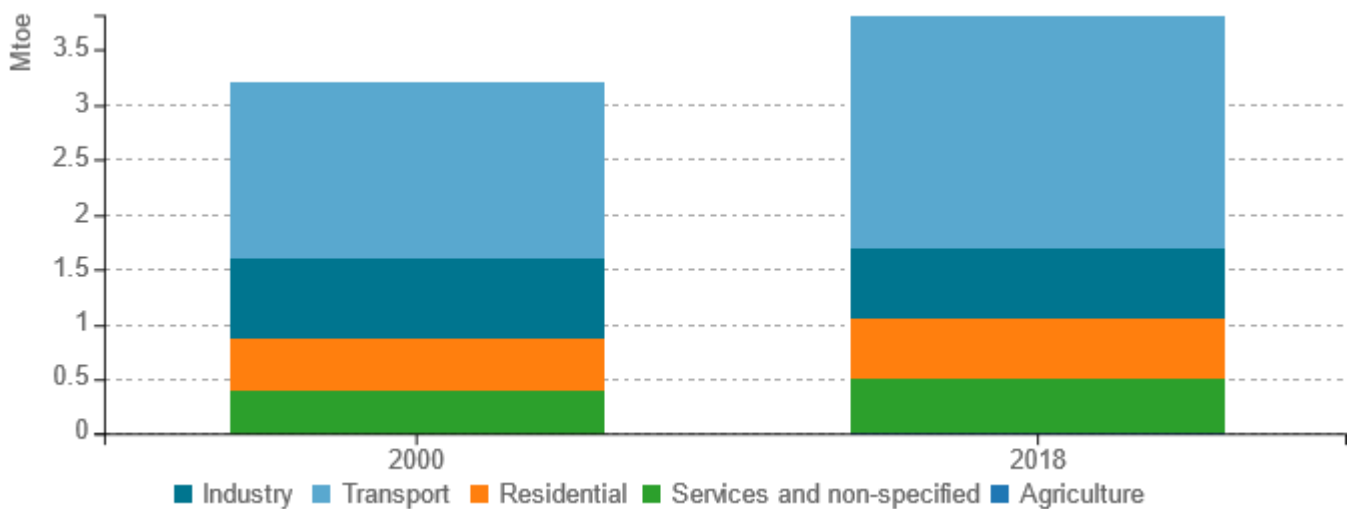


Energy efficiency trends and policies

Overview

The energy balance of Luxembourg is dominated by the transport sector for years, due to the central location of the country in Europe and its attractive prices for fuels. The importance of the transport sector has increased between 2000 (1.6 Mtoe) and 2018 (2.12 Mtoe), mainly due to its activity level and transit traffic. Since 2000, the energy consumption of the residential and tertiary sectors face a moderate increase with regard to the strong evolution of the population and the GDP. The industry decreases its respective share in the energy balance (from 722 ktoe in 2000 to 632 ktoe in 2018) due to energy efficiency gains and structural changes.

