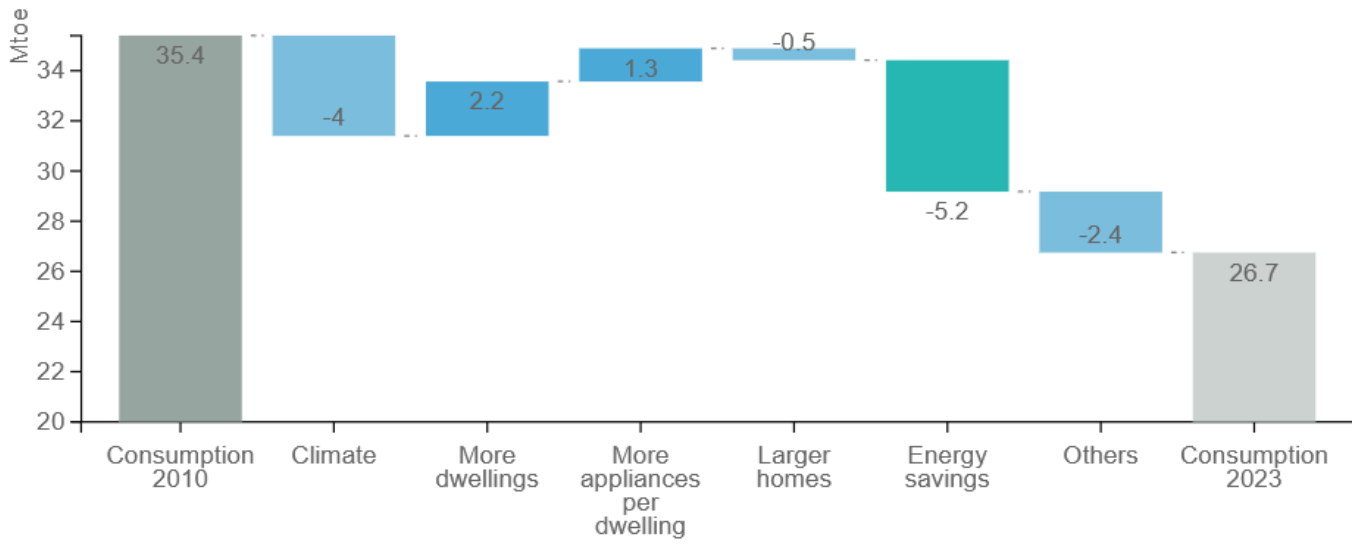
appliances per dwelling contributed to increasing energy consumption by 2.2 Mtoe and 1.3 Mtoe, respectively. The other effects also reduced the energy consumption by 2.4 Mtoe.

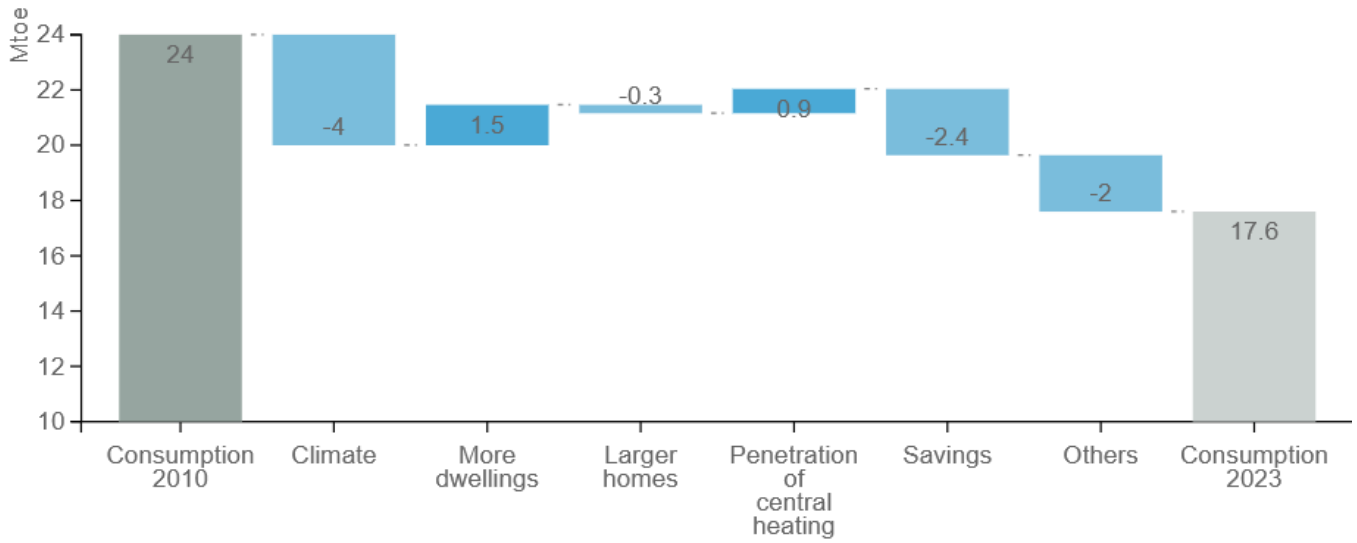
Figure 11: Main drivers of the energy consumption variation in households



