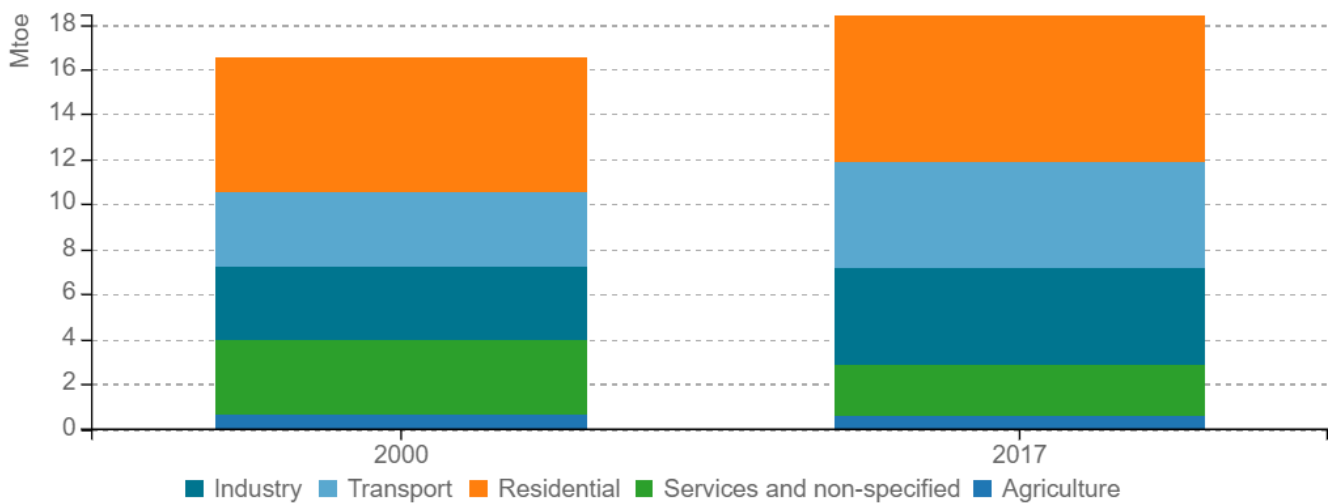


Energy efficiency trends and policies

Overview

In 2017, the final energy consumption of Hungary was 15% higher (18.4 Mtoe) than in 2000 (16.5 Mtoe). The residential sector, the largest consuming sector, accounted for the largest share with over one third of total final consumption (35% compared to 27% for the EU average) in 2017. The share of both the transport and industry sectors have been growing to 26% and 24% in 2017, respectively. The share of transport is continuously growing but it is still well below the EU average (31% in 2017). The share of services decreased from 20% in 2000 to 12% in 2017. The share of agriculture remained relatively low at 3%.