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

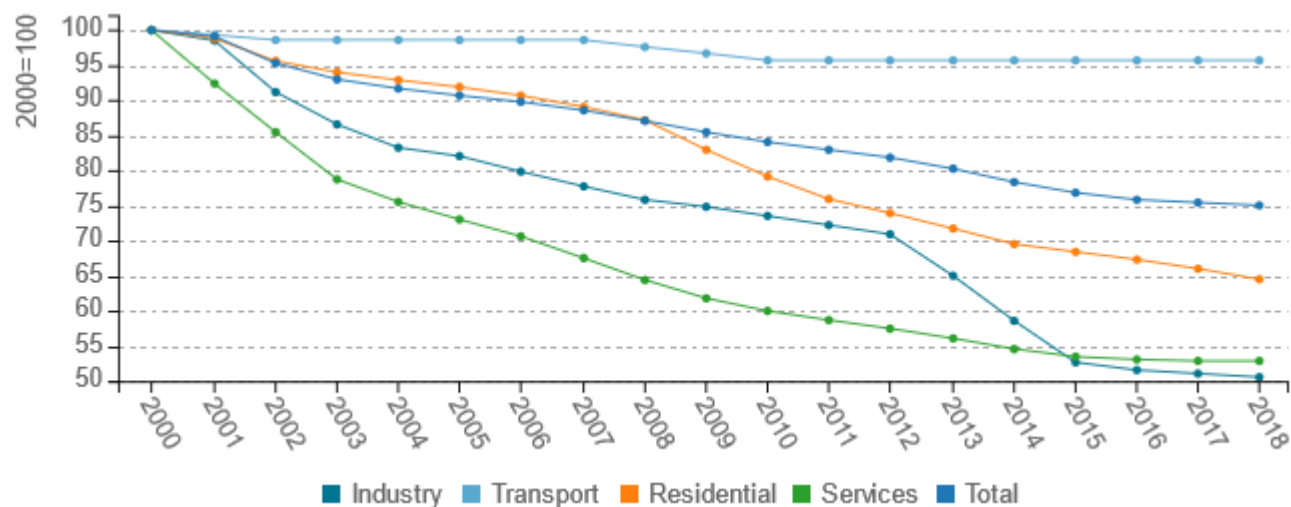


Source: ODYSSEE

The progressive introduction of energy efficiency measures has prompted significant and lasting ODEX improvements since the year 2000. In the residential sector the implementation of the EPBD had set stricter building codes. Only new nearly zero energy-buildings are authorized as of 2017, whereas the renovation of existing buildings is promoted. In the industry the voluntary agreement between the Government and Fedil promotes energy efficiency among the country's large energy consumers through quantified objectives and energy management systems. In the transport sector, the implementation of fiscal measures since 2017 led to measurable improvements in the road transport. Finally, the energy efficiency obligation scheme provides significant energy savings since 2015.



Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

The Energy Efficiency Obligation Scheme is the most recent and most ambitious cross-cutting measure ever implemented in Luxembourg in the field of energy efficiency. It was designed according to the article 7 of the Energy Efficiency Directive 2012/27/EC and is active since 2015. The measure is intended to provide energy savings in every sector (buildings, industry, and some cases in transport) and with every energy vector.

Table 1: Sample of cross-cutting measures

Measures	NEEAP measures	Description	Expected savings, impact evaluation	More information available
GEN-LUX9 Energy Efficiency Obligation Scheme	yes	The obligation only applies to electricity and gas suppliers. The obligated parties may undertake measures in all sectors (including transport) and involve all types of energy vectors. The obligated parties have considerable flexibility in terms of the nature of their actions with respect to their final customers. For instance, they may grant financial assistance for savings measures, offer information, advice and audits, or a combination thereof. Obligated parties may also arrange for the savings to be achieved by third parties (installers, electricians, energy advisors etc.).	The energy savings target to be achieved by 31 December 2020 was calculated at 5 993 GWh. On 1 March of each year, the obligated parties report on the energy savings achieved during the preceding year.	www.myenergy.lu

