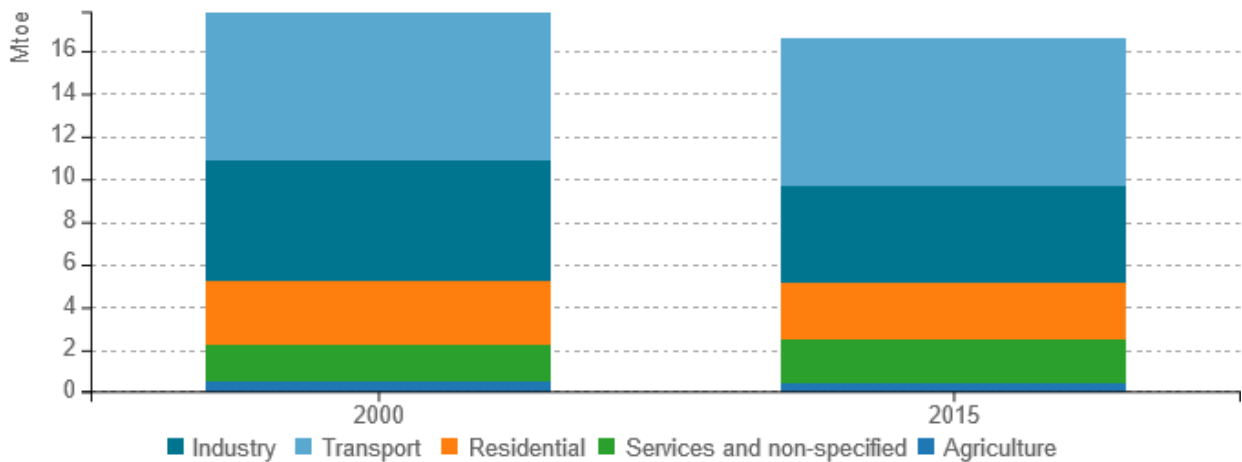


Energy efficiency trends and policies

Overview

In 2015 the final energy consumption in Portugal was 16,6 Mtoe, 6,6% lower when compared to 2000. The transport sector is the largest consumer, accounting for 41,9% of final energy consumption in 2015 followed by the building sector (residential and services) with 28,1%, exceeding industry with 27,4%. The industry reduced its the energy consumption -4,4 percentage points from 2000 to 2015. In opposite, transport and services saw their share increase by +2,9% and +2,2%, respectively. In this same period, residential sector kept a steady share around 16% with a slight increase of +0,7%.

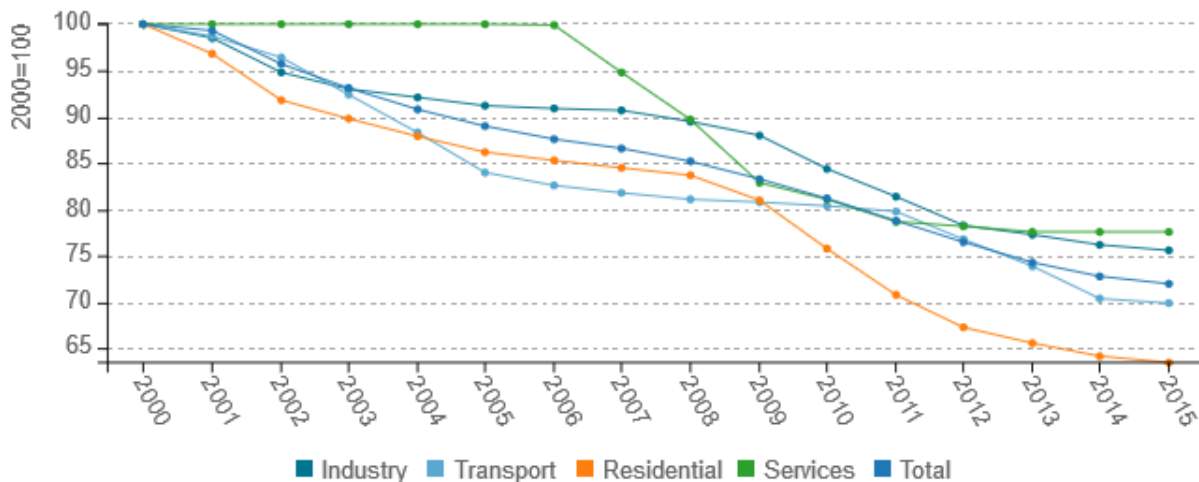
Figure 1: Final energy consumption by sector (normal climate)



Source: ODYSSEE

Energy efficiency of the whole economy (ODEX) improved by 28% over the period 2000 to 2015 by an annual average gain of approximately 1.9%. For the same period and although all sectors have contributed for this improvement, the residential sector reached the higher energy gain by 2,4%/year, followed by transport with 2,0%/year, showing a positive progress in energy efficiency. Industry and service sector followed the same trend as the global ODEX attaining, in 2015, an annual improvement of 1,6% and 1,5%, respectively.

Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

Portugal is still under the second National Energy Efficiency Action Plan (NEEAP), which intent to reduce, till 2020, the primary energy consumption up to 22,5 Mtoe. The NEEAP encompasses six specific areas: Transport, Residential, Tertiary, Industry, State , Agriculture and Behaviors, in programmes, taxes, incentives and financing. In the public administration sector, in addition to the Energy Efficiency Program in Public Administration (ECO.AP), other goals were settled in the NEEAP, like the purchase of more efficient vehicles in the transport fleet and a more efficiency public street lighting. In the industry the Management System of Intensive Consumption of Energy applies for all companies and facilities with a consumption over 500 toe/year, imposing binding energy audits. Concerning the buildings, a more ambitious requirements to either thermal envelope or technical systems (heating/cooling/DWH/lighting/elevators) were settled, aiming to achieve nearly of near-zero buildings. In the transport programs aimed to encouraging the renewal of road vehicles plus it's efficient use were settled; urban mobility through the incentive for public transport use and the energy efficiency in transport system through the Management Regulations of Energy Consumption. The estimated intermediate targets for 2016 were achieved with the reduction of 1,5 Mtoe (63% of the 2020 goals).

Table 1: Sample of cross-cutting measures

Measures	NEEAP measures	Description	Expected savings, impact evaluation	More information available
Energy Efficiency in Public Administration (ECO.AP)	yes	Promotion of Energy Performance Contracting, aiming to achieve a level of energy efficiency of around 30% by 2020 in the Public Administration.	n.a.	Link
Energy Efficiency Fund (EEF)	yes	Constitutes a financial instrument capable of financing the programs and measures provided in the National Energy Efficiency Action Plan (NEEAP) in all its lines of action, that are fundamental for Portugal to achieve the goals set out related to efficient energy end-use and energy services.	Medium	Link

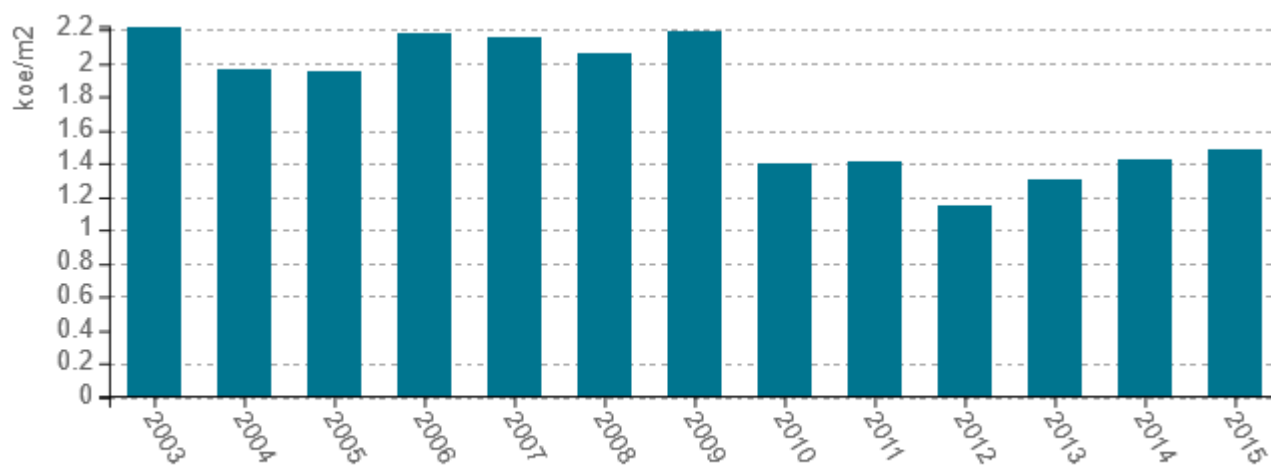
Source: MURE

Buildings

In the residential sector, cooking has the largest share of energy consumption, 39% in 2015, even it has fallen -3% compared to 2000, followed by space heating with 21%, water heating with 20% and electrical appliances with 19%. Space cooling has no expression in energy consumption (1%). Between 2000 and 2015 the electrical appliances increased their consumption by +1.3%/year while space heating reduced by -1,5%/year, cooking by -1,2%/year and water heating -0,8%/ year. Thanks to better performance equipment's and inhabitant behavior on cooking and heating, the energy consumption in the residential sector diminished around -0,9%/ year.