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

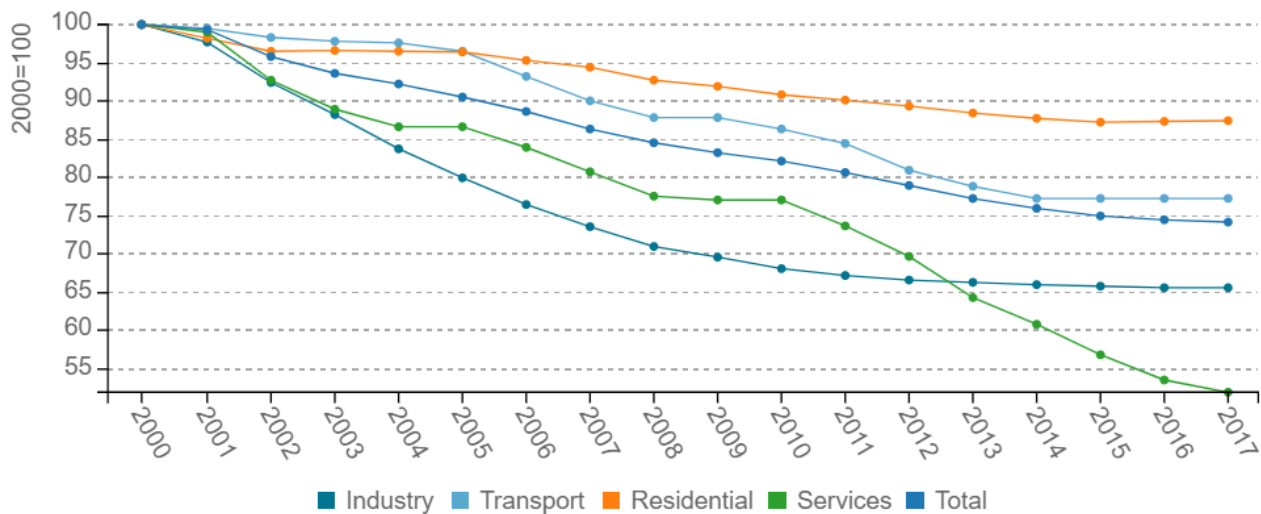


Source: ODYSSEE

Energy efficiency improvement, measured by ODEX improved annually by 1.5% on average from 2000 to 2017, or 26% over the period. The main driving forces have been industry and services with an average of 2% and 2.8% improvement per year, respectively. Improvement in the industry and services sector were due especially to the introduction of energy efficiency requirements and labelling regulations affecting buildings, equipment, processes and appliances. Energy efficiency improvements in the transport were close to the average (1,3%/year over the period 2000-2017), while the progress was slower for the residential sector, with less than 1% per year (0.7%). Based on ODEX, no energy efficiency improvement is observed after 2014 in the residential and transport sectors.



Figure 2: Technical Energy Efficiency Index



Source: ODYSSEE

Hungary intends to achieve the target of 1.5% annual additional energy savings up to 2020 according to Article 7. of EED with several alternative measures. A new energy efficiency obligation scheme is only planned to be introduced from 2021. The most important energy efficiency measures are non-refundable, and in part, refundable support schemes, outlined in the Operational Programmes (OPs), financed by EU Funds. The focus of the 5th priority axis of the Environmental and Energy Efficiency Operative Programme (KEHOP) is explicitly the improvement of energy efficiency, combined with the development of renewable energy solutions in public buildings, the development of heating systems, including district heating, and awareness raising. The Territorial and Settlement Development Programme (TOP) finances energy efficiency upgrades at local authorities. The Economic Development and Innovation Operational Programme (GINOP) has also sub-programmes that aim to promote energy efficiency in the enterprise sector. GINOP also finances a residential zero interest loan scheme operated by state-owned Hungarian Development Bank. The various OPs target a wide range of consumer groups, with a wide range of potentially supportable projects, related to energy efficiency improvement in buildings, to industrial production and processes, and renewable energy.

Table 1: Sample of cross-cutting measures

Measures	NEEAP measures	Description	Expected savings, impact evaluation	More information available
Operational Programmes with main focus on energy efficiency improvement, financed by ESIF and Cohesion	yes	The most important measures of the 4th NEEAP are Operational Programmes (OPs) financed by the ESIF and European Cohesion Funds (some of them coupled with state budget), with primary focus on energy efficiency improvement. These are the Environmental and Energy Efficiency OP (KEHOP), the Regional and Rural Development OP (TOP), Competitive Central	Cumulative energy savings attributable to OPs with main focus on energy	4th NEEAP of Hungary (2017) and annual reports.

Funds		Hungary OP (VEKOP), Economic Development and Innovation OP (GINOP), Rural Development OP, Human Resources Development OP (EFOP). The OPs target a wide range of consumers (households, SMEs, local governments, public institutions, non-profit organizations, heat producers and suppliers), with a wide range of energy efficiency projects in buildings, production and processes, and renewables. Only savings , with a primary focus on energy efficiency improvement and/or final energy saving are counted to these programmes. There are more than 10 other Operational Programmes, where the primary focus is not energy efficiency, but other policy goals, such as rural development. Here, supported projects indirectly influence energy consumption, only projects are considered, where costs related to energy efficiency improvement are among eligible costs, and documented energy savings have been achieved.	efficiency in 2017: 3,74493 PJ, expected in 2020: 22,766 PJ	
National Network of Energy Managers	yes	The National Network of Energy Managers was established in 2017 to exploit the energy efficiency potential in public institutions, including local governments, and to advise SMEs and households on energy saving methods and opportunities. Offices of the network are existing regional governmental offices, where energy managerial tasks are performed by local staff. The main tasks include free energy advising for public institutions, for managers of public buildings to help to prepare mandatory energy saving plans every 5 years, SMEs and households, promotion of energy audits and introduction of energy management system in public institutions and SMEs, and provision of help to implement energy saving measures.	2017: 0,005PJ	Link

