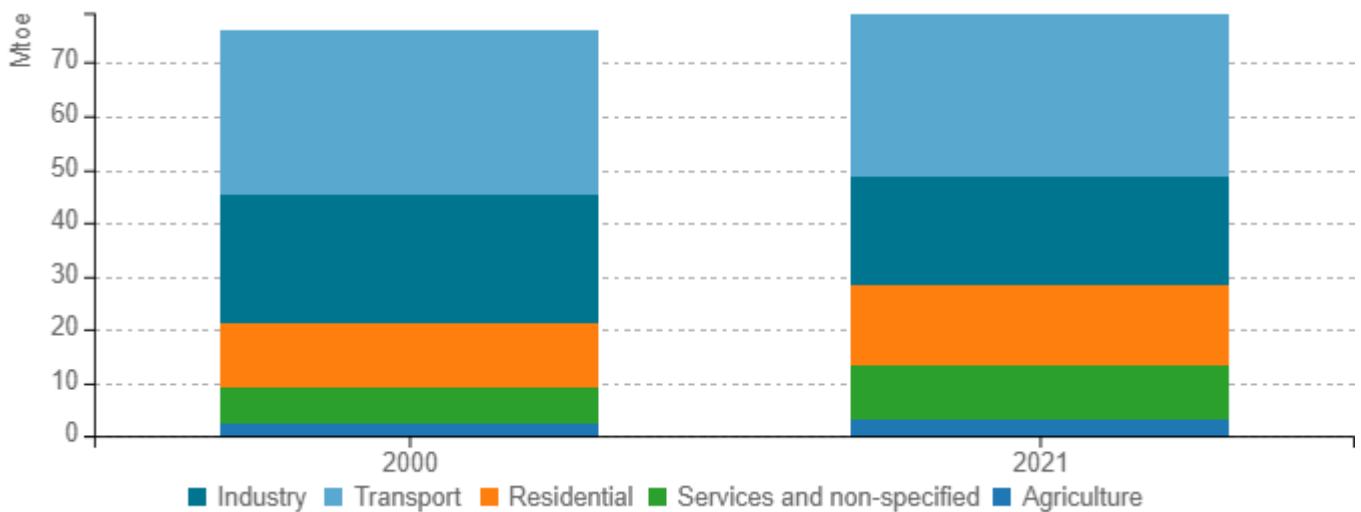


Energy efficiency trends and policies

Overview

In 2021, the climate corrected final energy consumption in Spain, excluding non-energy uses, amounted to 79.1 Mtoe, 8.2% higher than the consumption in 2020, in a scenario marked by the progressive normalization and recovery of the post-COVID-19 economic activity. Transport continues to be the most consuming sector with 38.4% of consumption. The buildings -residential and services- sector accounts for 31.9% of consumption, of which 59.2% corresponds to households. Industry makes up 25.7% of demand, showing a continuous decline both in terms of demand and contribution to GDP, in line with the expansion of the services sector in the economy.

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

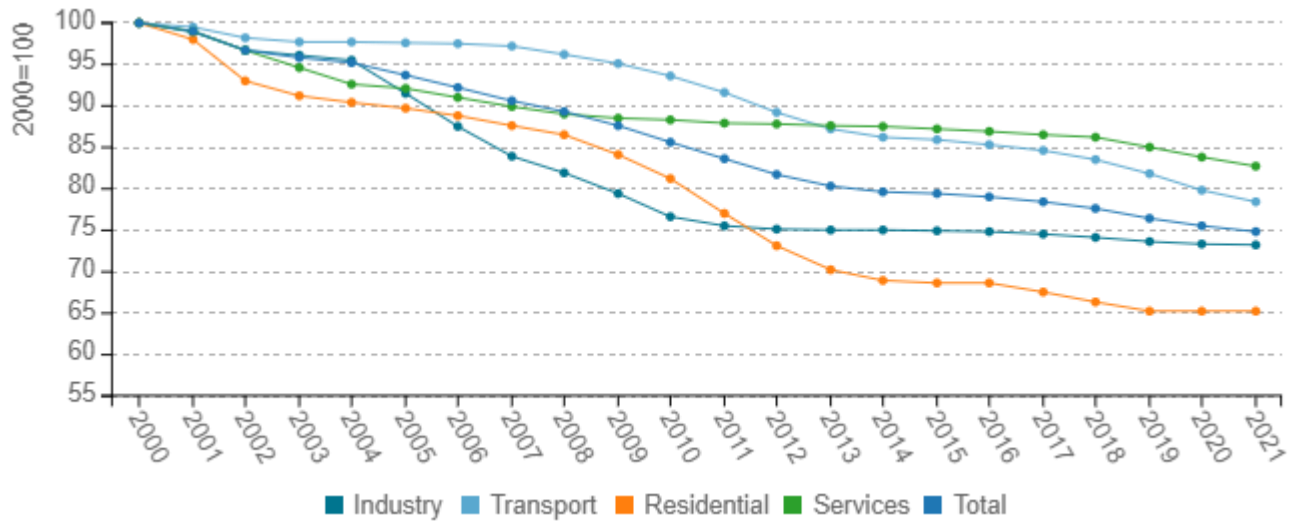


Source: ODYSSEE

According to the ODEX index, the global energy efficiency has improved by 1.4%/year from 2000 to 2021. The residential sector presents the greatest progress (+2.0%/year), induced by technological and legislative developments in building and equipment, to which is added the effect of the rehabilitation of existing homes. Next is industry (+1.5%/year), although an important part of its improvement happened before the 2008 crisis. Further behind are transport (+1.2%/year) and the services sector (+0.9%/year). Starting in 2014, the pace of improvement in the first two sectors loses momentum compared to the last two ones, whose progress is reinforced under the impact of the pandemic, and its subsequent recovery, recording improvements over 1.5%/year between 2019 and 2021.



Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

The National Integrated Energy and Climate Plan 2021-2030 (Spanish NECP), submitted on 31 March 2020, to the EC, is a planning instrument originating in Regulation (EU) 2018/1999 on Energy and Climate Governance. The Plan assumes an efficiency improvement target of 39.5% in 2030, equivalent to a primary energy consumption (Art.3, EED) of 98.5 Mtoe (non-energy uses excluded). Likewise, it establishes a binding target for cumulative final energy savings of 36.8 Mtoe between 2021 and 2030 (Art.7, EED). The latter must be achieved through the implementation of alternative measures in combination with a system of energy efficiency obligations on energy traders, which must make an annual financial contribution to the National Energy Efficiency Fund (FNEE). This Plan presents 17 efficiency measures of which 10 have a sectoral approach to comply with the savings obligation (Art.7, EED). In June 2023, the draft of the first update of the NECP was sent to the EC in accordance with the provisions of Regulation (EU) 2018/1999 (Art.14). The new NECP revises previous objectives upwards. In its current wording it increases the efficiency improvement objective to 44%. In addition, it raises the final energy savings objective to 53.5 Mtoe (Art. 7). To this end, the new Plan presents 23 complementary measures, among which are those promoted by the Recovery Plan, the National System of Energy Efficiency Obligations, Energy Savings Certificates, as well as alternative measures. 15 of these measures have a sectoral approach. This draft is subject to review according to the comments received by the different agents (Commission and public participation process).

Table 1: Sample of cross-cutting measures

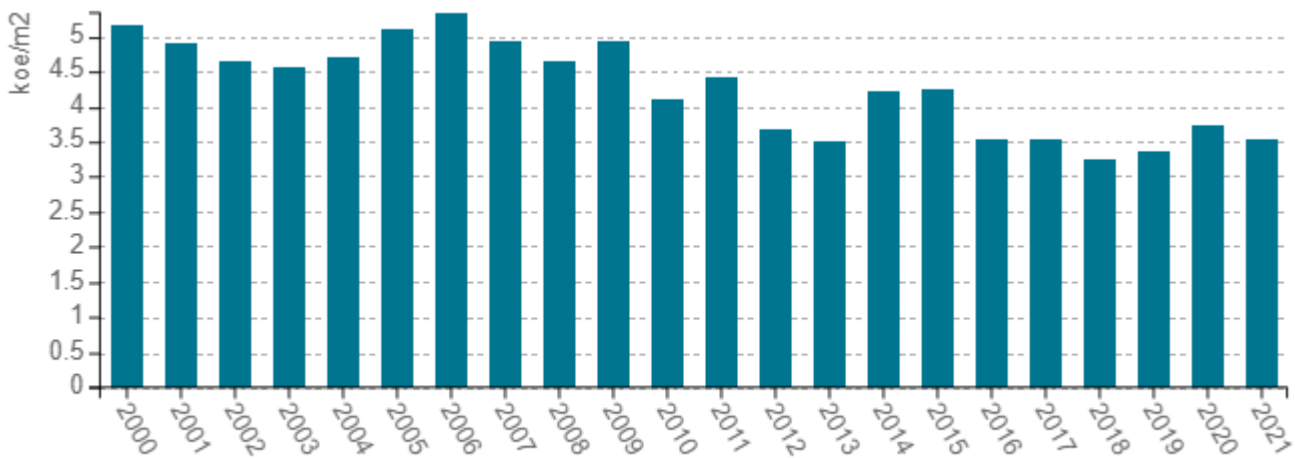
Measures	NECP measures	Description	Impact evaluation
The National Energy Efficiency Fund (FNEE)	yes	The National Energy Efficiency Fund (FNEE), attached to the Ministry for the Ecological Transition and the Demographic Challenge (MITERD) through the State Secretary of Energy, aims to finance economic and financial support mechanisms, technical assistance, training, information or other measures in order to increase energy efficiency in the different energy consuming sectors, so that they contribute to achieving the national energy savings objective established by the national system of energy efficiency obligations established by article 7 of the EED.	High
Energy Saving Certificate System (CAE)	yes	Through Royal Decree 36/2023, of 24 January, and within the scope of the national system of energy efficiency obligations (SNOEE), a system of certificates is established by which it is possible an accreditation mechanism to achieve energy savings through the presentation of Energy Savings Certificates (CAE). The purpose of this CAE System is to contribute to the fulfilment of the final energy savings objective established according to Article 7 of EED. These CAE must reflect the annual final energy savings recognized because of investments in energy efficiency actions, which must comply with the principles and methodology for calculating savings indicated in Annex V of the DEE.	High
Law 7/2021, of 20 May, on Climate Change and Transition	yes	This Law in force since 22 May 2021 aims to ensure compliance by Spain with the objectives of the Paris Agreement and facilitate the decarbonization of the Spanish economy and its transition to a circular model. The Law establishes a series of minimum objectives regarding the reduction of GHG emissions, penetration of renewables and improvement of energy efficiency. Specifically, in the field of efficiency, the aim is to reduce primary energy consumption by at least 39.5%. All these objectives may be revised upwards. The first review of these objectives is planned for 2023. This review may only contemplate an upward update of the current paths for reducing GHG emissions and increasing absorptions by sinks. The law includes as planning instruments to address the energy transition the National Integrated Energy and Climate Plan (Spanish NECP) and the Decarbonization Strategy for 2050 of the Spanish Economy. The Law promotes a series of measures to achieve the established objectives. Among these measures, those aimed at energy efficiency stand out, with special emphasis on buildings and transport.	Medium

