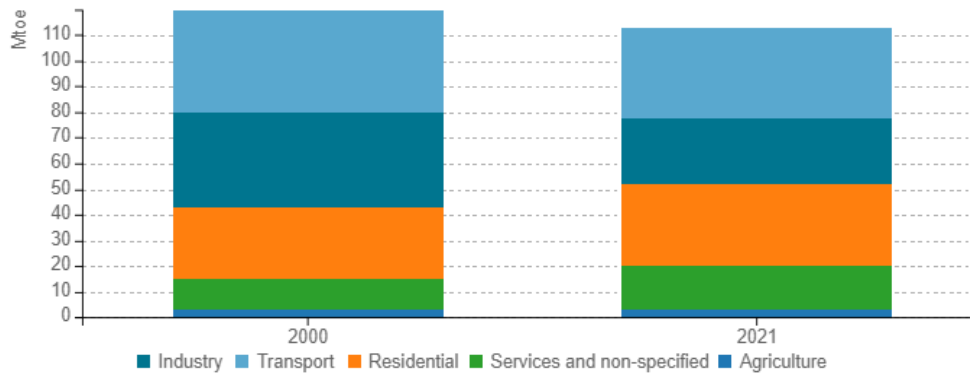


# Energy efficiency trends and policies

## Overview

In 2021 final energy consumption climate corrected was 112.7 Mtoe, -5.6% since 2000: in particular the variation compared to previous year was -8% in 2020, due to COVID pandemic, and +7.3% in 2021. In 2021 the largest consuming sector was transport sector representing 31.4% of total final energy consumption with a 2 percentage points decrease since 2000. Over the period 2000-2021 residential and services sectors grew by 4.8 and 5.6 percentage points, respectively: the building sector, comprising residential and services sectors, represents 43.5% of total final energy consumption in 2021. Energy consumption in industry decreased by 31.3% since 2000: in the last years the consumption was stable around 25 Mtoe.

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

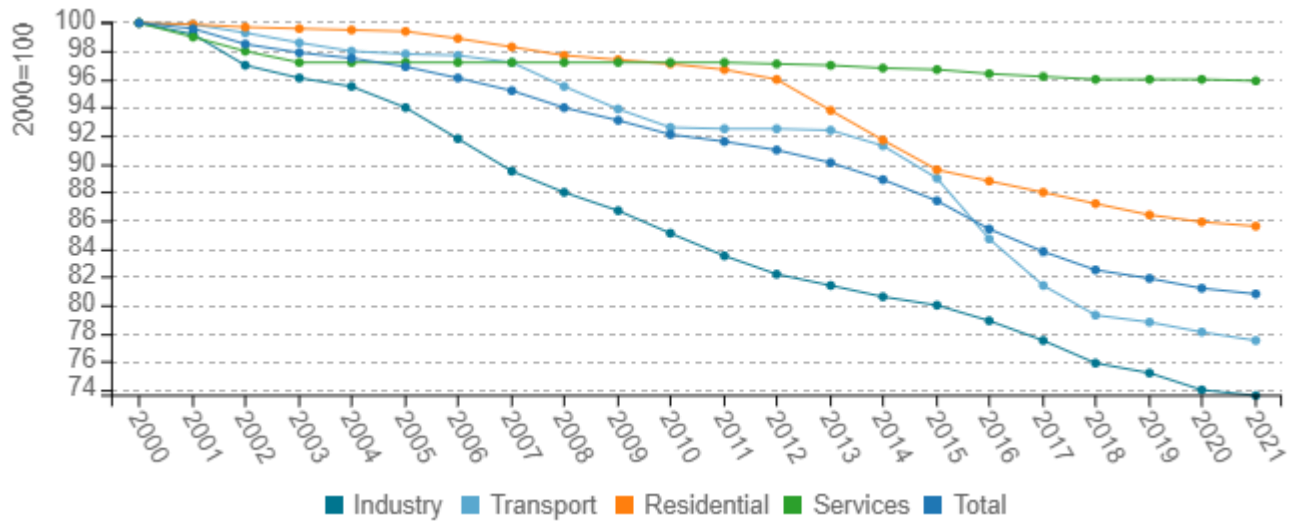


Source: ODYSSEE

Energy efficiency for final consumers, as measured by ODEX, improved by 19% over the period 2000-2021 at an average of 1.0% per year. The highest progress in energy efficiency was achieved by the industry: 1.5% per year over the period 2000-2021. The improvement in transport sector was quite constant, 1.2% per year, accelerating in the years 2015-2018 due to fast increase of passenger traffics compared to energy consumption. The residential sector had a steady progress in energy efficiency but slower because of the changes in lifestyle and dwelling comfort: 0.7% per year over the period 2000-2021.



Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

Legislative Decree n. 73/2020 transposes the EU directive 2018/2002 on the Energy Efficiency First Principle into the Italian regulatory framework. The L.D. indicates the minimum national energy efficiency contribution for 2030 set in the Integrated National Plan for Energy and Climate, updates the figure of the Energy Management Expert, provides incentives for SMEs for the implementation of energy management systems ISO 50001 and for energy audits every two years until 2030, starts the new Conto Termico by 30 June 2021, 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 of 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. The investments are divided for 80% in Southern Italy and 20% in the Centre and North of Italy. Relative to the obligation by art. 8 of UE Directive 2023/1791, in 2022 the reduction in final consumption was 2.5 Mtoe, equal to 93.4% of the related intermediate target reported in the INECP.

Table 1: Sample of cross-cutting measures

Measures	NECP measures	Description	Expected savings, impact evaluation
<a href="#">White Certificates scheme</a>	yes	Obligation scheme to electricity and gas distributors with more than 50,000 final users to achieve energy savings targets. The obligated parties may also achieve the targets by purchasing white certificates from other parties.	High
<a href="#">EU directive on Energy Efficiency First principle implementation</a>	yes	Implementation of the energy efficiency first principle into the Italian regulatory framework	High

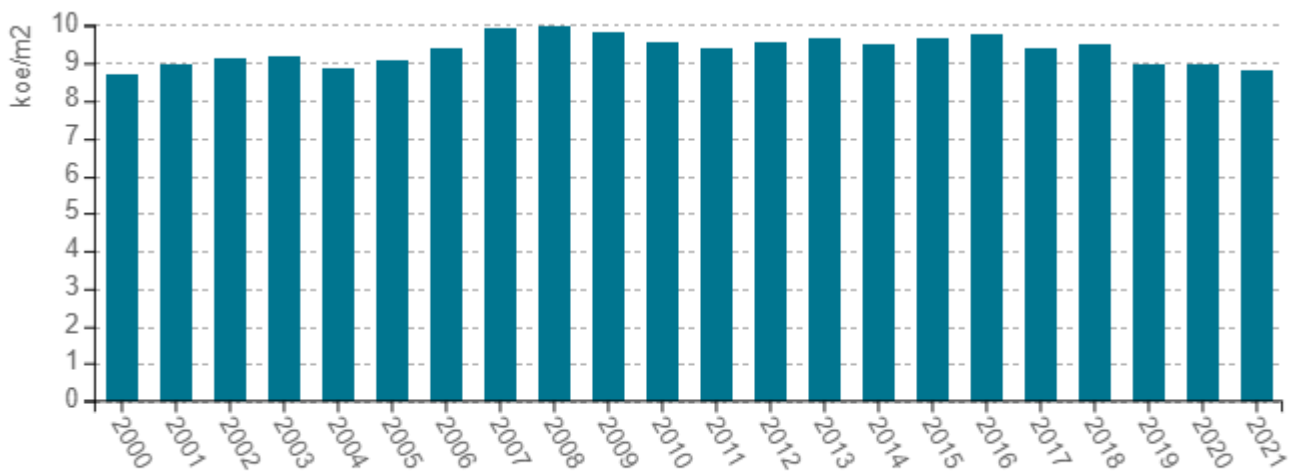
Source:



### Buildings

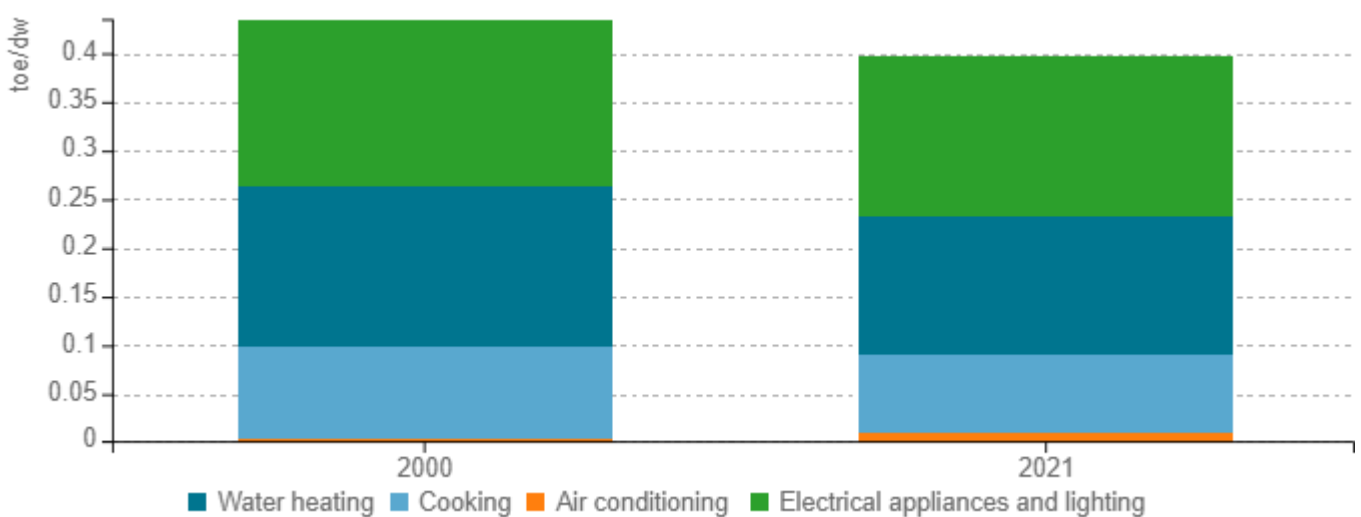
In 2021 energy consumption of residential sector was 31.7 Mtoe, +14% since 2000 (+0.6%/year). Space heating accounted for 67% followed by electrical appliances and lighting with 13%, water heating 12%, cooking 7% and air cooling 1%. Energy efficiency improvement led to decrease in space heating consumption per m<sup>2</sup>, -12% over 2008-2021, and in unit consumption per dwelling for electrical appliances and lighting, -3.5% since 2000 and -5% since 2011. Consumption had an increasing trend: +0.8%/year for space heating, +0.1%/year for cooking and for water heating, +0.7%/year for electrical appliances, and +5.5%/year for air cooling. Distribution of consumption by end-use was practically constant in the last 10 years.