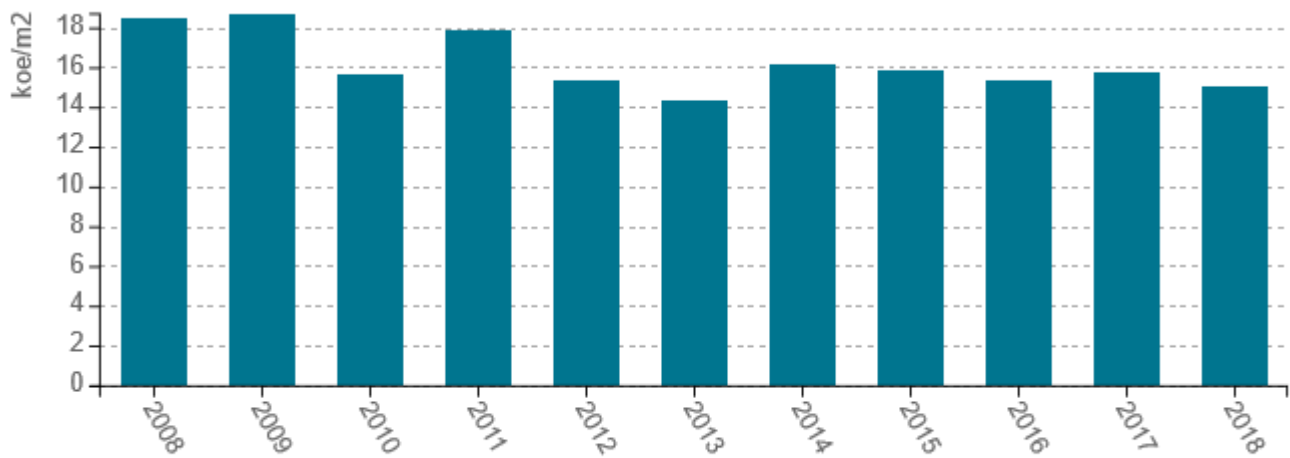
Source: MURE



Buildings

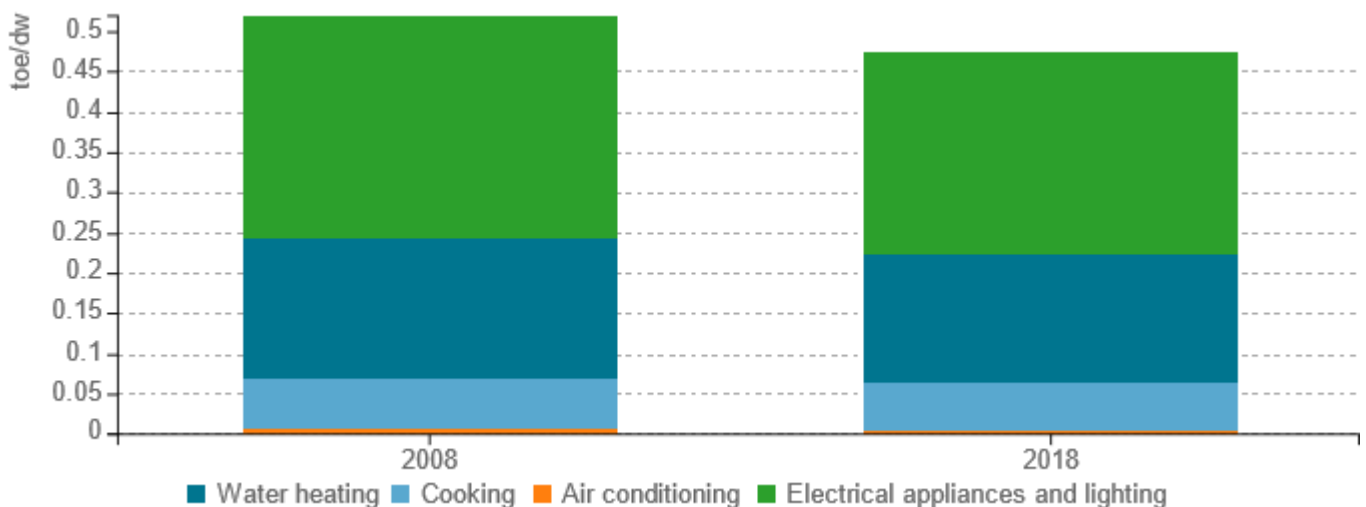
The specific energy consumption decreased continuously from 18.5 koe/m² in 2008 to 15.1 koe/m² in 2018. This is due to two main drivers: the new building codes that have been implemented in 2007, and the evolution of the building stock towards more energy-efficient dwellings. The energy consumption by end-use per dwelling (except space heating) has decreased from 0.52 toe/dwelling in 2008 to 0.47 toe/dwelling in 2018. The main improvements occurred in electrical appliances and water heating end-uses.

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)

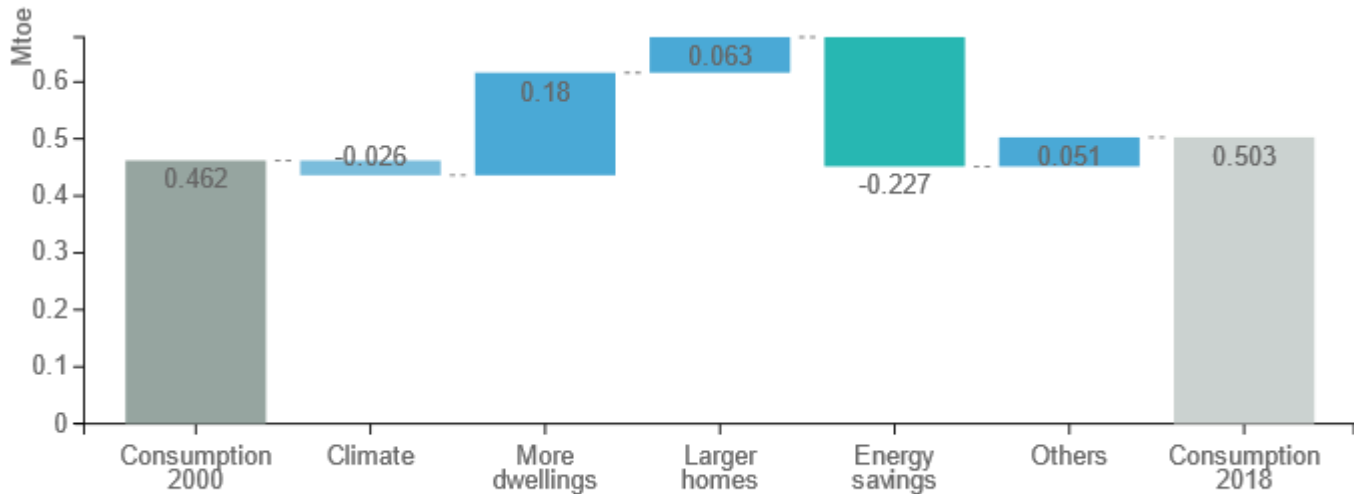


Source: ODYSSEE



The energy consumption of the households sector has increased from 0.462 Mtoe in 2000 to 0.503 Mtoe in 2018. The main drivers of this evolution are: firstly, the increase of the amount of dwellings, linked to the increase of the population (from 434.000 inhabitants in 2000 to 602.000 in 2018). Secondly, the evolution towards bigger but more energy-efficient buildings played an important role as well.