Source: MURE

Buildings

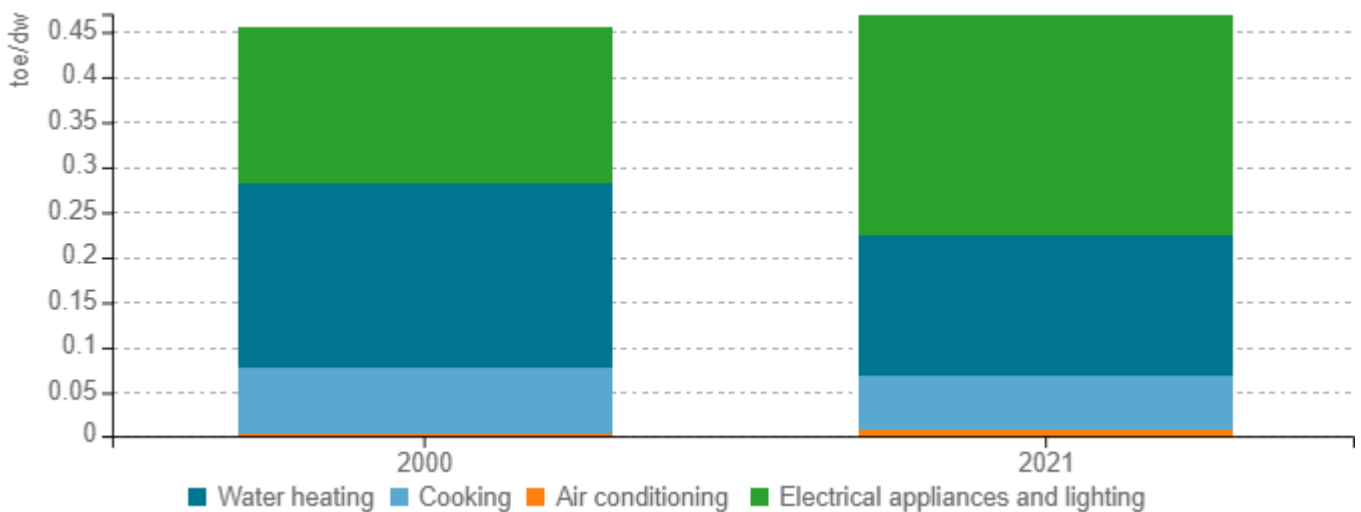
In 2021, 67% of the energy demand of residential buildings was concentrated in heating (41%) and electrical equipment (26%). Water heating is the next most relevant use (19.5%), while air conditioning barely exceeds 1% of consumption. Between 2000 and 2021, consumption in residential buildings has increased by 1.1%/year, mainly due to electricity demand (+2.5%/year). Since 2000, the consumption associated with electrical equipment has grown by 3.4%/year, increasing its share in demand (+12 pp). Except for air conditioning, whose demand has risen by 7.5%/year, the remaining uses have remained practically stable, with an imperceptible variation (+0.1%/year) in the case of heating, whose share has decreased by 9 pp. The unit heating consumption follows an erratic behaviour throughout the period with a downward trend (-1.8%/year), to which, efficiency improvements in heating equipment and homes contribute.

Figure 3: Energy consumption of space heating per m2 (normal climate)



Source: ODYSSEE

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

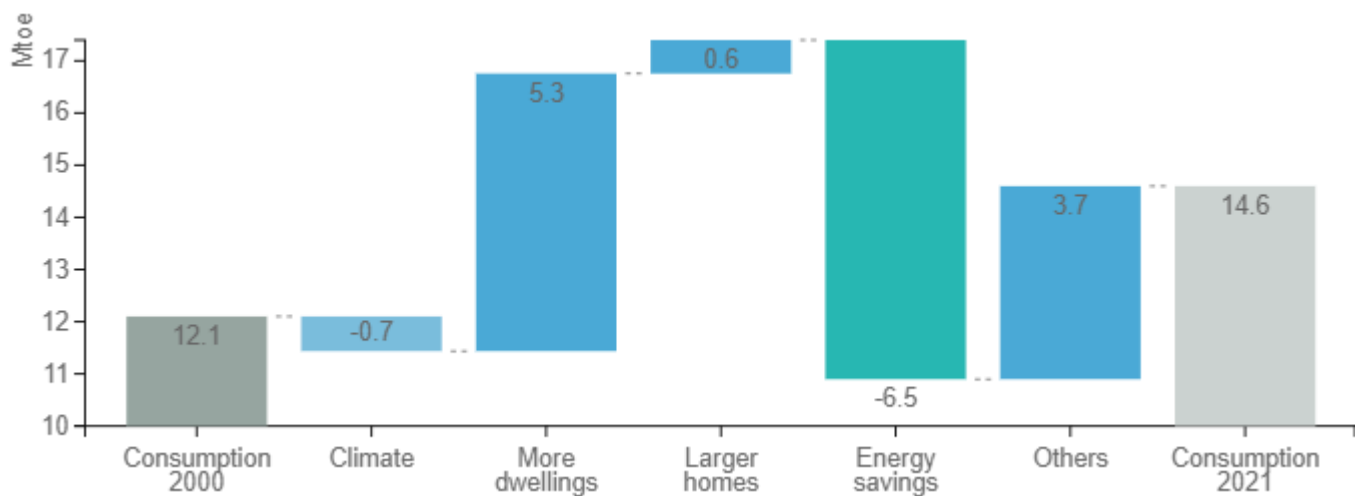


Source: ODYSSEE



Throughout the 2000-2021 period, the energy consumption in the residential sector has grown by 2.7 Mtoe, due to the increase in the number of occupied dwellings (+5.3 Mtoe), as well as greater comfort (+4.3 Mtoe) associated with the acquisition of equipment and a certain movement towards larger homes. These effects have been partially offset by the energy savings (-6.5 Mtoe) attributable to efficiency improvements in equipment and buildings, and to a lesser extent by the favourable weather (-0.7 Mtoe).

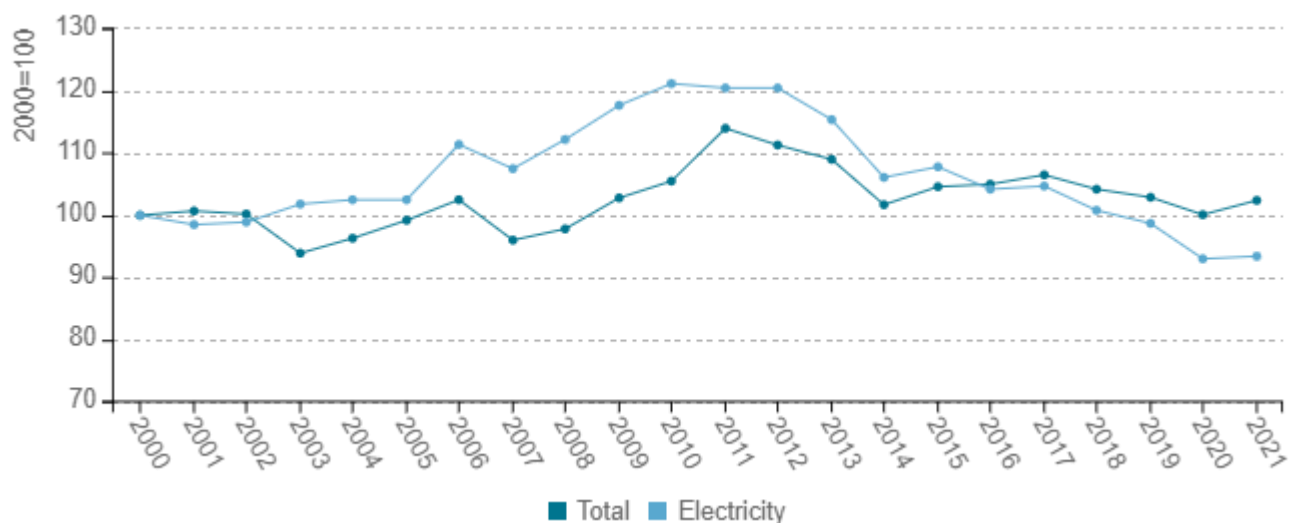
Figure 5: Main drivers of the energy consumption variation of households