Source: ODYSSEE

Energy consumption for space heating reduced by 6.4 Mtoe from 2010 to 2023. The main drivers of this decrease are energy savings (-2.4 Mtoe) and climate effect (-4 Mtoe), followed by other effects (-2 Mtoe) and larger homes (-0.3 Mtoe). These reductions are counterbalanced by more dwellings (+1.5 Mtoe) and the penetration of central heating (+0.9 Mtoe).

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



Source: Odyssee

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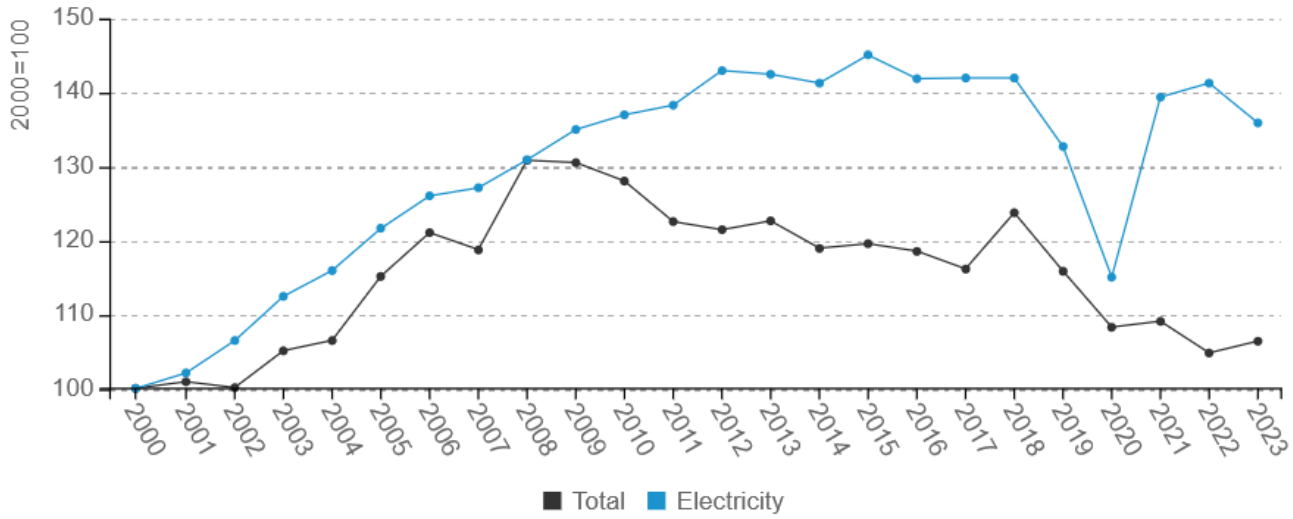
Energy consumption per employee in services reduced by 1.4%/year since 2008 with positive peak in 2018 (+6.5%) due to ambient heat counting and negative peak in 2020 (-6.6%) due to COVID-19 pandemic. The decreasing trend depends on decrease in energy consumption and growth in employment. Electricity consumption per employee grew until 2012 (+3%/year) and then stabilized around 5,400 kWh/emp.

Figure 13: Energy and electricity consumption per employee in services (with climatic corrections)



Source: ODYSSEE

The Budget Law 2025 reduced the tax deductions for building renovations from 50% to 36% in 2025 and 30% in 2026-2027. In 2023 energy savings from tax deduction amounted to 2.04 Mtoe/year of energy. The Superbonus measure has been gradually weakened from 2023. In August 2022, the Italian government added EUR 500 million to the Fund for development and cohesion (total fund EUR 2 billion). This will finance investments for electrification, use of renewable hydrogen instead of fossil fuels, and the reduction of energy consumption. These projects are divided for 80% in Southern Italy and 20% in the Centre and North Italy. The Component C3 of Mission 2 of NRRP allocated 15.36 billion euros for buildings renovation across 3 lines of action: energy efficiency improvements of school buildings and judiciary buildings, energy efficiency improvement and seismic renovation of public and private residential buildings, district heating. The renovation will affect over 100,000 buildings, for over 36 million square meters. In 2024 energy savings from tax deductions for buildings amounted to 2.5 Mtoe/year of final energy.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
Energy Efficiency and Renewable	No	The Decree Law n. 34 of 19 May 2020, converted with amendments into Law n. 77/2020, was promulgated in the	4.02 TJ