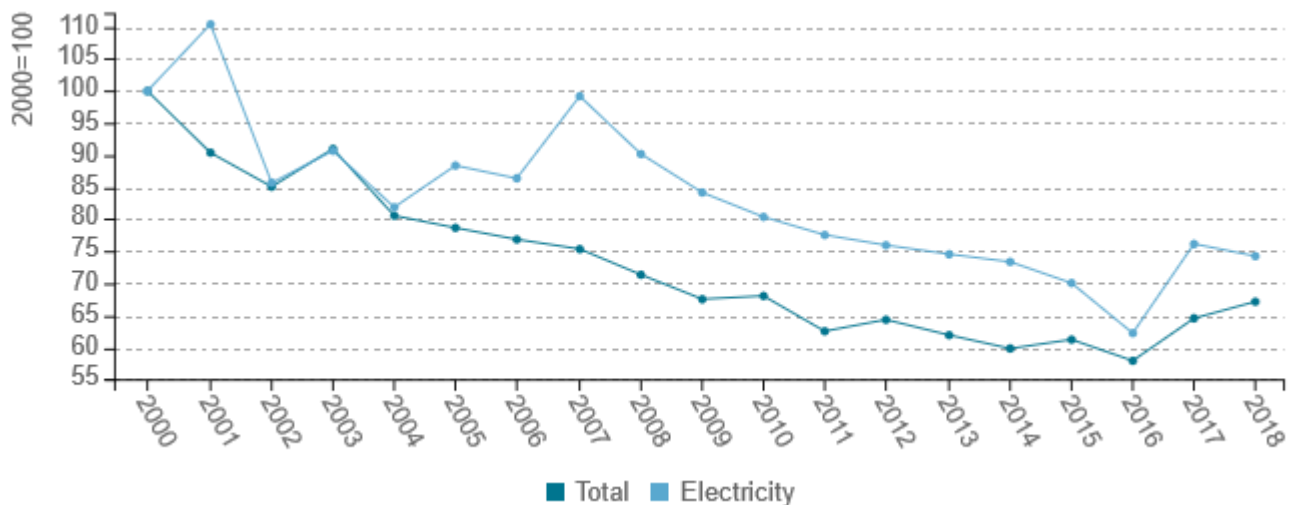
Figure 5: Main drivers of the energy consumption variation of households



Source: ODYSSEE

The specific energy and electricity consumption indexes per employee strongly decreased from 100 in 2000 to 67.2 (energy) and 74.3 (electricity) in 2018. This decrease is linked to the higher headcount of the whole sector (from 189.600 employees in 2000 to 355.800 in 2018) and to the technical progress in installations (HVAC, lighting, computers...).

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



Source: ODYSSEE



The policies which have been implemented in the buildings sector are essential in order to trigger the uptake of significant energy efficiency improvements among households and non-residential buildings. The succeeding regulations impose an ambitious improvement trajectory involving stricter standards applying to the construction of new buildings, and the promotion of energy-efficient renovations of the existing building stock.

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

Measures	Description	Expected savings, impact evaluation	More information available
HOU-LUX13 Regulation on the energy performance of residential buildings	Implementation of the 2008 Energy Efficiency Ordinance implements European Buildings Directive 2002/91/EC for dwellings. The requirements are raised by around 30% compared with the 1996 Thermal Insulation Ordinance.	Energy savings will amount to 126 GWh (2016).	www.myenergy.lu
HOU-LUX14 Grant scheme for renovation of residential buildings (2008-2012)	The measure comprises financial aid for the following elements: The improvement of the energy efficiency of an existing dwelling (>10 years) For the thermal envelope structural elements, Technical advice (energy audits).	Energy savings will amount to 11 GWh (2016).	www.myenergy.lu
HOU-LUX15 Grant scheme for efficient new residential buildings (2008-2012)	The measure aims at promoting low-energy and passive housing.	Energy savings will amount to 11 GWh (2016).	www.myenergy.lu
TER-LUX3 Regulation on the energy performance of non-residential buildings	The measure targets 3 effects on the energy efficiency of non-residential buildings: Intensification of the energy efficiency requirements on new non-residential buildings; Introduction of energy efficiency requirements during the conversion or renovation of non-residential buildings; Introduction of an energy efficiency requirement on lighting in new non-residential buildings.	Energy savings will amount to 197 GWh (2020).	www.myenergy.lu