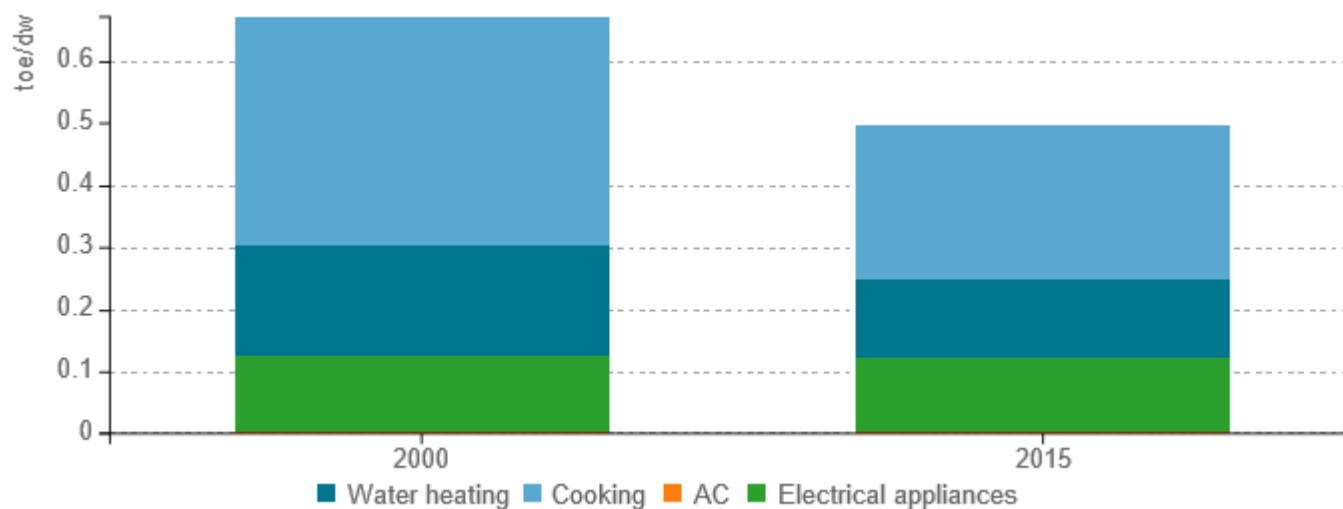


Figure 3: Energy consumption of space heating per m2



Source: ODYSSEE

Figure 4: Energy consumption by end-use per dwelling

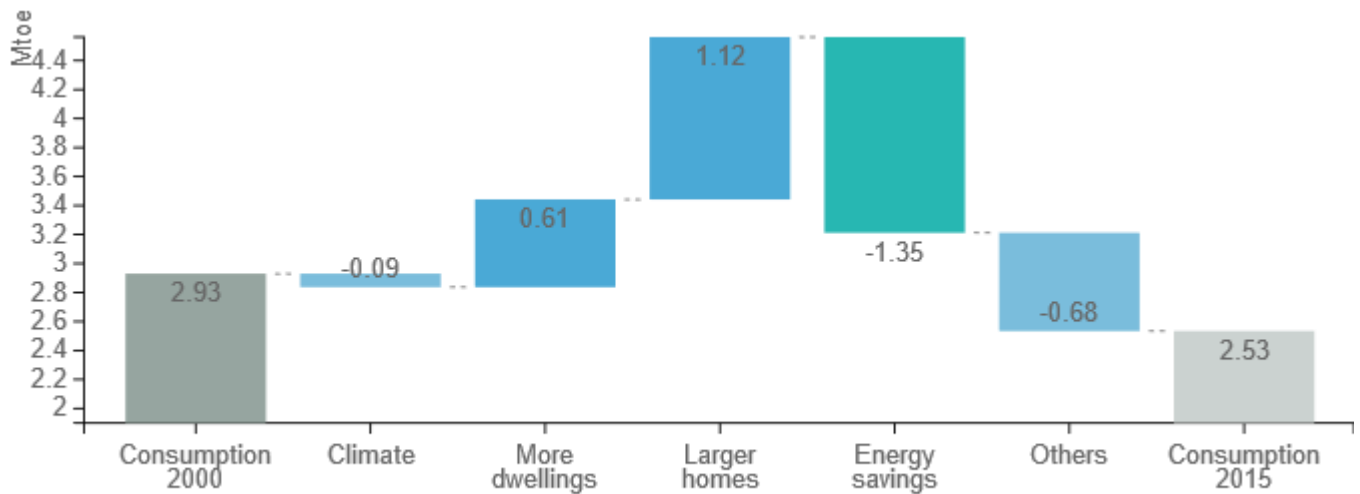


Source: ODYSSEE

The final energy consumption in the residential sector is 14% lower in 2015 related to 2000. This is mainly explained by energy savings (-1,35 Mtoe) and by other factors (-0,68 Mtoe). On the other end, factors like more dwellings (+0,61 Mtoe) and larger homes (+1,12 Mtoe) contributed negatively. The stock of permanently occupied dwellings increased +22% in the same period and the average area of dwellings grew around +23% in the last 12 years. The energy savings might also be affected by the inhabitant behavior attained during the period of the economic crisis (post 2010).