Source: ODYSSEE

Between 2000 and 2011, the unit electricity consumption per employee in the services sector grew (+1.7%/year) above the total (+1.2%/year). Subsequently, there is a change in trend in both indicators, with a more pronounced drop under the impact of the crisis, which attenuates from 2015 onwards except for the effect derived from the pandemic. In the 2011-2021 period the electricity indicator has registered a more pronounced reduction (-2.5%/year), 2.3 times higher. This greater decrease in electricity demand may be due to the penetration of more efficient electrical equipment, mainly in the most consuming branches (offices, trade, and hostelry), together with energy management systems.

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



Source: ODYSSEE



In the buildings sector, the actions implemented follow the community guidelines, in particular the Directives on Energy Efficiency (EED) and Buildings (DEEE). Regarding this last directive, in recent years progress has been made in its transposition through different regulatory provisions that increase the levels of demand for efficiency, such as the Technical Building Code (Royales Decree 732/2019, 450/2022), the Regulation of Thermal Installations in Buildings (Royal Decree 238/2013, 178/2021) and the Energy Certification of buildings (Royales Decree 235/2013, 309/2021). Concerning the first directive, there are measures in accordance with articles 4, 5, 6 and 7. The long-term strategy for energy rehabilitation in buildings in Spain (ERESEE 2020) stands out, the measures aimed at the energy renewal of public buildings such as the PIREP Program, the Energy Transition Plan in the General State Administration (AGE) or the AGE Energy Savings and Efficiency Measures Plan, the AGE Green Public Procurement Plan (PCPE), 2018- 2025, as well as support measures (legislative and economic) for rehabilitation such as Law 10/2022 of June 14, and the PREE, PREE 5000 Programs, in addition to the aid programs for residential rehabilitation and social housing (Royal Decree 853/2021).

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

Measures	Description	Expected savings, impact evaluation
Aid Program for energy rehabilitation actions in existing buildings (PREE)	Program, coordinated by the IDAE, responsible for monitoring the aid, managed by the Autonomous Communities, direct beneficiaries of the aid for its distribution among the ultimate recipients of these, through the publication of the corresponding calls in their respective territories. The program, regulated by Royal Decree 737/2020, of 4 August, aims to boost the sustainability of the existing building through actions on the thermal envelope, thermal and lighting installations, giving continuity to the preceding programs (PAREER-CRECE, PAREER II). It is endowed with a budget of €300M.	High
Aid programs for residential rehabilitation and social housing	These programs, regulated by Royal Decree 853/2021, of 5 October, aim to contribute to the fulfilment of the objectives of the Recovery Plan in the areas of residential rehabilitation and construction of social housing, specifically in relation to investments C02.I01 "Rehabilitation program for economic and social recovery in residential environments" and C02.I02 "Program for the construction of housing for social rental in energy efficient buildings", both included within the component 2 "Implementation of the Spanish Urban Agenda: Urban rehabilitation and regeneration plan".	Medium
Law 10/2022 on measures to promote rehabilitation in the context of the Recovery Plan	This Law aims to address the challenges in terms of rehabilitation and improvement of the housing stock. To achieve this, it includes different measures: introduction of three new tax deductions aimed at promoting rehabilitation in habitual residences and residential buildings; improvements in the regime of communities of owners by modifying the Law on horizontal property applicable to rehabilitation works that contribute to improving the energy efficiency of the building, establishing a simple majority regime for the performance of such works; modification	High

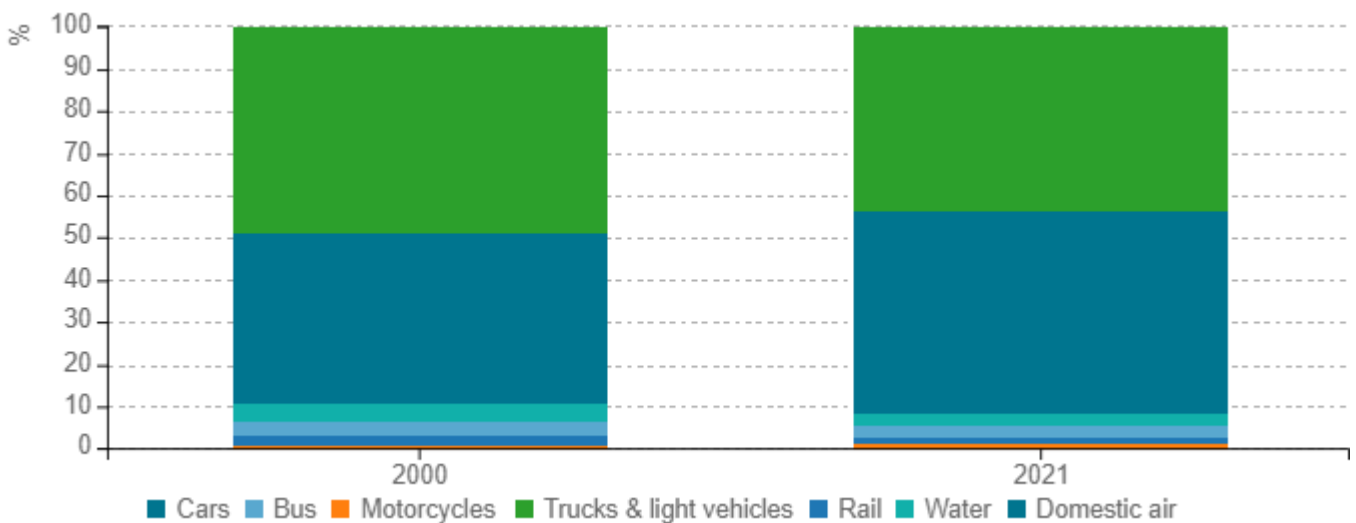
	<p>of the Land and Urban Rehabilitation Law in order to strengthen the powers of communities of owners with full legal capacity for credit operations related to both the rehabilitation of buildings and compliance with the duty of conservation; and creation of a line of guarantees so that credit institutions can offer financing for rehabilitation actions of residential buildings.</p>	
<p>Energy Transition Plan in the General State Administration (AGE)</p>	<p>This Plan forms a global package of €1,070 M that aims to modernize public administrations in the field of ecological transition, in coherence with the European Green Deal and the Energy Efficiency Directive, including measures aimed at energy savings and efficiency of buildings and infrastructure, sustainable mobility and the deployment of renewable thermal and electrical energies in the AGE. This Plan is financed by the European Recovery and Resilience Mechanism to the extent that it is part of the Recovery Plan (PRTR), within investment 4 of component 11 “Modernization of Public Administrations” (C11.4). For the execution of this Plan, Interdepartmental Agreements have been signed between the Secretary of State for Energy and different ministries.</p>	<p>Medium</p>