**Figure 3: Energy consumption of space heating per m<sup>2</sup> (normal climate)**



Source: ODYSSEE

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

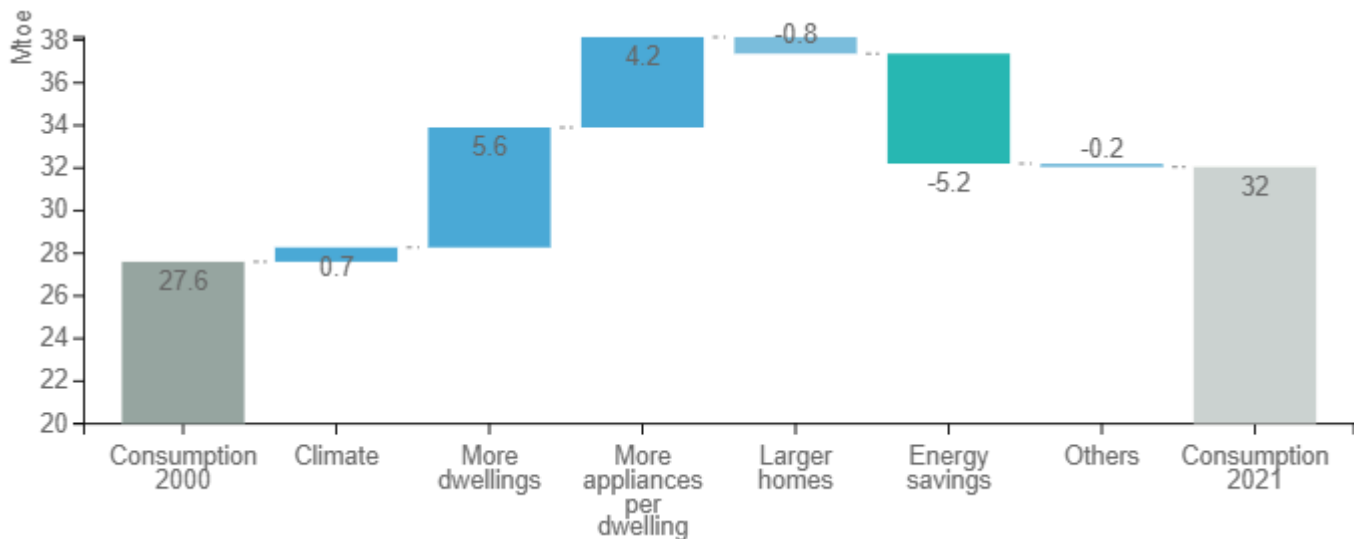


Source: ODYSSEE



Over the period 2000-2021 the energy consumption of residential buildings grew by 4.4 Mtoe. This increase was mainly due to two factors: more dwellings for 5.6 Mtoe, and greater comfort for 4.2 Mtoe (especially more appliances per dwelling). Energy savings have counterbalanced the effects of the energy consumption growth for 5.2 Mtoe.

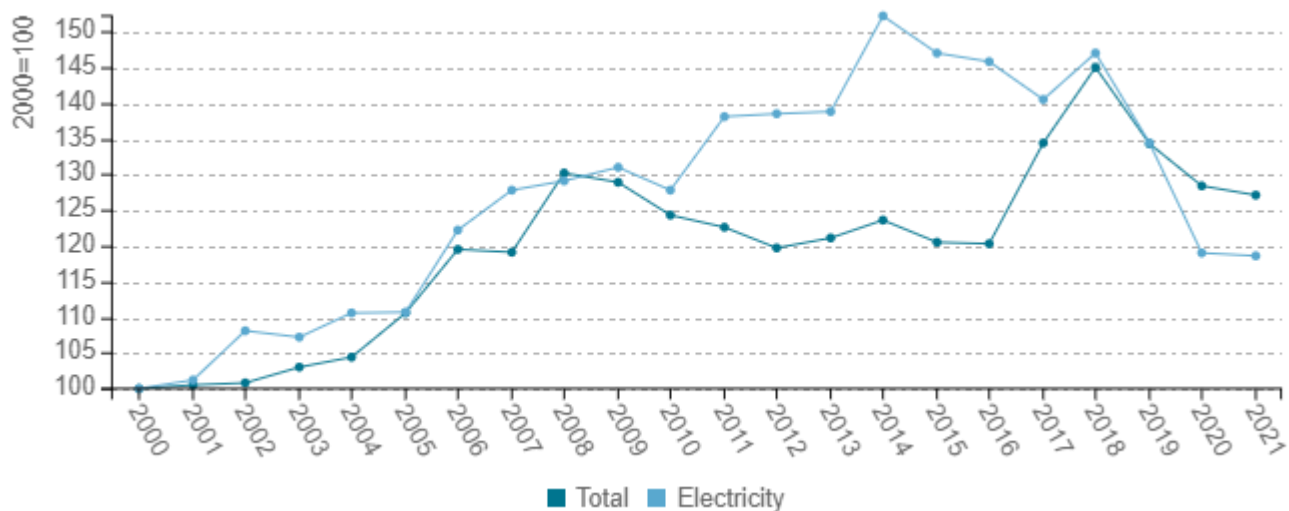
**Figure 5: Main drivers of the energy consumption variation of households**