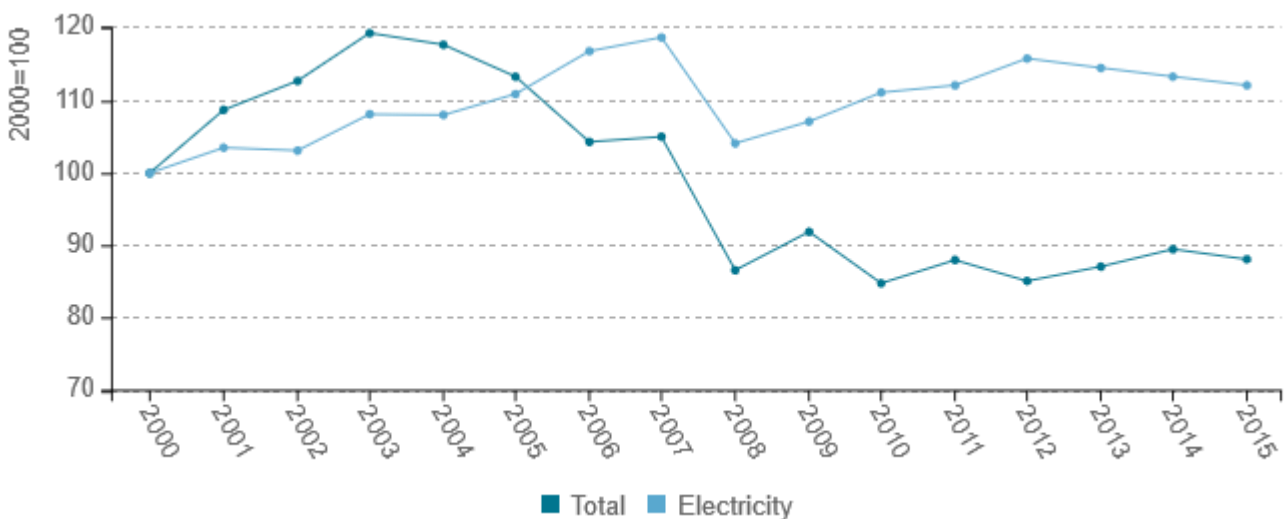
Figure 5: Main drivers of the energy consumption variation in households



Source: ODYSSEE

In service sector the electricity energy consumption grew by +3,1%, indicating an increase of electrical appliances and IT equipment's in line with the growth of employees which was about +1,9%/year, causing a ratio raising of electricity/employees by 12,1%. The total final energy consumption increased (+0,9%) and the ratio of "total energy/employees" resulted in an efficient trend (11,9%).

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



Source: ODYSSEE

The first legal instrument on building codes for residential sector, to lay down minimum energy requirements entered in force in 1991, while for the tertiary sector the first legal instrument aiming to establish rules for the HVAC systems dimensioning in buildings, dates from 1998. Since then, the referred legislation was updated twice, the first time in 2006, pursuing the adoption of the European Directive nº 2002/91/CE, of 16th December, and the second time in 2013, in order to adapt to the recast of the same directive (Directive nº 2010/31/UE, of 19th May). Over the last years, new buildings are increasingly their energy performance aiming to reach nearly zero energy goals. On the other end, the renovation of existing buildings presents now an important challenge in terms of energy efficiency potential. Several incentives and financing schemes have been implemented like the Energy Efficiency Fund for instance, financing insulation, windows, renewable systems, and efficient equipment's



acquisition. In 2017 the financial instrument for the rehabilitation and urban revitalization (IFRRU 2020) was launched. This is an instrument to support investments in urban rehabilitation, which covers the entire national territory and allows the implementation of energy efficiency solutions.