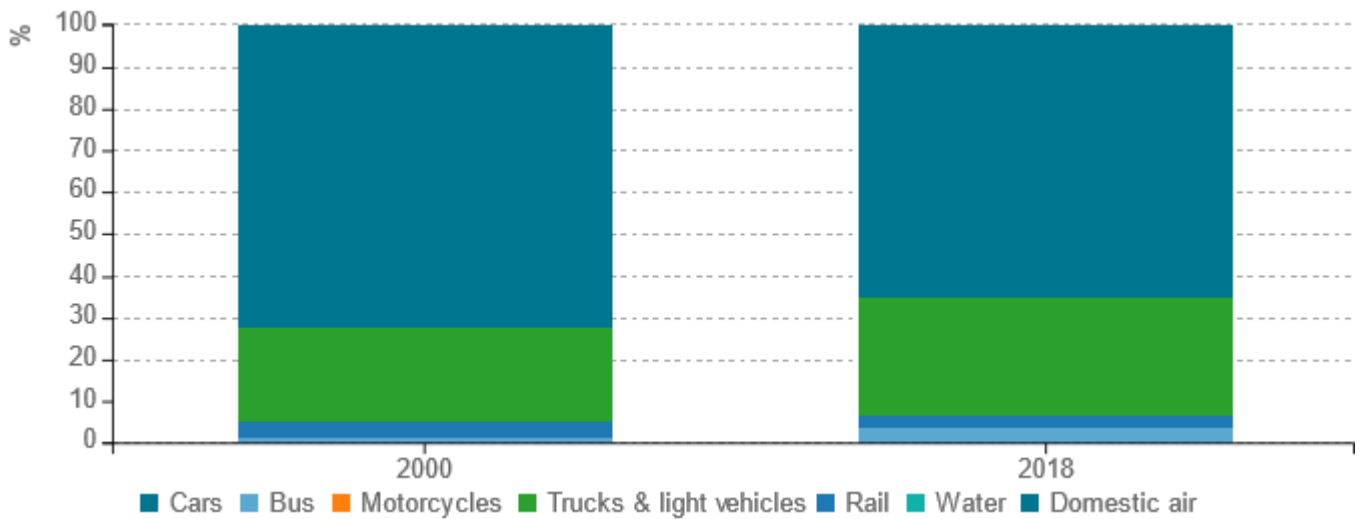
Source: MURE



Transport

Since 2000, most of the energy consumption for transport is linked to road transport. Although the absolute value of energy consumption of road transport has decreased since 2012, the sum of the energy consumption by mode (car, bus, truck, LDV) has steadily increased over the years.

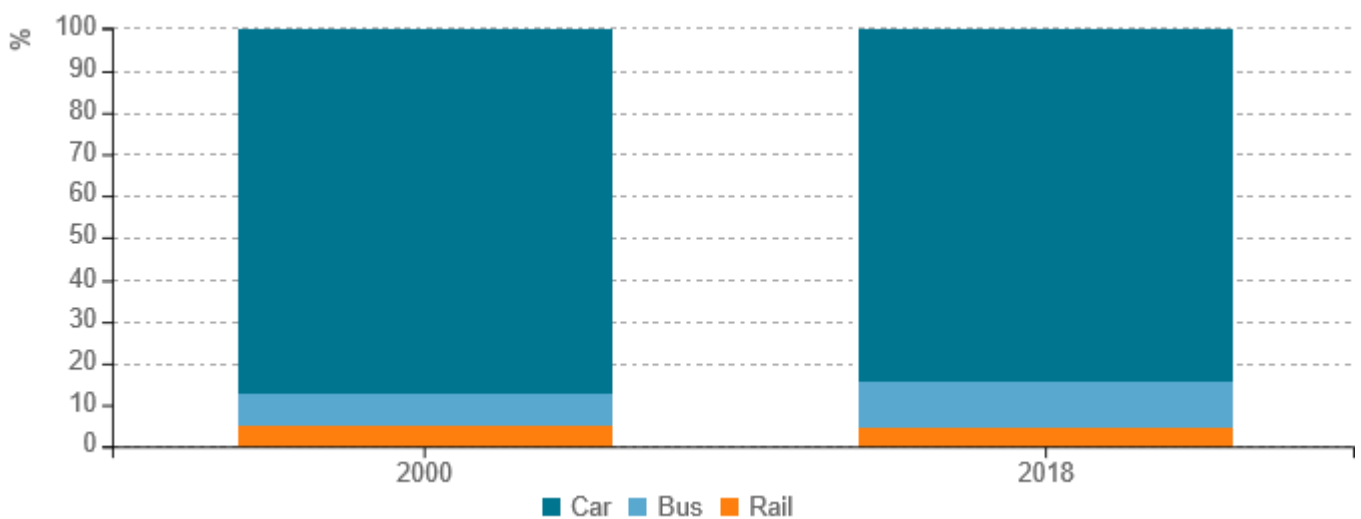
Figure 7: Transport energy consumption by mode



Source: ODYSSEE

Since 2000, the share of transport modes for passengers evolved favouring public transportation. Cars lost ground (from 87.3% in 2000 to 84.2% in 2018), while buses derived most of the benefits of this modal split change, more than doubling its absolute activity level. Rail progressed in absolute value.