Source: ODYSSEE

Energy consumption per employee in service sector had a growing trend: the peak in 2018 was due to ambient heat counting and the drop in 2020 was due to COVID. The electricity consumption per employee grew by 0.9%/year in 2000-2021 due to significant increase in electricity consumption of health services since 2011: unit consumption of other branches dropped after 2011.

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



Source: ODYSSEE



The Component C3 of Mission 2 of National Recovery and Resilience Plan 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. The Decree Law n. 34/2020, converted with amendments into Law n. 77/2020, established a 110% tax deduction (Superbonus) for expenses incurred from 1 July 2020 to 31 December 2021 for the implementation of specific interventions aimed at energy efficiency and static consolidation or the reduction of the seismic risk of buildings. The expected energy savings from Superbonus are around 191 ktoe/year with a reduction in greenhouse gas emissions of around 667 ktCO<sub>2</sub>/year. The Superbonus measure was extended to 31 December 2023 by NRRP. The Budget Law 2022 extended to 31 December 2024 tax deductions for building renovations, Ecobonus and Sismabonus. In 2022 energy savings from tax deduction amounted to 1.4 Mtoe/year of energy (54.3% of total energy savings).

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

Measures	Description	Impact evaluation
<a href="#">Tax deduction scheme (Ecobonus and Superbonus)</a>	Fiscal incentives for the existing buildings: 65% tax-deductions for the energy efficiency measures in existing dwellings (thermal insulation, installation of solar panels, replacement of heating and air-conditioning systems) and for home automation interventions (multimedia devices for the remote control of heating, hot water and air-conditioning); tax deductions, ranging from the 70% to the 75%, for the energy efficiency interventions on the common parts of the condominium buildings. Superbonus: 110% tax deduction for expenses incurred from 1 July 2020 to 30 June 2022 for energy efficiency and anti-seismic interventions. The main interventions are thermal insulation of opaque vertical, horizontal and inclined surfaces that affect over 25% of the building's dispersing surface, solar shielding, winter air conditioning and reduction of seismic risk.	High
<a href="#">Energy Performance of Buildings (EU Directive 2018/844)</a>	Minimum requirements for new and for the existing buildings which undergo to major renovation according to the type of building and the climatic area. The L. D. requires the adoption of the " Long Term Renovation Strategy" in order to support the renovation of the national residential and non-residential buildings stock, both public and private, to obtain a decarbonised and energy-efficient building stock by 2050, facilitating the cost-effective transformation of existing buildings into nearly zero-energy buildings.	High
<a href="#">Programme for the Energy Renovation of the buildings of the Central Public Administration (PREPAC)</a>	The mechanism promotes energy efficiency actions on the buildings of the central public administration, with the goal of the energy renovation of at least 3% per year of the air-conditioned useful covered area of the buildings. The programme has been refinanced for the period 2021-2030 (Legislative Decree 73/2020).	