Source: MURE

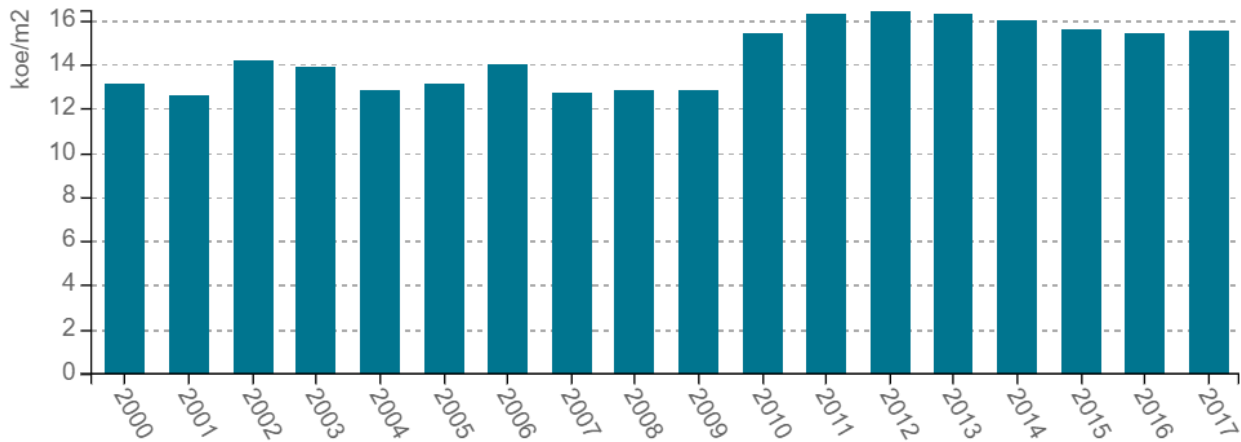
Buildings

There is no clear trend of energy efficiency improvement in household space heating (this is in part due to data problems). Fuel substitutions from gas and district heating to wood and waste, which are less efficient, must have played a role in the increasing space heating consumption after 2009. The share of gas for space heating decreased from 64% to 53% in the period of 2000-2017, while the share of solid biomass (wood and waste) increased from 8% to 34%. As residential network-based energy prices have been frozen in 2011 by Government (for electricity, gas and district heating, but not for wood and waste), relative prices of heating fuels influence the



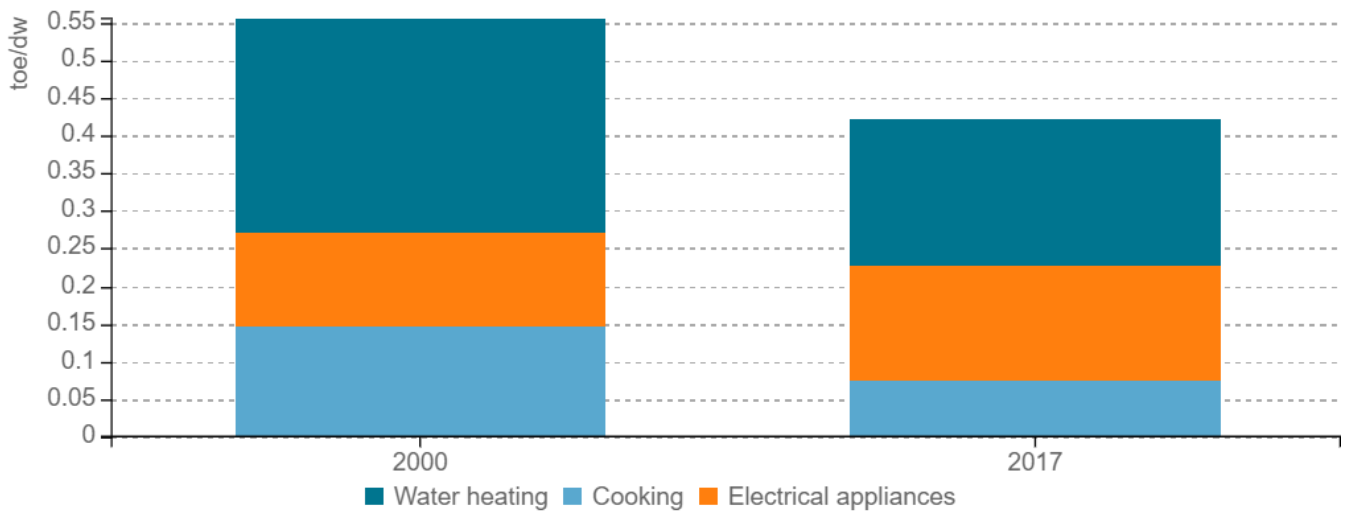
choice of fuel mix. In addition, 21% of households have a complementary heating solution, e.g. wood stove besides gas or oil boilers. Energy prices kept artificially low for households do not provide the necessary incentive for households to implement energy efficiency upgrades related to heating.