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Energy Refurbishment tax reduction - Decreto Rilancio (Superbonus)		aftermath of the COVID-19 pandemic for the recovery of the economy. The Decree allocates part of the total budget to enhancing energy efficiency and renewable installations. In particular, the Decree establishes a 110% tax deduction (Superbonus) for expenses incurred from 1 July 2020 for the implementation of specific interventions aimed at energy efficiency and static consolidation or the reduction of the seismic risk of buildings. The installation of photovoltaic systems and infrastructure for recharging electric vehicles in buildings are also interventions eligible for the 110% tax deduction. Maximum eligible expenditure limits are set for each intervention. The 110% tax deductions for expenses incurred from 1 July 2020 to 31 December 2021, documented and paid by the taxpayer, are divided into five annual instalments of the same amount or into four annual instalments of the same amount for expenses incurred from 1 January 2022.	
National Recovery and Resilience Plan - Energy efficiency and buildings renovation	No	The Italian National Recovery and Resilience Plan has an allocation of 191.5 billion euros, financed through the Recovery and resilience facility, plus additional 30.6 billion euros of national resources. The Plan is structured on 6 Missions: in particular, 37% of the funds are destined for the ecological transition (Mission 2) and sustainable mobility (Mission 3). Interventions aimed at energy efficiency are distributed within different Missions. The Component C3 of Mission 2 aims to improve the efficiency of public and private buildings, also by integrating renewable energies. This component includes 15.36 billion euros in total for energy efficiency measures across 3 lines of action: - M2C3.1 energy efficiency improvements of school buildings and judiciary buildings; - M2C3.2 energy efficiency improvement and seismic renovation of public and private residential buildings through the temporary incentive; - M2C3.3 district heating.	4.02 TJ
Renewable Energy for Heating and Cooling and Small Interventions Increasing Energy Efficiency Support Scheme	Yes	This measure functions as an inventive for renovating private buildings. Started in 2016, the main changes compared to the 1.0 version are the reduction of the time for the granting from six to two months and the introduction of new energy efficient measures. Conto Termico aims at installing systems that produce thermal energy from renewables and high-efficiency systems.	1.34 TJ

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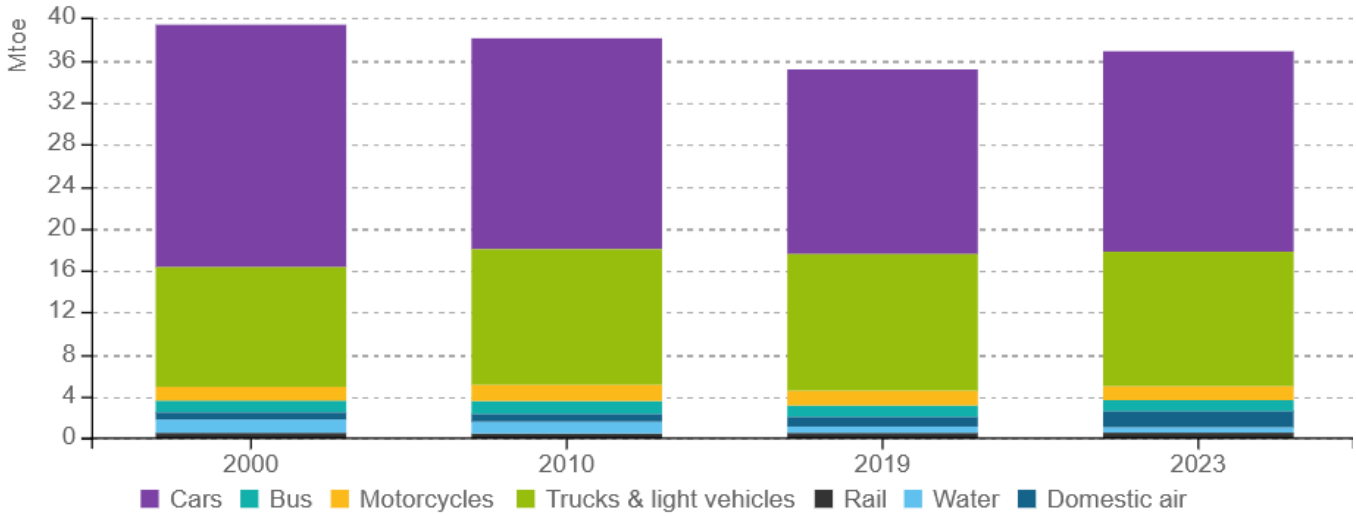
(Conto Termico 2.0) - Residential sector			

Source: MURE

Transport

The transport sector's energy use declined by 3% from 2010 to 36.9 Mtep in 2023. Cars and road freight remained dominant (52% and 35%, respectively). Maritime transport's role diminished (–2 pp), while air transport expanded (+2 pp), and other modes showed little change.