Figure 8: Modal split of inland passenger traffic

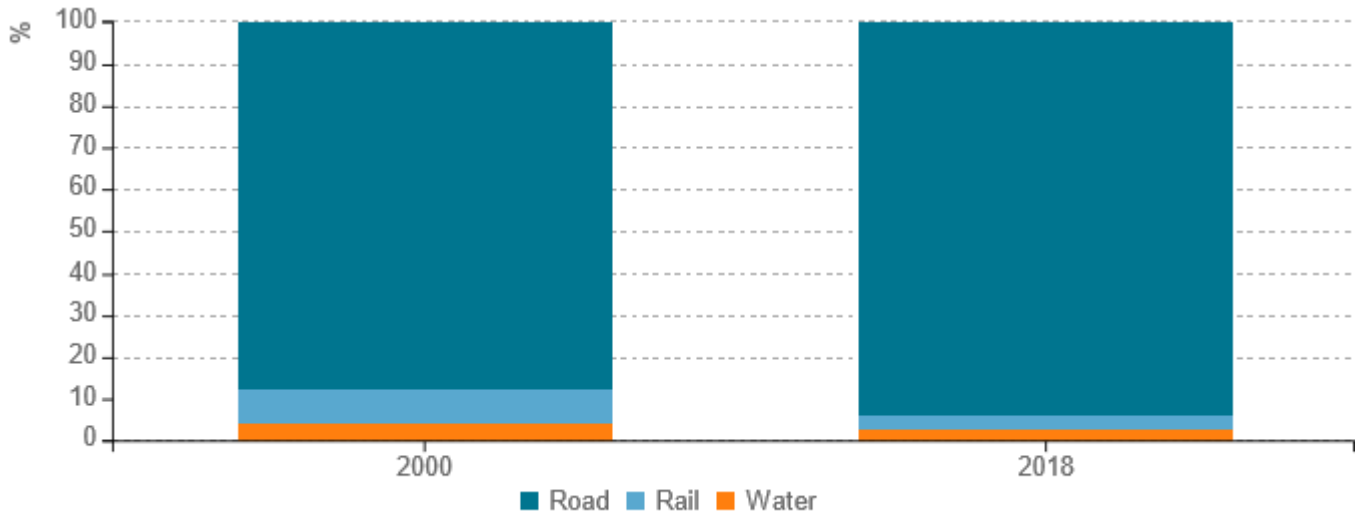


Source: ODYSSEE



The share of road freight increased steadily over time and reached 93.9% in 2018. Because the absolute road transport activity levels are comparable between 2000 and 2018, this evolution is explained by the strong decline of the absolute rail freight traffic (-67%). The absolute value of water transport traffic declined by 46% during the same period.

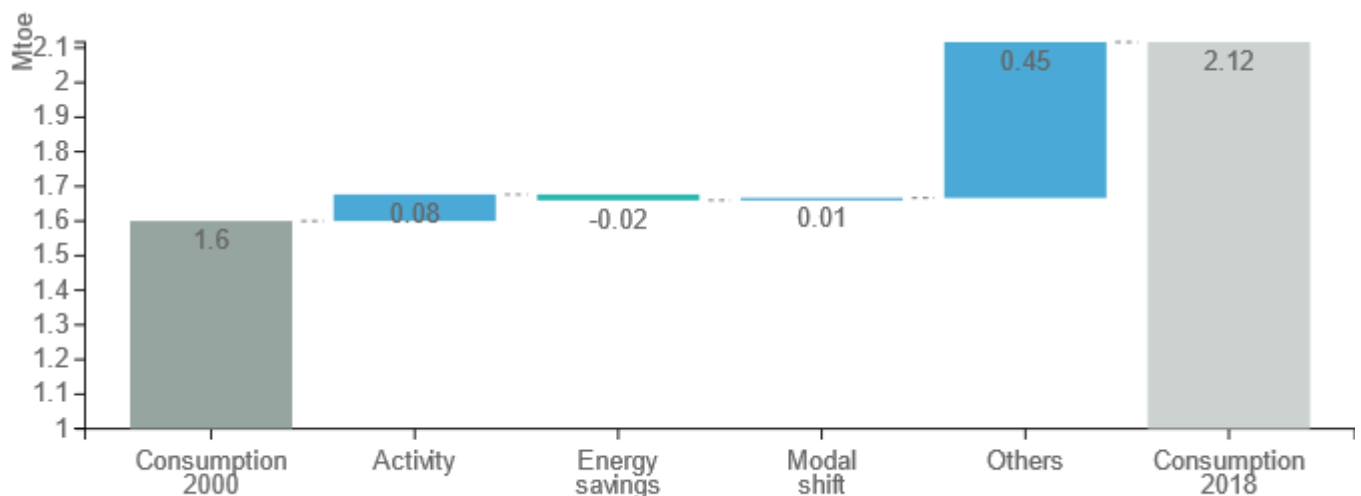
Figure 9: Modal split of inland freight traffic



Source: ODYSSEE

Analysing the drivers of energy consumption for Luxembourg is not an obvious task. The main identified cause is an increase of the transport activity, mainly in passenger road traffic. The second driver, energy savings, can be linked to the improved fuel efficiency of private cars over the years. The modal shift towards public transportation exists but does not influence the trends. The "other effects" are probably linked to the transit traffic, on which the country has little influence.