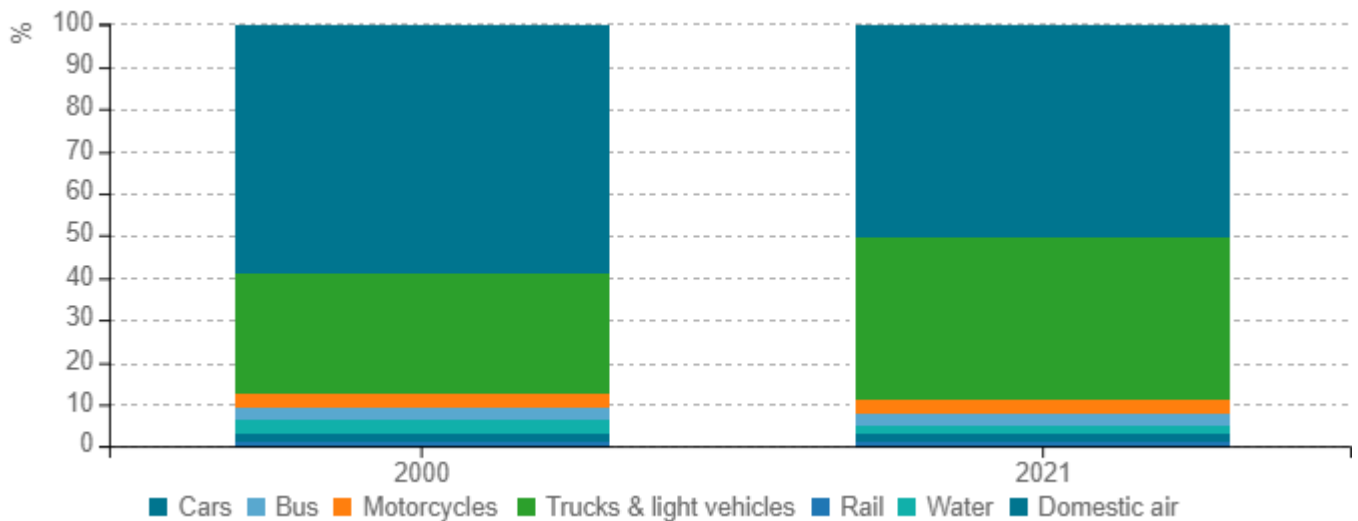
<a href="#">Thermal Account scheme (Conto Termico)</a>	Conto Termico 2.0 strengthens and simplifies the support mechanism Conto Termico. Incentive scheme to encourage Public Administrations and private parties to implement energy efficiency improvement actions in buildings and technical installations as well as for the generation of renewable thermal energy.	
<a href="#">Energy Efficiency and Renewable Energy Refurbishment tax reduction - Decreto Rilancio (Superbonus)</a>	The Decree Law n. 34/2020 established a 110% tax deduction (Superbonus) for expenses incurred from 1 July 2020 to 31 December 2023 for the implementation of specific interventions aimed at energy efficiency and static consolidation or the reduction of the seismic risk of buildings.	

Source:

### Transport

Road transport, passengers and freight, is the main mode of transport with around 95% of energy consumption. In 2021 cars accounted for 50%, goods vehicles for 38%, followed by motorcycles 4%, bus 3%, water 2% and rail 2%. Domestic air dropped to 1% in 2020 and 2% in 2021 for the stop due to the COVID.

Figure 7: Transport energy consumption by mode

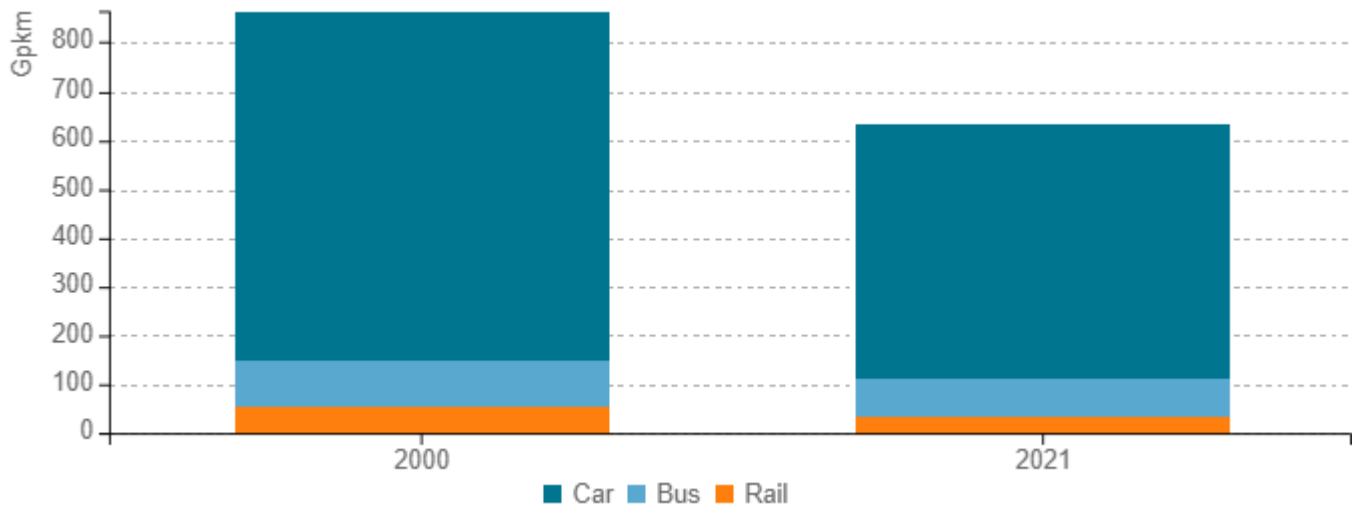


Source: ODYSSEE

Passenger traffic was growing since 2012: +3%/year over 2012-2019. In 2020 passenger traffic dropped by 36.4% due to the transport stop for COVID: in the 2021 the recovery was +10% compared to 2020. The share of cars is quite stable over 2000-2021: the drop in 2000-2012 was counterbalanced by the growth in 2012-2021.