Figure 14: Transport energy consumption by mode



Source: ODYSSEE

The share of passenger traffic by car was 83% in 2023, followed by bus with 10% and rail with 7%. The share of cars grew by 1 percentage points since 2010 as that of rail while the share of bus decreased by 2 percentage points from 2010.

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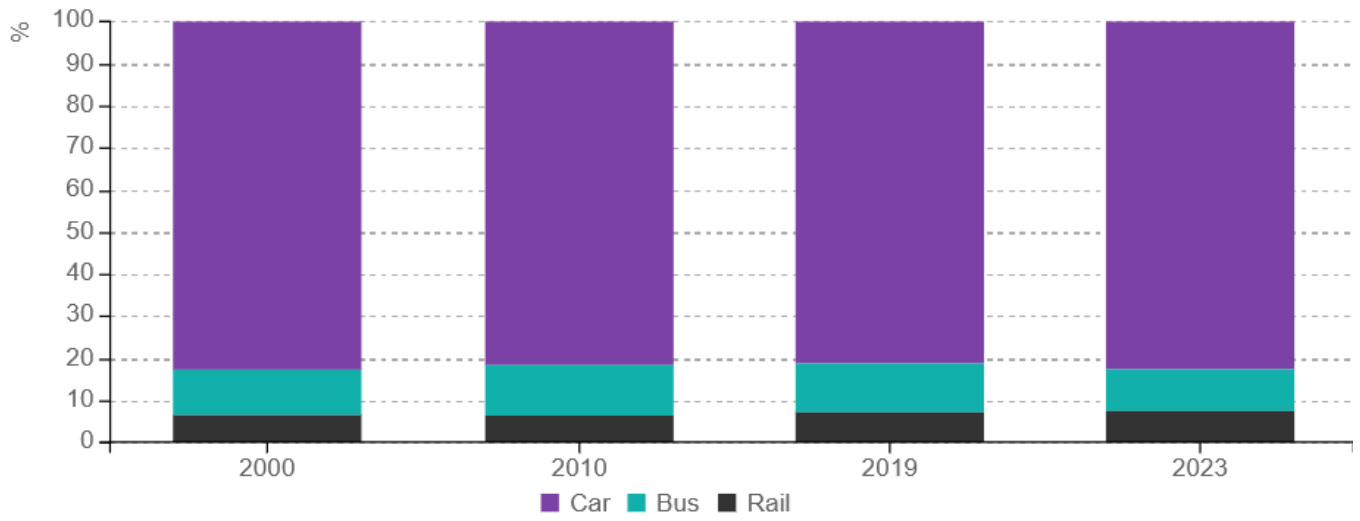
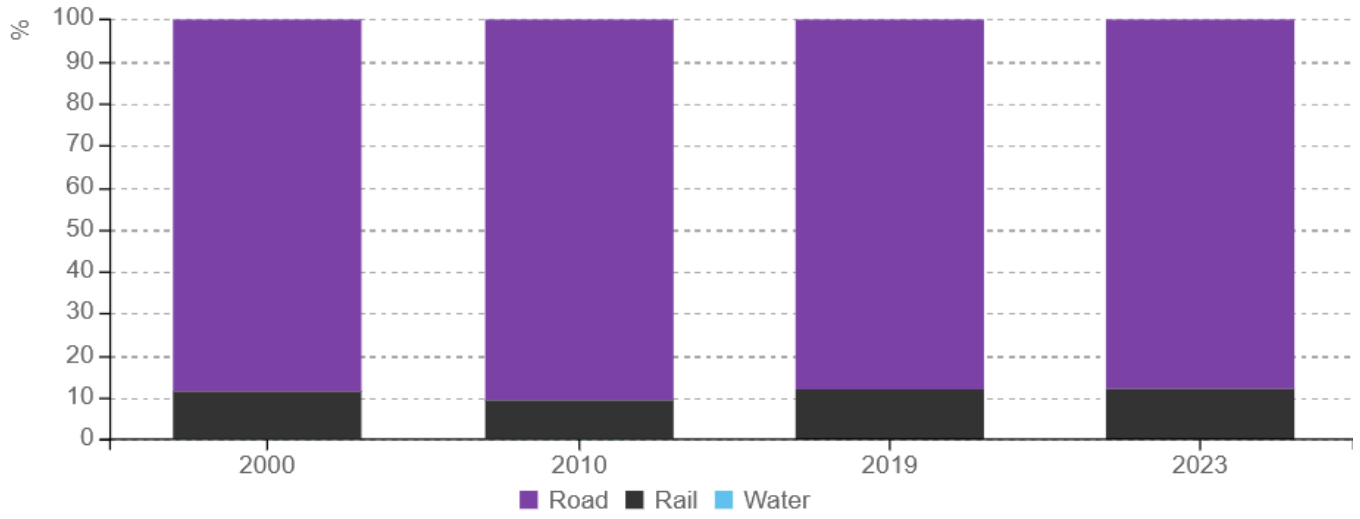
Figure 15: Modal split of inland passenger traffic