Source: MURE

Transport

In 2021 the final energy consumption in transport is still dominated by road (90%), whose representativeness has increased in 3.3 pp since 2000 under the boost of freight transport and cars. Cars account for 42.5% of transport consumption, while trucks and vans 43.5%. The remaining modes show a slight decline, reaching a share between 1.1% (rail) and 5.6% (air).

Figure 7: Transport energy consumption by mode

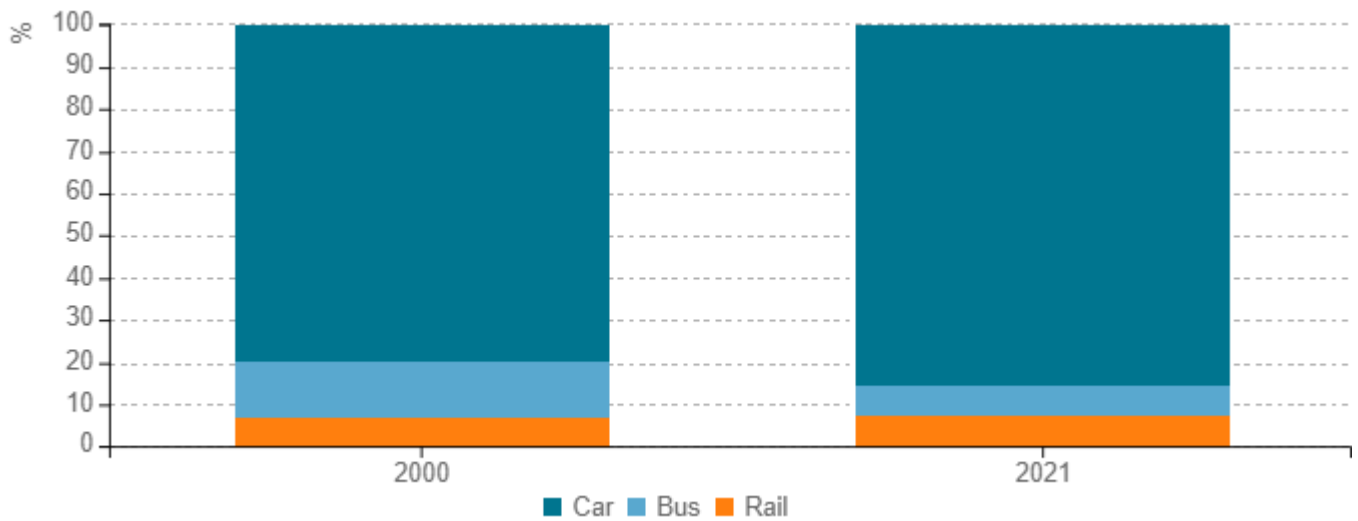


Source: ODYSSEE



The passenger traffic has decreased by 0.7%/year since 2000. In 2021 cars continue to cover most of the passenger traffic (85.6%), increasing their share since 2020 by 5.6 pp. In contrast, public transport has lost representation, falling below 15% (7.2% buses; 7.2% rail). However, this loss must be analysed with caution due to a methodological change implemented in 2017 that affects the accounting of bus traffic and, consequently, public transport.

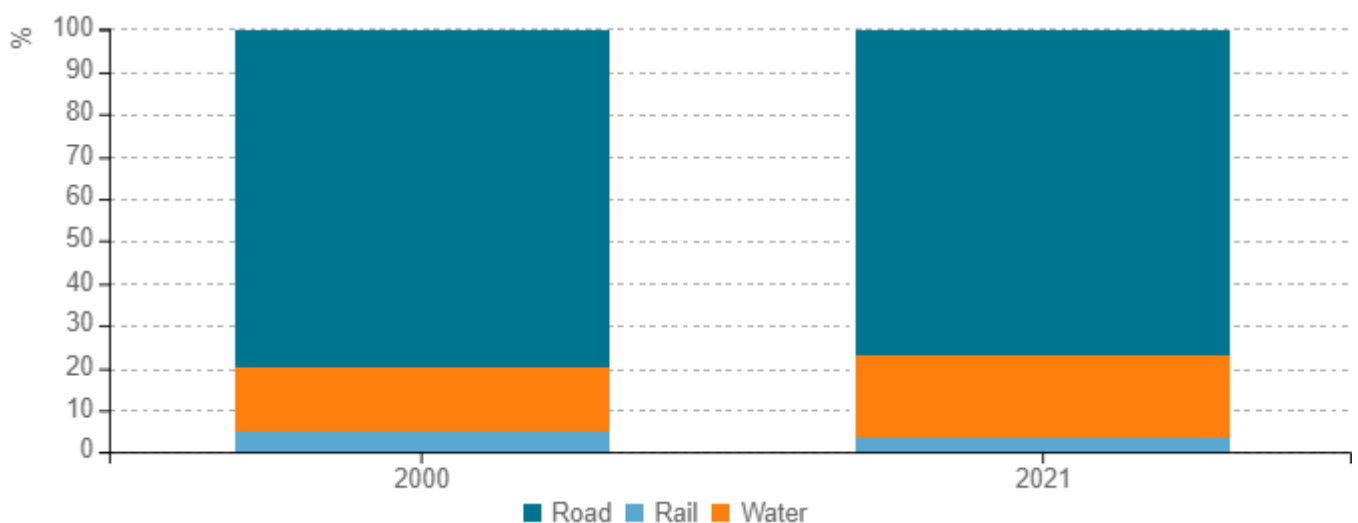
Figure 8: Modal split of inland passenger traffic