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



Source: ODYSSEE



The situation concerning the energy consumption in the transport sector is rather difficult to address. The two successful measures provide impacts that apply to different kinds of consumers:

- TRA-LUX8 Increase of fuel taxes: this measure applies to every fuel consumer, thus has a potential to provide higher energy savings.
- TRA-LUX9 CO2-related vehicle tax: this measure applies only to the resident vehicle owners, thus a lower audience. Nevertheless, its effect has the potential to last in the mid-term, because it prompted changes in the vehicle stock.

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

Measures	Description	Expected savings, impact evaluation	More information available
TRA-LUX8 Increase of fuel taxes	Taxes on fuel (petrol and diesel) are raised on a regular basis. The effects of this measure are: In the short-term: this will encourage driving behaviour that aims to achieve lower fuel consumption; In the longer-term: this will influence the motorists to purchase more economical vehicles.	The energy savings are expected to reach 86 GWh by year 2020.	Link
TRA-LUX9 CO2-related vehicle tax	Since 1 January 2007, vehicle tax has been dependent on the vehicle's CO2 emissions. On average, this change in approach led to an increase in tax. In the longer term, this will influence purchasing decisions in favour of more economical vehicles.	The energy savings are expected to reach 31 GWh by year 2020.	Link

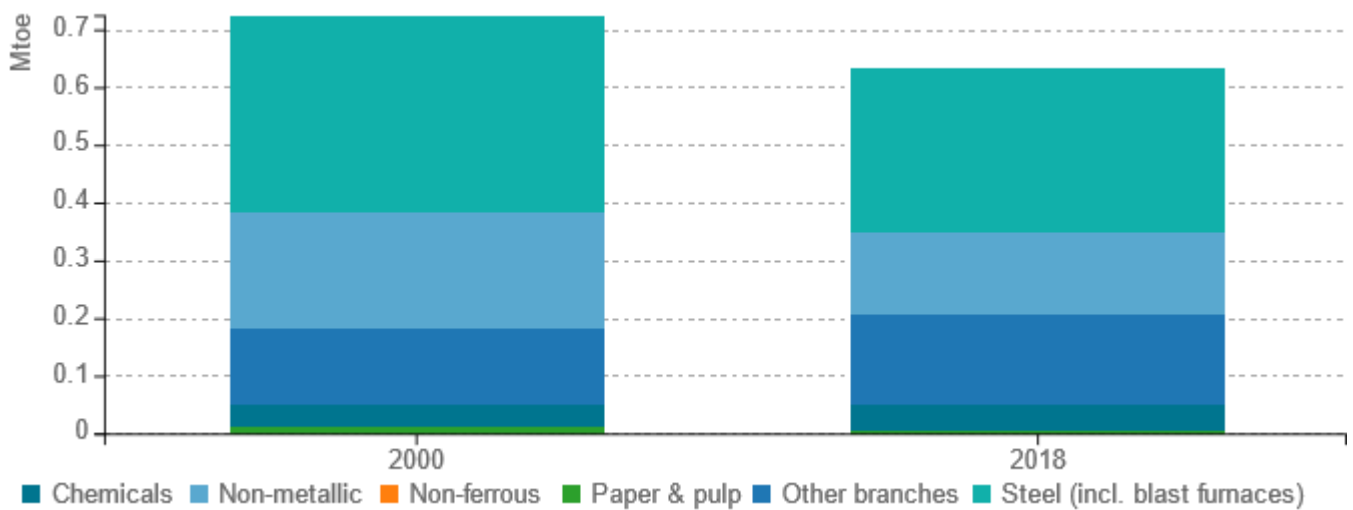
Source: MURE



Industry

Over the years from 2000 to 2018, the structure, levels of activity and energy efficiency of the industry evolved, leading to a steady decline of steelmaking combined with an uptake of chemicals and other branches. This results in a reduction of the energy consumption of 12% for the industrial sector.