Source: ODYSSEE

The share of freight transport by road was 88% in 2023, 3 percentage points decrease since 2010, while the share of rail transport increased by 3 points since 2010 to 12% in 2023. The share of water transport was negligible.

Figure 16: Modal split of inland freight traffic



Source: ODYSSEE

Energy consumption of cars per passenger-km decreased by 12% over 2000-2023. After a rapid decrease between 2010 and 2017, the indicator increased to reach its 2010 level in 2023, with 0.028 koe/pkm.

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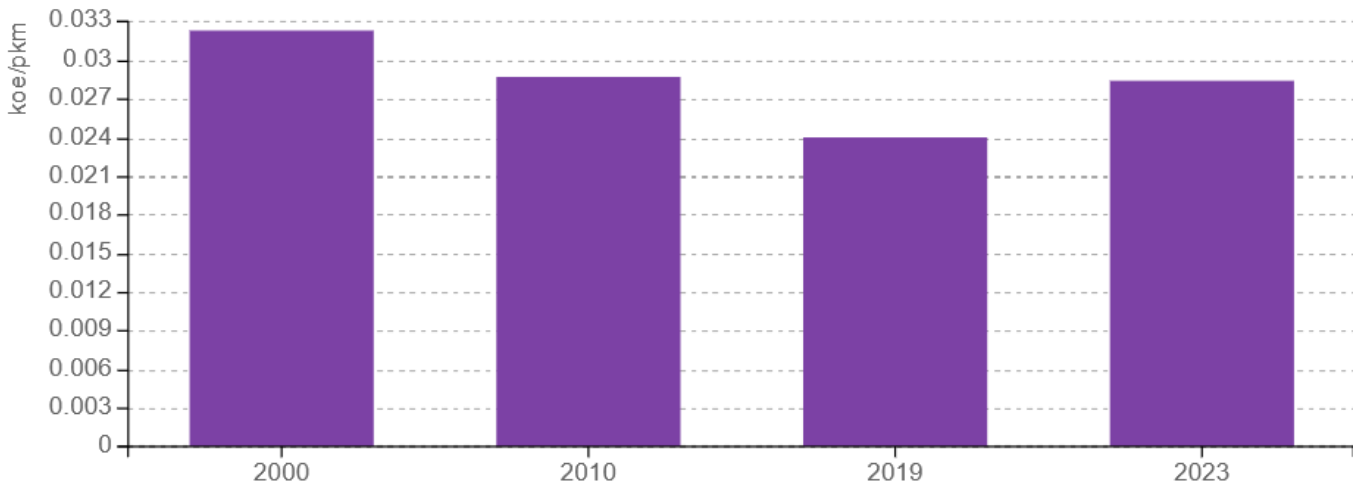
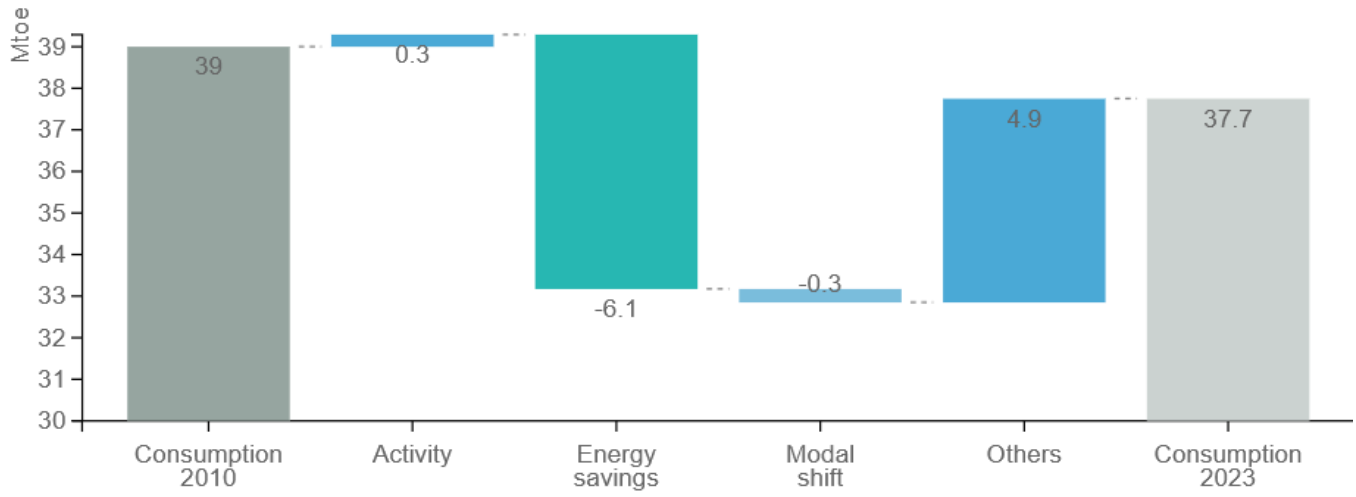
Figure 17: Energy consumption of cars per passenger-km