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

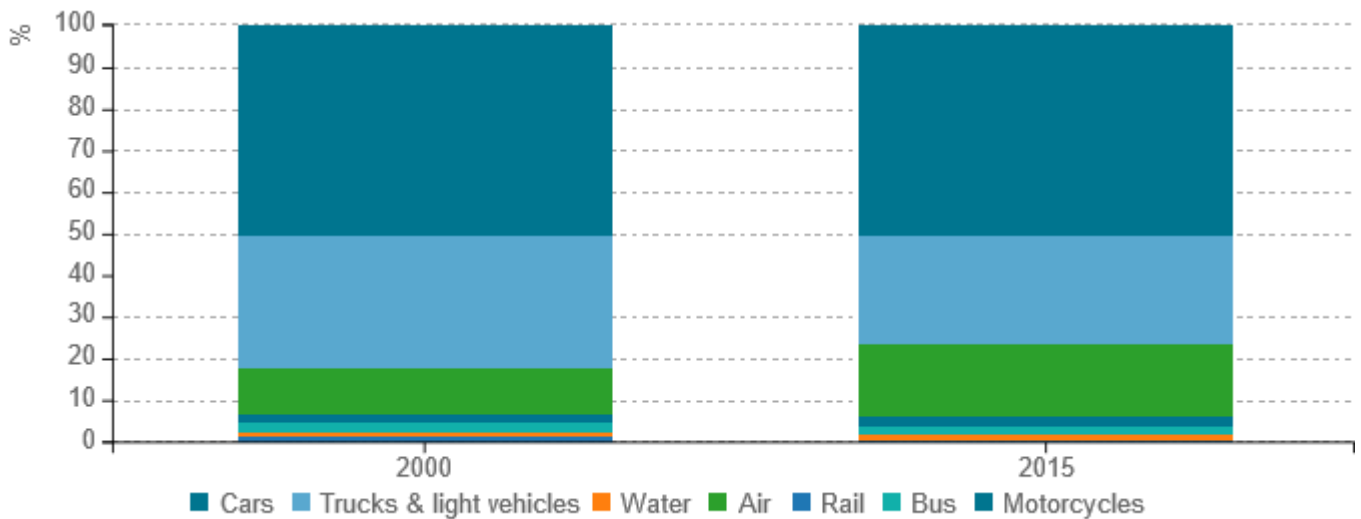
Measures	Description	Expected savings, impact evaluation	More information available
Residential buildings codes	Imposes minimum energy requirements to both new and renovated residential buildings.	High	Link
Services buildings codes	Imposes minimum energy requirements to both new and renovated non-residential buildings.	High	Link

Source: MURE

Transport

Cars, the biggest transport mode consumer, kept the same energy consumption share, around 50,4%. With less 5,8% of share the road freight transport represents 26% of the consumption followed by air transport with 17,3%. The remaining consumption was split among motorcycles (2,4%), bus (1,9%), inland waterways (1,4%) and rail (0,5%).

Figure 7: Split of the transport energy consumption by mode

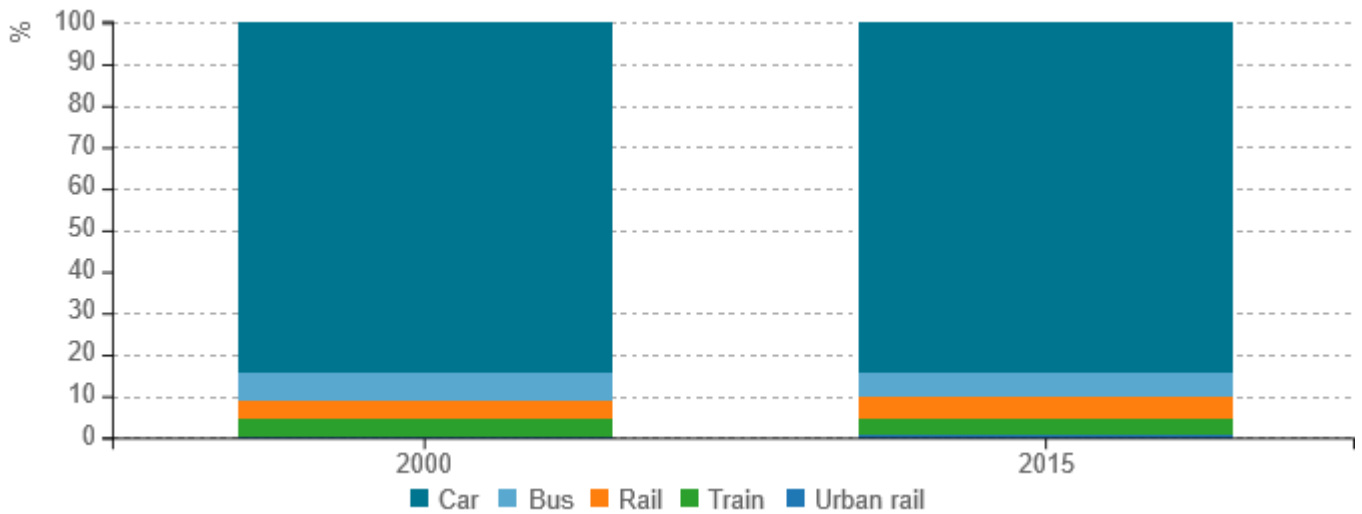


Source: ODYSSEE

Between 2000 and 2015, the passengers traffic had a slight grow (by +0,3%/year). In this period cars remained steady and slight changes were observed in the other transportations mode.