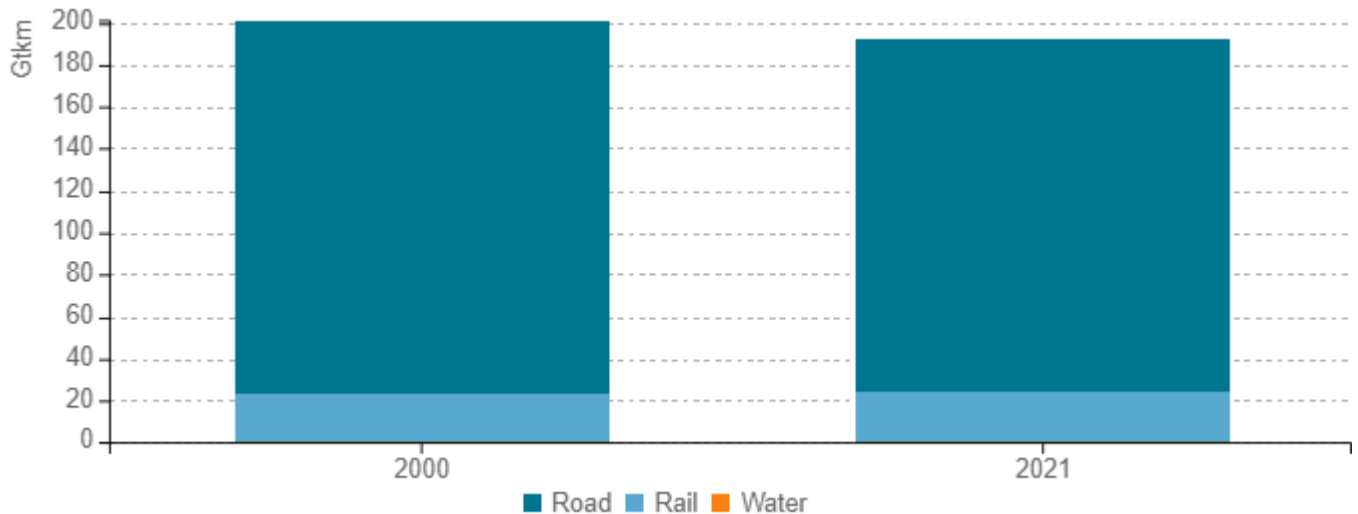
**Figure 8: Modal split of inland passenger traffic**



Source: ODYSSEE

The freight traffic (measured in tonne-km) was increasing since 2014, +25% in 2014-2021 but -4% compared to 2000. The drop over the period 2000-2014 is driven by the significant decrease in road goods traffic (-2.1%/year), especially since 2010, and in rail traffic (-0.9%/year).

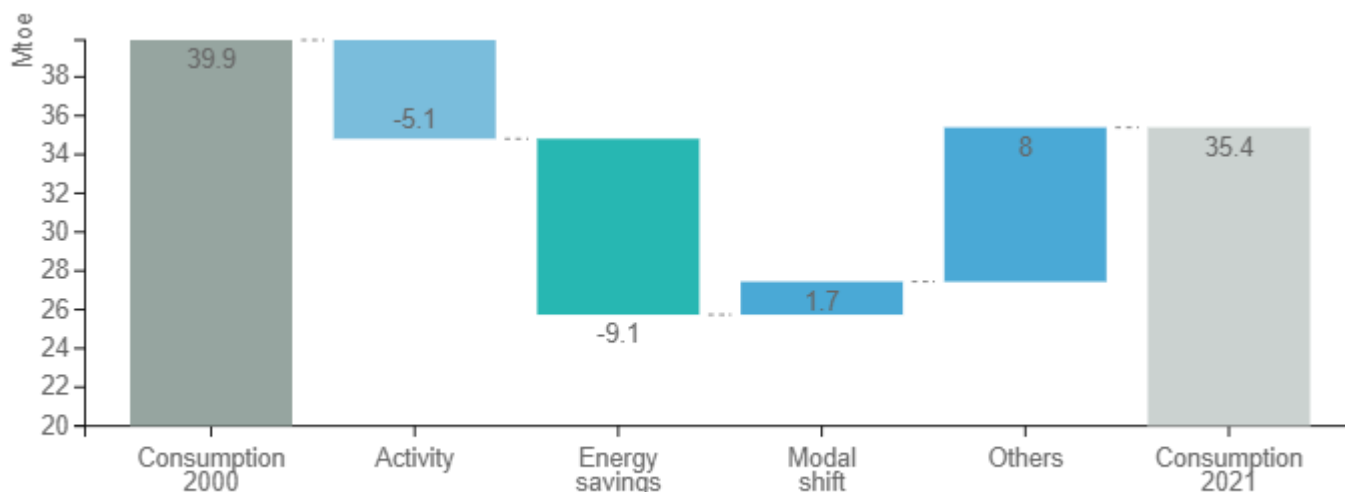
**Figure 9: Modal split of inland freight traffic**



Source: ODYSSEE

Over the period 2000-2021, the transport energy consumption reduced by 4.5 Mtoe (-11.3%). Energy savings (-9.1 Mtoe) and the decrease in activity (-5.1 Mtoe), due to a reduction in passenger and freight traffic, led to a cut in energy consumption, especially in the last years, partially counterbalanced by an increase in modal shift from public to private transport (1.7 Mtoe) and other effects (7.9 Mtoe), mainly low load factor in passenger and goods traffic.