Source: ODYSSEE

The energy consumption in transport reduced by 1.3 Mtoe from 2010 to 2023. The main drivers of this reduction are energy savings (-6.1 Mtoe) partially counterbalanced by other effects (+4.9 Mtoe), mainly low load factor in passenger and goods traffic. Activity (0.3 Mtoe) and modal shift (-0.3 Mtoe) contributed slightly to the energy consumption variation between 2010 and 2023.

Figure 18: Main drivers of the energy consumption variation in transport



Source: ODYSSEE

The 2023 Budget Law established a new fund for sustainable mobility aimed to achieve the emissions targets. The fund has an allocation of 2.2 billion euros for the period 2023-2034 intended to finance the renewal of buses, hydrogen trains, intermodality in the freight transport of goods, alternative fuels for ships and airplanes, the transformation of airports, the renewal of road transport vehicles. MIT-MEF Interministerial Decree n. 166/2023

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set “Sea Modal Shift” replacing Marebonus: new incentive program for maritime companies to road/sea shift in short-medium range maritime transport: 21.5 million euros annually for years 2023-2026. The MIT Decree n.134/ allocates 22 million euros annually for Ferrobonus incentives for years 2023-2026. In 2024 energy savings amounted to 3.7 Mtoe/year of final energy.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
National Recovery and Resilience Plan - Rail upgrade and secure roads	No	Mission 3 "Infrastructure for sustainable mobility" of National Recovery and Resilience plan aims to build the necessary infrastructure for sustainable transport by 2026, contributing to the achievement of the European targets for reducing emissions and progressive decarbonisation of mobility. The planned investments are consistent with the Integrated National Energy and Climate Plan. The planned investments amount to 25.40 billion euros for - development of the Italian railway system: the main objective is to enhance the passengers and good transport by rail, increasing the capacity and connectivity of the railway and improving the quality of service along the main national and regional connections; - enhancement of the competitiveness of the port system for environmental sustainability and development of intermodal infrastructures on the basis of integrated planning.	1.48 TJ
Incentive for low-emissions vehicles	Yes	The 2019 Budget Law (Law 30 December 2018 n. 145) established a fund for the provision of subsidies for the purchase or lease of low-emission vehicles for the period 1 March 2019-31 December 2021. The vehicles have to be characterized by polluting emissions less than 70 g/km and price less than 50,000 Euros excluding VAT.	4.45 TJ
incentives for the purchase of non-polluting vehicles	No	The Decree of the President of the Council of Ministers of 6 April 2022, modified by the Decree of the President of the Council of Ministers of 4 August 2022, defines the incentives for the purchase of non-polluting vehicles in the years 2022, 2023 and 2024. The Fund for the incentives has resources of 650 million Euros for each year and it is assigned to the Ministry of Economic Development to disburse the grants.	1.48 TJ