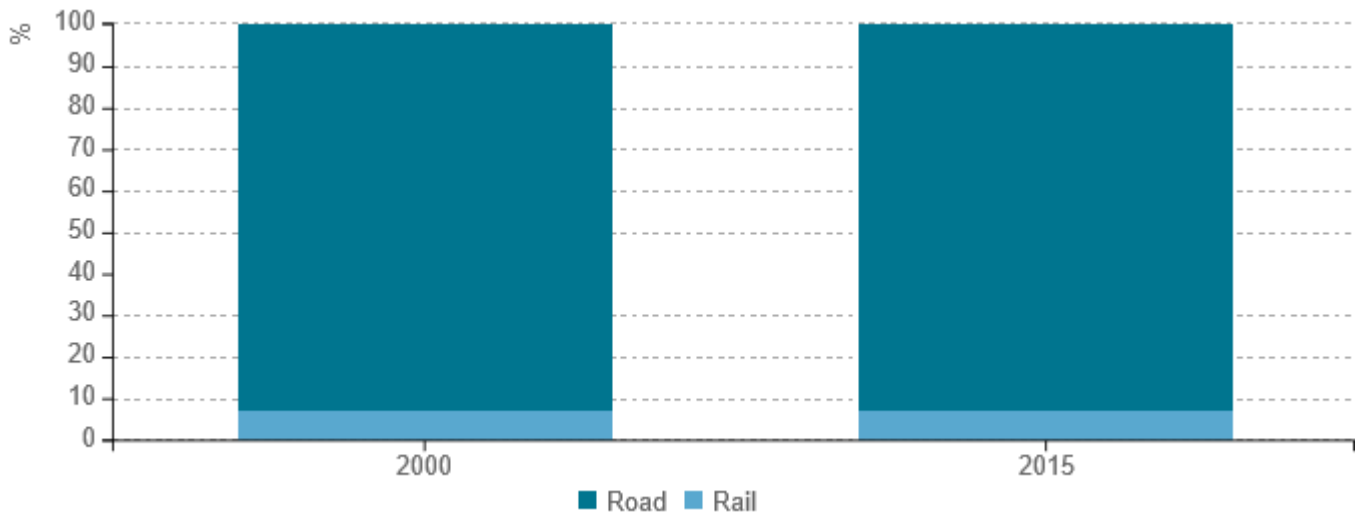
Figure 8: Share of transport in passenger traffic



Source: ODYSSEE

Traffic of goods (measured in tonne-kilometre) has grown sharply by +1,7%/year since 2000 to 2015. Road (that represents 92,9% of share of the traffic of goods) shown an identical trend with an increased by +1,72%/year. Rail maintained the same tendency observing an increase of +1,5%/year .

Figure 9: Share of modes in freight traffic

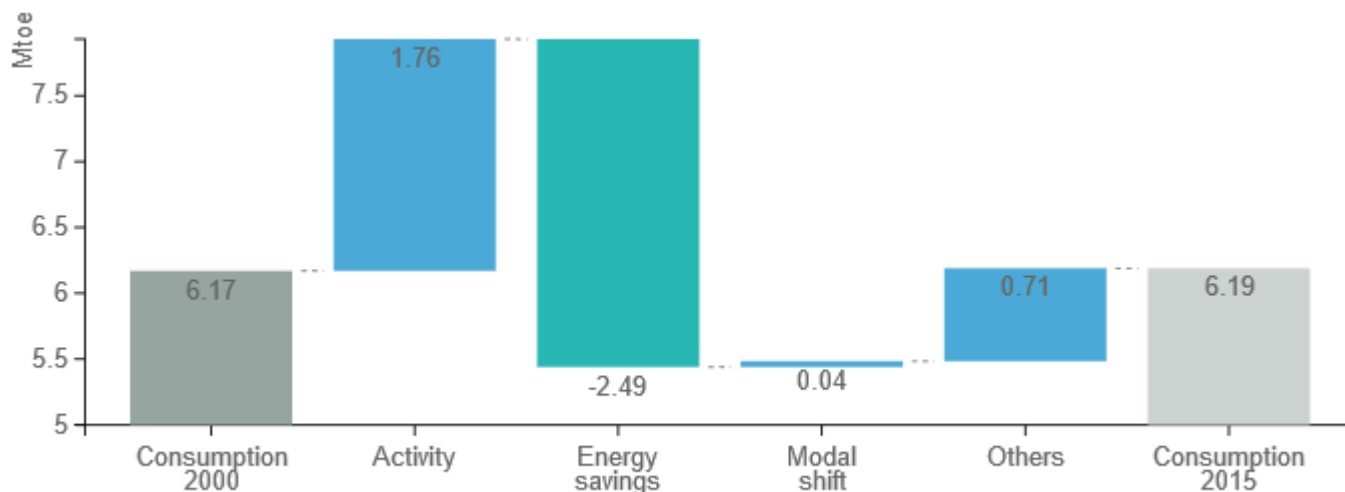


Source: ODYSSEE

The final energy consumption in the transport sector showed a small increase (+0,3%) in 2015 face to 2000. This fact is observed in energy savings of the transport sector (-2,49 Mtoe) which was able to offset the growth effect associated with the sector activity (+1,76 Mtoe), other effects (+0,71 Mtoe) and modal shift (+0,04 Mtoe).