Source: ODYSSEE

The freight traffic has increased by 1.1% between 2000 and 2021. The road represents 77% of the freight traffic in 2021, 2.8 pp less than in 2000. Sea transport is next in importance with 19.6% of the freight, which supposes an increase of 4.5 pp compared to 2000. The rail barely reaches 4% of traffic of goods, to which is added a loss of representativeness of 1.7 pp since 2000.

Figure 9: Modal split of inland freight traffic

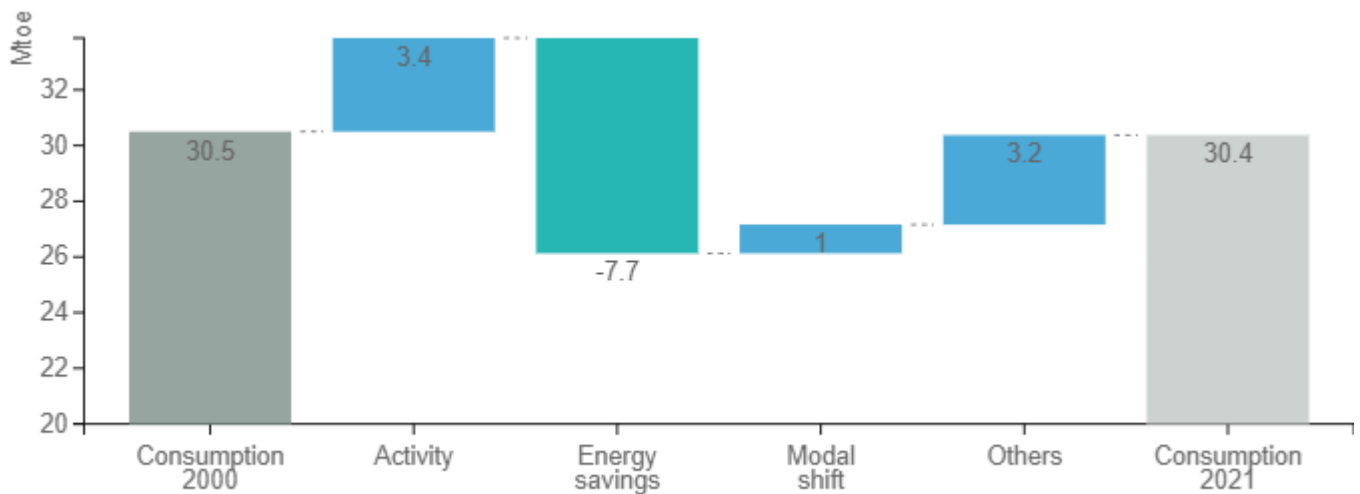


Source: ODYSSEE



The energy consumption in transport has decreased by 0.1 Mtoe between 2000 and 2021. This is mainly explained due to efficiency improvements (-7.7 Mtoe) induced by technological developments in vehicles. This effect has been practically offset by the effects associated with the behaviour and use of vehicles (+3.2 Mtoe), the activity (+3.4 Mtoe), to which is added the negative contribution of the modal shift with low contribution of the most efficient transport modes (+1.0 Mtoe).

Figure 10: Main drivers of the energy consumption variation in transport



Source: ODYSSEE

Energy efficiency measures in the transport sector fall into three typologies: improvement in the efficiency of the vehicle fleet through the renewal and/or electrification of vehicles; the promotion of modal change towards less energy-consuming modes; and the efficient use of means of transport. Concerning the first type, the vehicle acquisition aid programs stand out (MOVES, MOVES Singulares, MOVES FLOTAS, the Program for the sustainable transformation of freight and passenger fleets) while within the second type the Infrastructure, Transport and Housing Plan 2012-2024 (PITVI), the Aid Program for municipalities for the implementation of low-emission zones and the Program for the digital and sustainable transformation of urban transport deserve a mention. Regarding the third type, since 2014 the training system to get the driving license for private and industrial vehicles includes driving techniques. Likewise, the use of clean and efficient vehicles is encouraged through a registration tax on CO2 emissions and the classification of vehicles according to polluting potential. Within the framework of the NECP, there is a commitment to modal change, traffic reduction, the use of collective public transport, sustainable mobility, and the electrification of transport. On the other hand, the recent review of the NECP delves into changes in transport and sustainable mobility, with emphasis on the transformation of cities. In addition, reinforcing the commitment to public and collective transport and the railway, among others.