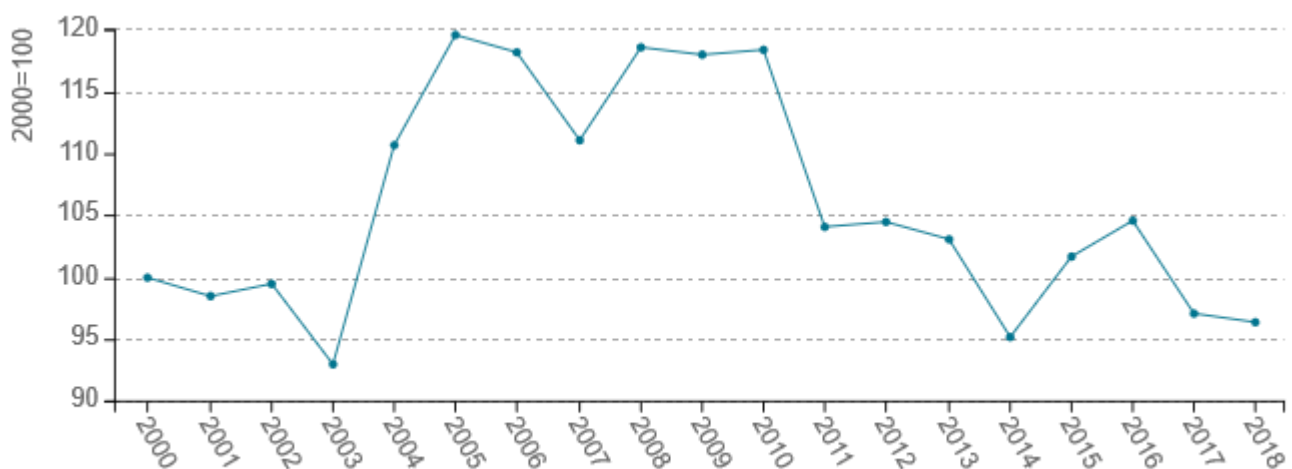
Figure 11: Final energy consumption of industry by branch



Source: ODYSSEE

The steel industry underwent several distinct events explaining the evolution of its energy performance: (2004-2006): the overhaul of its major steelworks and rolling mills impaired its overall performance; (2008-2010): the post-crisis years forced operation under partial load conditions; (2011-2014): the recovery of the market and the voluntary agreements enabled the return to a context allowing a better energy efficiency.

Figure 12: Unit consumption of steel (toe/t)

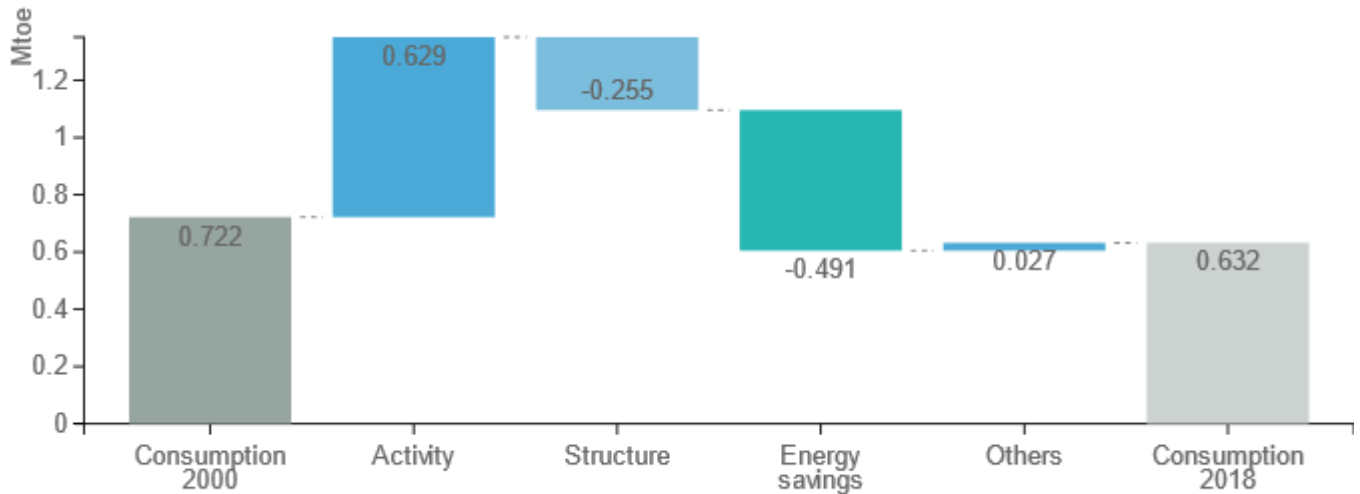


Source: ODYSSEE



The reduction of energy consumption of the industry sector by 12% (2000-2018) is explained by the following factors: the evolution of the structure in many sectors (steel, cement, chemicals) and the energy savings mainly generated by the successive voluntary agreements with the industry and by competitive forces have more than offset the increase of the energy consumption due to activity levels.

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



Source: ODYSSEE

The most successful measure for industry is the voluntary agreement, which started in 1996 and covers most of the energy consumption linked to industrial consumers. The last agreement ended in 2017, providing significant energy efficiency gains. A new agreement has been signed for the period 2017 - 2020. Since 2015, the energy efficiency obligation scheme complements the voluntary agreement by implying the obliged parties to take an active role in the industries' energy efficiency improvement plans.

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

Measures	Description	Expected savings, impact evaluation	More information available
IND-LUX10 Voluntary Agreements (2017-2020)	The majority of the country's large industrial energy consumers participate in this voluntary agreement (about 50 companies) The aim of the voluntary agreement is to improve energy efficiency by a general objective of 7 % between 2017 and 2020.	The energy savings are expected to reach 152 GWh by year 2020.	www.myenergy.lu

Source: MURE