Figure 10: 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 set “Sea Modal Shift” replacing Marebonus. It is the new incentive program intended for maritime companies to road/sea shift in short-medium range maritime transport: 39 million euros are available for year 2022 and 21.5 million euros for each of the years 2023-2026. In 2021 energy savings amounted to 2.9 Mtoe/year of final energy.

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

Measures	Description	Impact evaluation
<a href="#">Standards new passenger cars</a>	Car makers are required to achieve minimum efficiency standards for new cars.	Medium
<a href="#">Modal shift – Marebonus and ferrobonus</a>	Marebonus is an incentive for road/sea shift, through the creation of new maritime services and the improvement of existing ones. Ferrobonus is an incentive for road/rail shift, through the use of intermodal transport and transshipment transport to and from Italian logistics hubs.	
<a href="#">National Recovery and Resilience Plan - Rail upgrade and secure roads</a>	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 amount to 25.40 billion euros.	

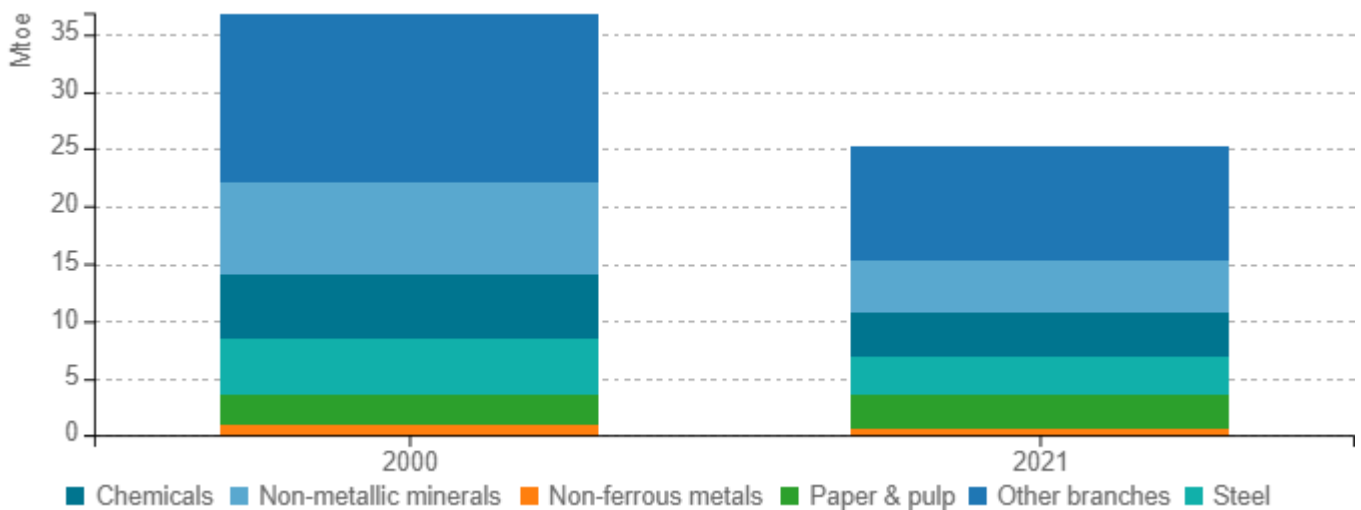
Source:



### Industry

Over the period 2000-2021 the energy consumption of industry reduced by 1.8%/year, from 36.8 Mtoe in 2000 to 25.3 Mtoe in 2021. The share of energy intensive branches (chemicals, steel, non-metallic, non-ferrous and paper) is around 60%: growing since 2019 (56%) after a decreasing period over 2011-2019.