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



Source: ODYSSEE

Main measures aiming energy efficiency in transport sector are included under NEEAP 2, which are still ongoing until NEEAP 3 is approved. Green Taxation that focus on review of the private vehicle tax regime as well as the intends to encourage public transportation use in detriment of individual transportation, particularly in urban areas (development of public transportation infrastructures, associated with better offer and services) and the application of the Regulation for Energy Management in the Transport Sector are some of the more successful NEEAP measures. The transport sector detain the major contribution of the final energy consumption in Portugal, making them a high priority area to address in the NEEAP.

Table 3: Policies and measures into force in the transport sector

Measures	Description	Expected savings, impact evaluation	More information available
National Action Plan for Energy Efficiency	Sets several guidelines for energy efficiency which are organized to promote private transport energy efficiency, the use of public transport and energy efficiency within passengers and freight transport operators	High	Link
Taxation on the purchase of passengers vehicles	Tax calculation formula including an environment component. The integration of the environment part in the tax calculation formula will be made annually and progressively, reducing the cylinder capacity component, favouring the less pollutant vehicles. Thus, in the beginning the CO2 emissions had a weight of about 10 % on the purchase tax vehicle. However, was that gradually increased into 2007 and 2008 up to 60%	High	Link

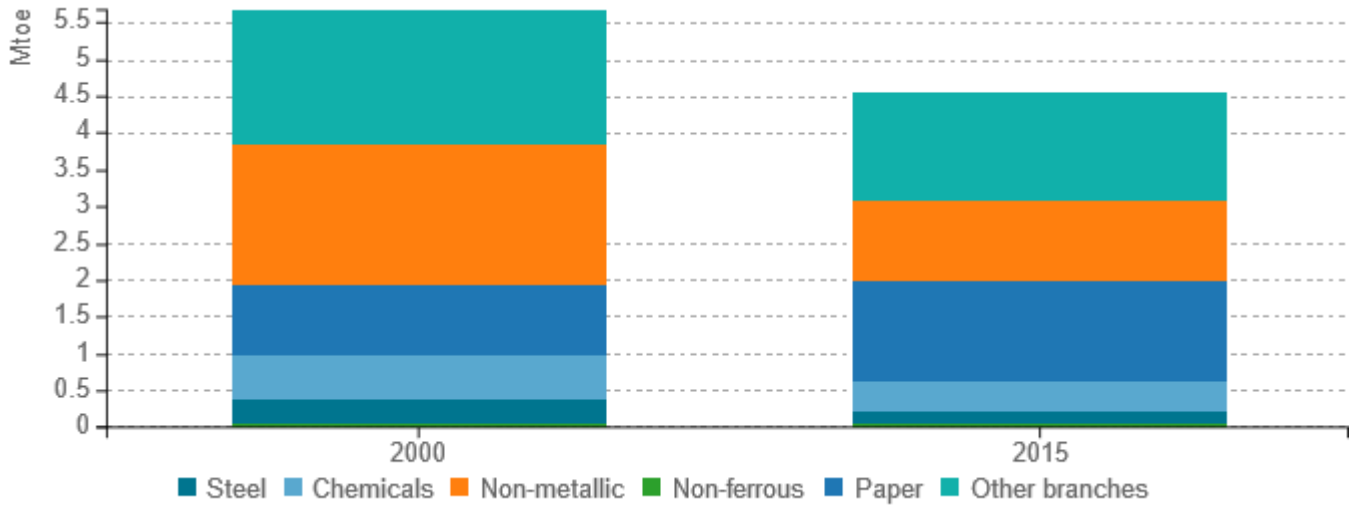
Source: MURE



Industry

Final energy consumption in industry had a significant reduction in 2015, less 1,11 Mtoe compared to 2000, expressing an annual average decrease of -1,3%. Around 68% of consumption remain concentrated in 5 intensive branches (steel, chemicals, non-metallic, non-ferrous and paper) representing the non-metallic and paper 54% of the consumption.

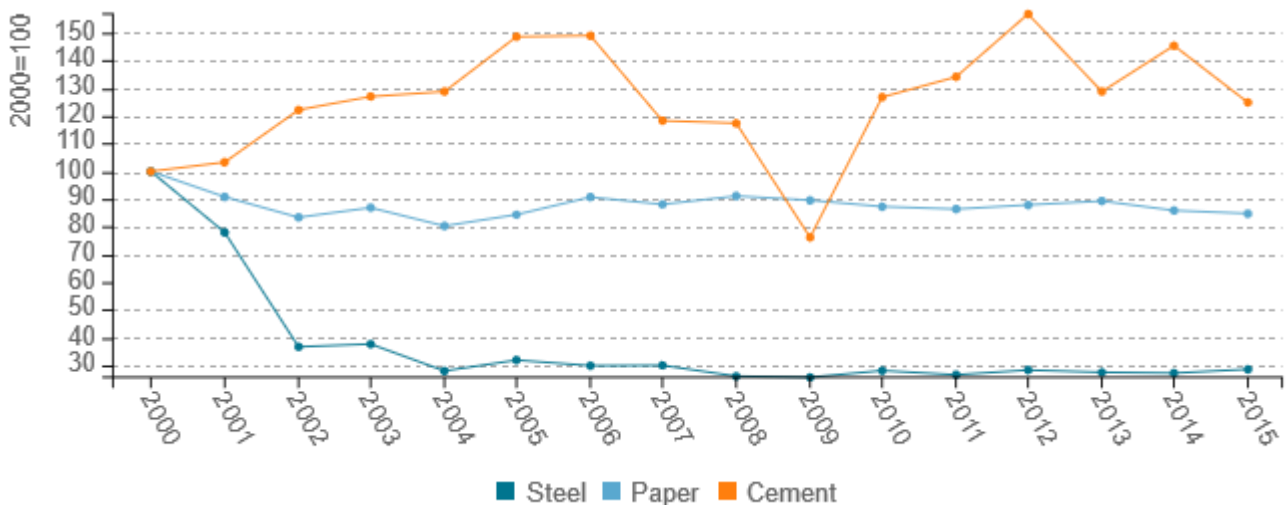
Figure 11: Final energy consumption by branch