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

Measures	Description	Impact evaluation
MOVES II-III programs for incentives for efficient and sustainable mobility	<p>The MOVES Program aims to finance actions to support mobility based on criteria of energy efficiency, sustainability, and promotion of alternative energies, including the provision of vehicle charging infrastructure electrical. The second and third editions are endowed with a joint budget of €500 M. In the second edition, the eligible actions are expanded, considering among them the acquisition of electric and fuel cell demo vehicles of categories M1 and N1 up to 9 months old. Likewise, the limit price of a passenger vehicle to be eligible is increased, as well as the maximum budget for heavy gas vehicles. On the other hand, vehicle scrapping is no longer mandatory. Regarding the third edition, some of the modifications are the greatest incentive effect, by increasing the aid intensities for the ultimate recipients not subject to the General Block Exemption Regulation, the increase in aid for electric vans and motorcycles for individuals, autonomous and administration, and expanding the eligibility of demo vehicles to motorcycles.</p>	High
Aid program to municipalities for the implementation of low-emission zones and the digital and sustainable transformation of urban transport	<p>This program aims to subsidize actions that contribute to the achievement of specific objectives, linked to the general objectives of component 1 of the Recovery Plan (PRTR): Decarbonization and digitalization of urban mobility. This program, financed by the PRTR, is developed through two calls for aid with a total amount of €1.5 M. The program includes four lines of action: Implementation of Low Emission Zones in provincial capitals and municipalities with more than 50,000 inhabitants; promotion of modal change in urban and metropolitan environments towards more sustainable means of transport, prioritizing collective public transport and active mobility; transformation of public transport of passengers and goods towards a zero-emission activity; and digitalization of the activity of public transport services.</p>	Medium
Program for the sustainable transformation of freight and passenger fleets	<p>This program seeks to accelerate investments to facilitate the sustainability of transport. In this way, it aims to promote the decarbonization of professional road transport by renewing the fleet of heavy goods and passenger transport vehicles (excluding those of public ownership), encouraging the penetration of vehicles powered by alternative energies (low-carbon vehicles (electric, hydrogen, hybrid and plug-in hybrid and gas vehicles (LNG or CNG)), as well as promoting the automotive sector and industrial reactivation. This program with a maximum allocation of 400 M is financed with the European Recovery and Resilience Mechanism to the extent that it is part of the Recovery Plan (PRTR), within investment 1 of component 1 "Sustainable mobility shock plan, safe and connected in urban and metropolitan environments.</p>	Medium

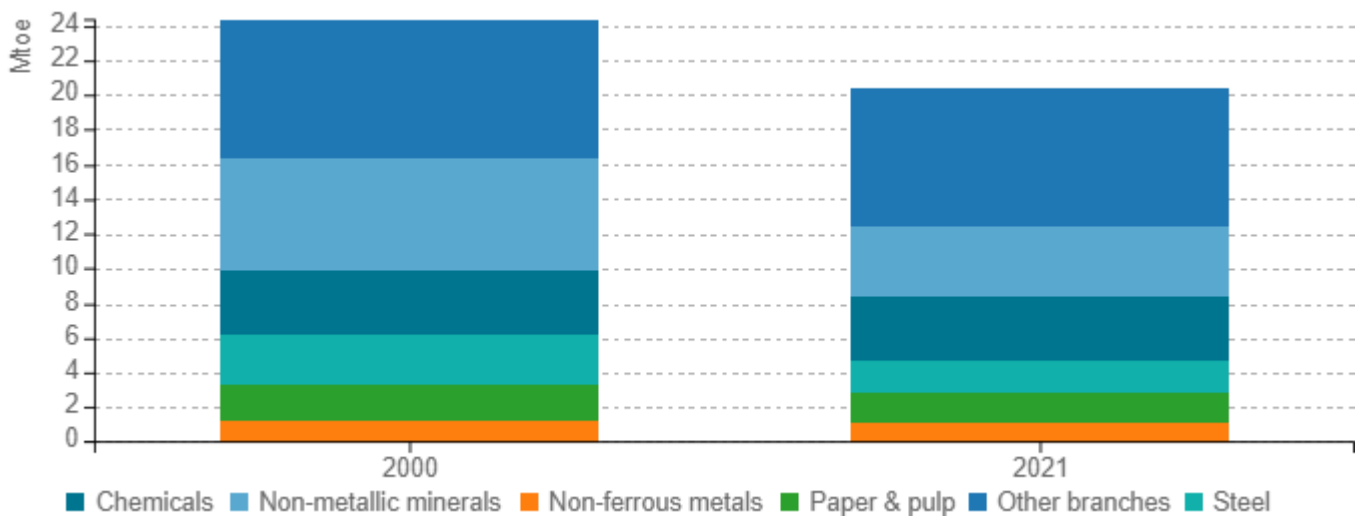
Classification and labelling of passenger cars and vans based on their polluting potential	<p>Through Instruction 15/V-110 of 7 April 2015, the "zero emissions" label was presented. This label must be carried by electric vehicles (battery-powered (BEV), extended range (REEV), plug-in hybrids (PHEV) with a minimum range of 40 km in electric, fuel cell (FCEV)) or hydrogen (HICEV) mode. By Resolution of 13 April 2016 of the General Directorate of Traffic the "zero", "ECO", "C" and "B" labels were approved, which classify 50% of the stock of vehicles based on its polluting potential. This measure will contribute to greater penetration of more efficient and less polluting vehicles.</p>	<p>High</p>
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Source: MURE

Industry

The energy consumption of the industry has followed a downward trend since 2005, which has continued with certain disruptions caused by the various crises (economic and health) and its subsequent recovery. In 2021, consumption amounts to 28.4 Mtoe, 16.3% lower than in 2000. Five intensive branches concentrate 61.2% of consumption: non-metallic minerals (20.1%), chemicals (18.0%), steel (9.1%), non-ferrous metals (5.5%), and pulp and paper (8.4%). The greatest reduction in consumption occurs in the non-metallic minerals and steel industries (-2%/year), decreasing their share in demand, respectively 6.2 and 2.7 pp.