Source: MURE

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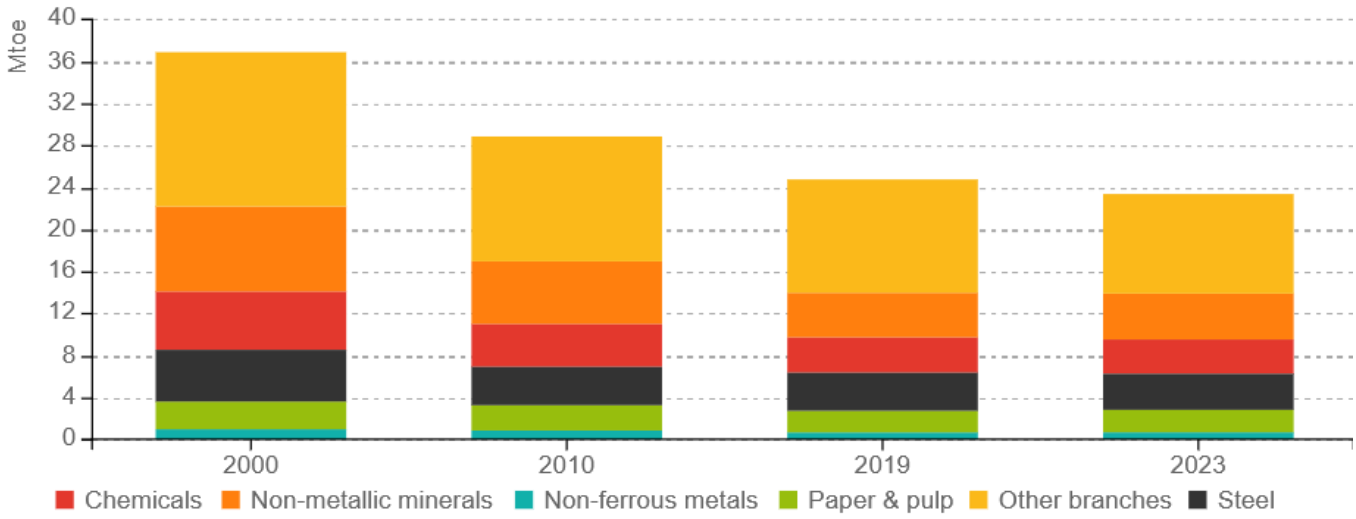
Industry

Between 2000 and 2023, industrial energy consumption declined from 36.9 Mtoe to 23.4 Mtoe, reflecting an average annual reduction of 2%. The most pronounced decrease occurred during 2004–2014, with consumption falling at an average annual rate of 4%.The drop was different across the different industrial branches: it decreased by 2.6%/year in non-metallic minerals, -2.3%/year in chemicals, -1.6%/year in steel and -0.9%/year in paper.

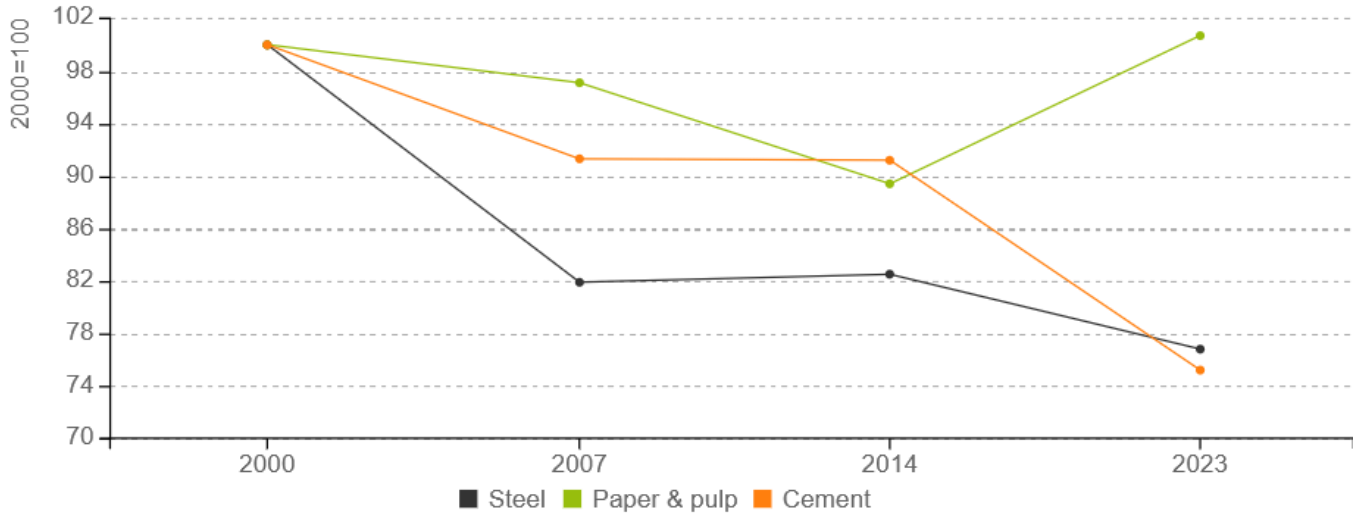
Figure 19: Final energy consumption of industry by branch



Source: ODYSSEE

The unit consumption of steel decreased by 1.1%/year over the period 2000-2023: some fluctuations were observed due to non-used production capacity and the economic crisis. The unit consumption of cement reduced by 1.2%/year: it remains quite stable over the period 2007-2014. The unit consumption of paper is at 2000 levels.