Source: ODYSSEE

Due to the reduction of coke consumption, steel reduced 0,19 toe/t between 2000 and 2012, stabilizing in 0,08 toe/t in 2015. Paper industry represents 29,8% of the consumption in 2015, however its unit consumption decreased by -1,03%/year. After 2009 the cement trend reversed to earlier indicators attaning in 2015 a unit consumptions of +24,9% superior related to 2000.

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

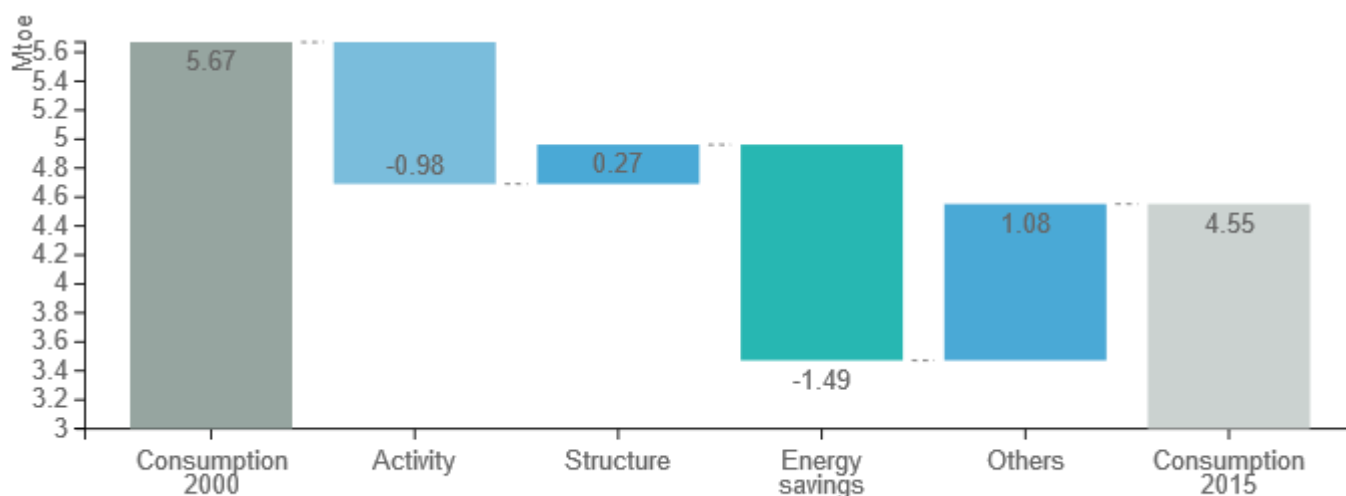


Source: ODYSSEE



Over the last 15 years two main factors have contributed to the decrease of the final energy consumption in the industry sector, the energy savings and the industrial activity, totalizing both -2,47 Mtoe, covering the contrary effect observed by the structural changes (+0,27 Mtoe) and other effects (+1,08 Mtoe).

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



Source: ODYSSEE

The Intensive Energy Consumption Management System (SGCIE) which replaces the prior Regulation on Management of Energy Consumption, establishes an energy consumption management and monitoring system for companies and facilities with intensive energy consumption of energy (over 500 toe/year). Under this mandatory regulation energy intensive facilities were extended to include non small and medium enterprises (PME), broadening the scope of the previous regulation.

Table 4: Policies and measures into force in industry

Measures	Description	Expected savings, impact evaluation	More information available
Intensive Energy Consumption Management System (SGCIE)	Promote the increase of energy efficiency through the modification of production processes, the introduction of new technologies and the behaviors changes. The SGCIE applies for all companies and facilities (also named "Operators") that have an annual consumption over 500 toe/year, imposing binding energy audits, with a 8-year periodicity.	Medium	Link

Source: MURE