Figure 11: Final energy consumption of industry by branch

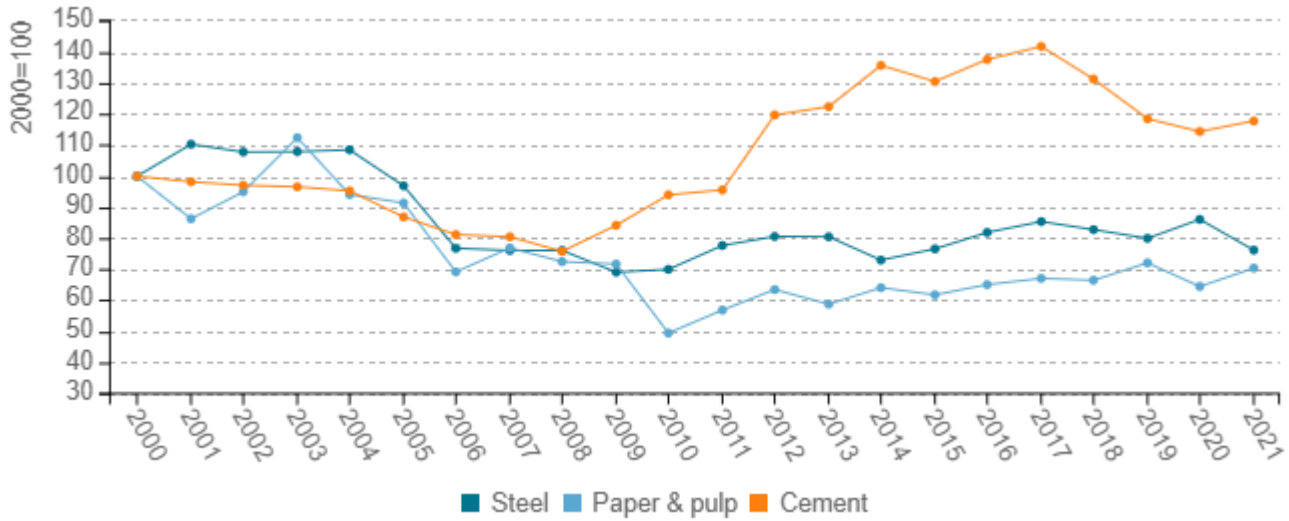


Source: ODYSSEE

Among the most intensive industries, the downward trend in unit consumption of the steel (-1.3%/year) and paper (-1.7%/year) stands out in the 2000-2021 period. In contrast, the cement industry, despite its good performance before the economic crisis, has worsened by 0.8%/year throughout the period. All trends towards improvement were interrupted due to the impact of the crisis on productive capacity and, consequently, on the performance of equipment and processes. With the change in the economic situation after 2014, the steel and paper industries in 2021 have recovered or even improved compared to the pre-crisis level, while cement remains 55% above.



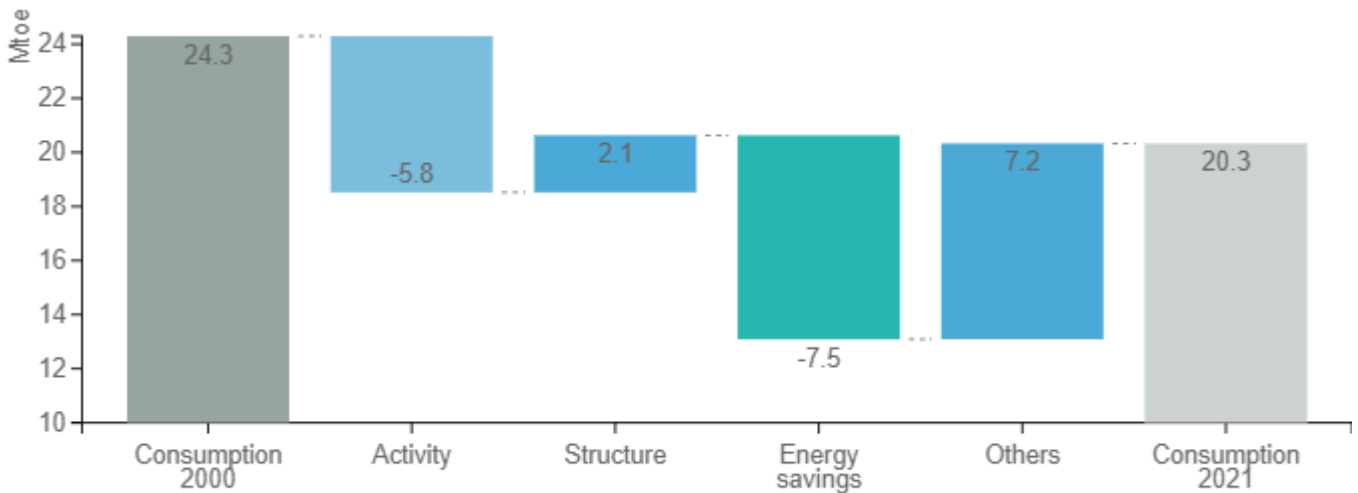
Figure 12: Unit consumption of energy-intensive products (toe/t)



Source: ODYSSEE

Between 2000 and 2021, the energy consumption of the industry has decreased by 4.0 Mtoe, mostly because of efficiency improvements (-7.5 Mtoe) and the drop-in activity (-5.8 Mtoe), reinforced during the different crises, economic (2008-2014) and 2020 health (COVID-19). These effects have been partially offset by operational inefficiencies (+7.2 Mtoe) mainly associated with the crises, and to a lesser extent by structural changes (+2.1 Mtoe).

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



Source: ODYSSEE

Actions to improve energy efficiency in the industrial sector, generally framed in the different efficiency plans, and more recently within the NECP, are aimed at promoting investments in efficiency projects through technological improvements and the implementation of energy management and audit systems. Among the most recent measures are the aid program for SMEs and large companies, the obligation to carry out audits in large companies and the aid lines within the framework of the Recovery Plan for innovation and sustainability plans in the manufacturing industry, and to comprehensive actions of the Electric and Connected Vehicle industrial chain (PERTE VEC). Within the new NECP, as a novelty, improvements are focused on energy intensive industries.

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

Measures	Description	Expected savings, impact evaluation
Energy audits and management systems	In compliance with Royal Decree 56/2016, of 12 February, which transposes article 8 of the EED, the obligation to carry out energy audits is imposed on large industrial companies (or groups of companies that meet this requirement). The audits must be carried out every 4 years, covering at least 85% of the final energy consumption of all the facilities that are part of the activities managed by the affected companies and groups.	Medium
Aids to SMEs and large companies in the industrial sector	This Program, currently endowed with a total budget of €625,075 M, is aimed at financing actions corresponding to the following typologies: improvement of technology in industrial equipment and processes; and implementation of energy management systems.	High
Aid line for innovation and sustainability plans in the manufacturing industry	This Line, co-financed under the Recovery Plan, aims to encourage the development and implementation of these plans in industrial companies. Aid may be granted in the form of loans, or a combination of grants and loans. Innovation and sustainability plans, structured in one or several projects associated with one of the following lines of action, will be eligible for aid: R+D+I line: Industrial research projects, experimental development, and innovation projects in the field. organization and processes; and the Innovation Line in Sustainability and Energy Efficiency, considering the following investments. The projects must be R+D+I or sustainability and energy efficiency innovation projects, intended to be applied in the value chain of the manufacturing industry, and must adapt to a series of thematic priorities, including the circular economy and eco-innovation and the decarbonization, energy efficiency, new sources of renewable energy and reduction of polluting emissions.	Medium

Source: MURE