Figure 20: Unit consumption of energy-intensive products (toe/t)



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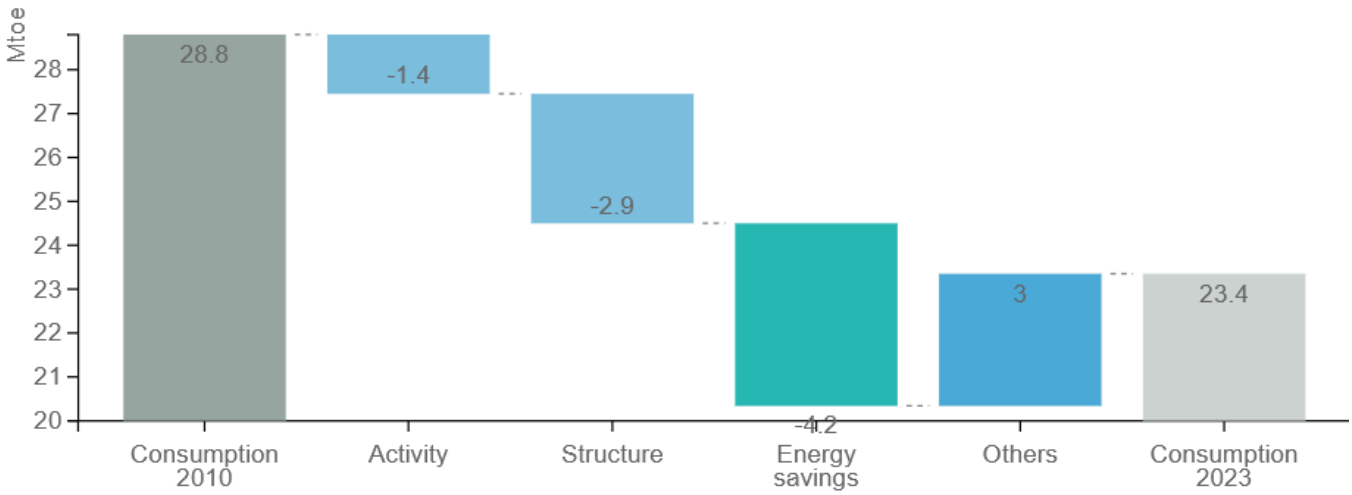
Source: ODYSSEE

In 2023, industry consumed 5.4 Mtoe energy less than in 2010 (-18.9%). This decrease was mainly driven by energy savings (-4.2 Mtoe), by structural changes towards less intensive branches (-2.9 Mtoe) and by a reduction in industrial activity (-1.4 Mtoe). Other effects, mainly non-used production capacity, increased the energy consumption by 3 Mtoe.

Figure 21: Main drivers of the energy consumption variation in industry



Source: ODYSSEE

The Transition Plan 5.0, established by art. 38 of Legislative Decree 19/2024 and converted into Law 56/2024, grants a tax credit to enterprises that invest in innovation projects resulting in a reduction in energy consumption. The tax credit is proportional to the expenditure incurred for the investments made and the reduction in energy consumption. The Plan provides a total of approximately 13 billion in the two-year period 2024-2025. The measure is included in NECP 2024.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
Energy audit cofinancing	No	The measure promotes energy efficiency in SMEs. In accordance with article 8 of the Decree n. 102 - 2014 (Mandatory Energy Audits. IND-IT1198), the Ministry of Economic Development co-finances regional programs to support the implementation of energy audits in SMEs or to adopt the ISO 50001 certification for the energy management. The funds cover the 50% of the costs associated with the energy audit implementation in SMEs.	1.06 TJ

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Industry 4.0 Programme	Yes	The programme is made up of a series of measures aimed at encouraging the development of the enterprises through private investments. Thanks to various fiscal tools, the plan aims to stimulate companies - in particular micro, small and medium-sized enterprises and innovative startups - to invest in innovation.	1.06 TJ
Mandatory Energy Audit_Implementation of Directive 2012/27/EU on energy efficiency	Yes	For large enterprises and those with high energy consumption, it introduces energy audits mandatory: they must run it within 5 December 2015 and then every four years.	5.29 TJ
Transition 5.0 - Implementation of production processes to an efficient and sustainable energy model	Yes	The measure supports the transition of production processes to an efficient, sustainable and renewable energy model, with the goal of achieving energy savings of 0.4 Mtoe in the period 2024-2026.	

Source: MURE

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