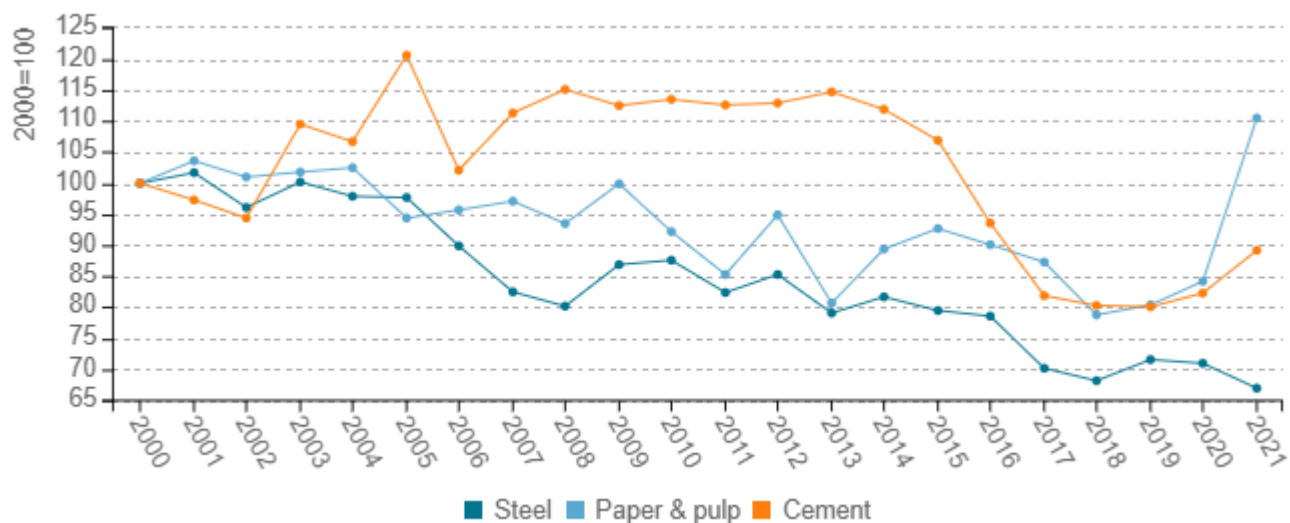
Figure 11: Final energy consumption of industry by branch



Source: ODYSSEE

The unit consumption of steel, including blast furnace consumption, decreased by 1.9%/year over the period 2000-2021: some negative years were due to non-used production capacity due to the economic crisis. The unit consumption of cement reduced by 0.5%/year: it remains quite stable over the period 2008-2014 and then it decreased until 2018.

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

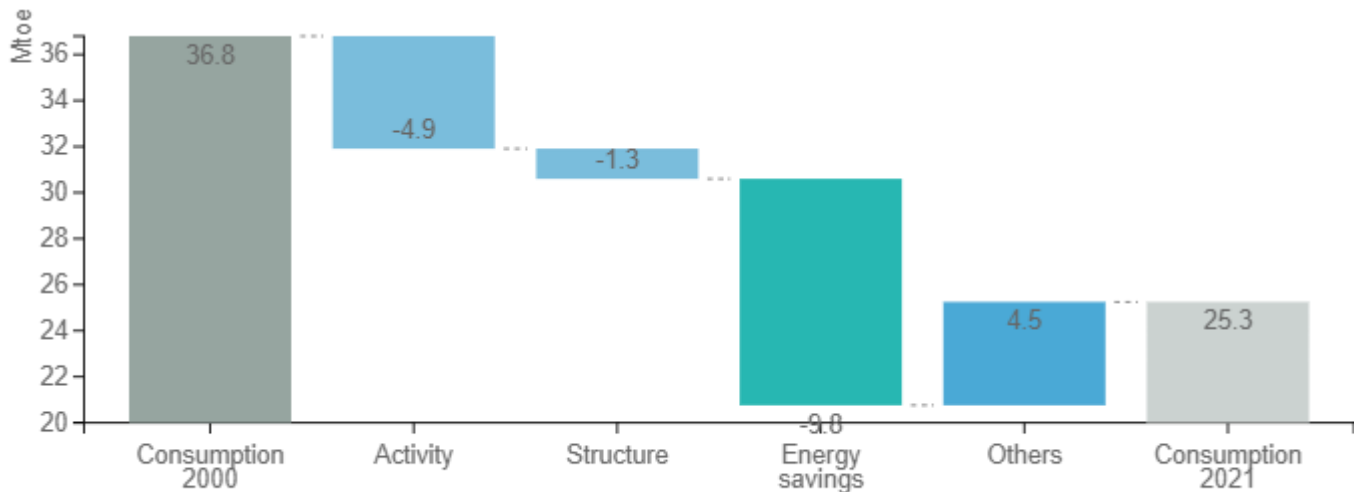


Source: ODYSSEE



The decrease in the energy consumption of industry, including blast furnace consumption, was 11.5 Mtoe (-31%) over the period 2000-2021. The drop was mainly driven by energy savings (-9.8 Mtoe) and decrease in activity, mainly due to the economic crisis and recession in years 2007-2015 (-4.9 Mtoe).

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



Source: ODYSSEE

Legislative Decree 73/2020 requires the transmission by 31 March of each year of energy savings for energy efficiency interventions achieved by the obliged subjects to energy audits, by enterprises with an ISO 50001 certified energy management system. In 2022, the declared energy savings were 0.8 Mtoe mainly by Large Enterprises and enterprises with an ISO 50001 certified.

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

Measures	Description	Expected savings, impact evaluation
<a href="#">Mandatory Energy Audit</a>	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.	Medium
<a href="#">Transition Plan 4.0 (Piano Transizione 4.0)</a>	It supports private investments for innovation and digitalization of production processes, the ecological transition, improvement of technical skills of employees and the development of new products and processes through the tax credit.	
<a href="#">Nuova Sabatini</a>	It supports micro and SMEs for investments in new capital goods, machinery, equipment and digital technologies.	

Source: MURE