Figure 3: Energy consumption of space heating per m2



Source: ODYSSEE

Figure 4: Energy consumption by end-uses per dwelling



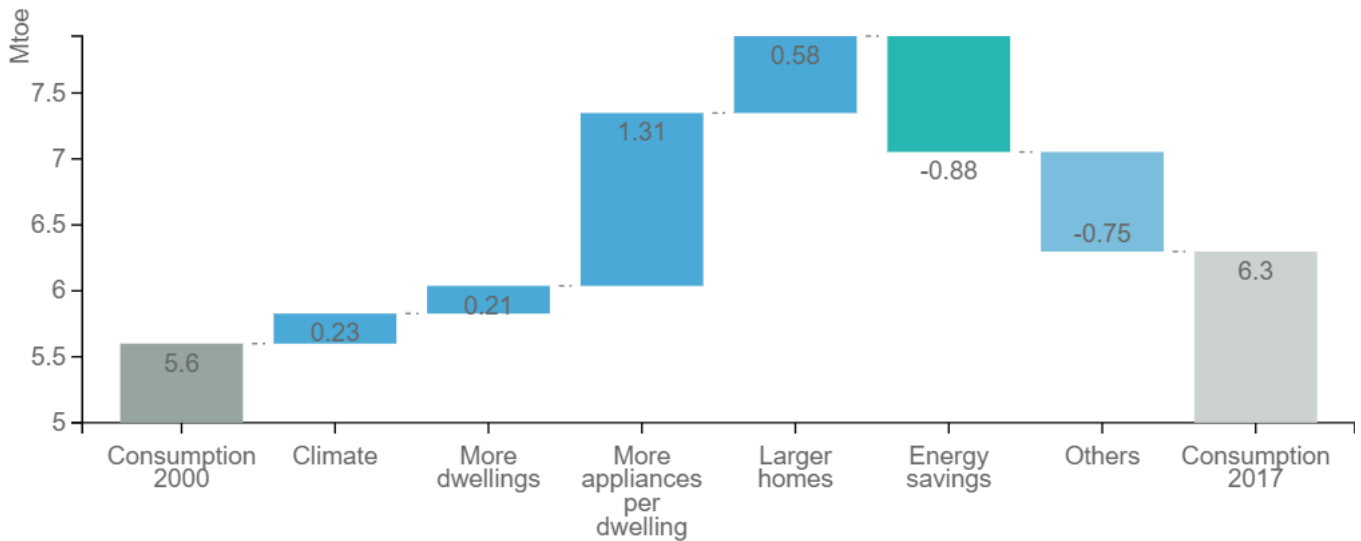
Source: ODYSSEE

Space heating accounts for 74% of final energy consumption of households, which is 10% points higher than the EU average. This share of space heating has been steadily growing from 57% in 2000 to 74% in 2017. Energy use for water heating and cooking show a declining trend, while electricity consumption has grown by 34 % over the period 2012-2017, after a heavy decline in consumption due to the 2008 crisis. Energy consumption in the household sector increased by 0.7 Mtoe, or by 12% from 2000 to 2017. The main driving forces behind the consumption variation have been the increase in the stock of household appliances and the increase in the average size of homes from 75 m2 in 2000 to 82 m2 in 2017, which contributed to raise consumption by 1.89



Mtoe over the period 2000-2017 (respectively 1.31 Mtoe and 0.58 Mtoe). Energy saving, the replacement of inefficient equipment and appliances, have contributed to lower the consumption increase by 0.88 Mtoe. Electrification of households is still, however, below the EU average by about 30%. Consumption of durable electric appliances has been rising, however, not only because of growing coverage, but, also because the stock of existing appliances is old (8-10 years on average), the renewing rate is slow (Ceced, Gkf). A decrease of 0,75 Mtoe of the consumption was the result of a change in consumer behaviour, of changes in fuel mix and other unknown effects and data problems.

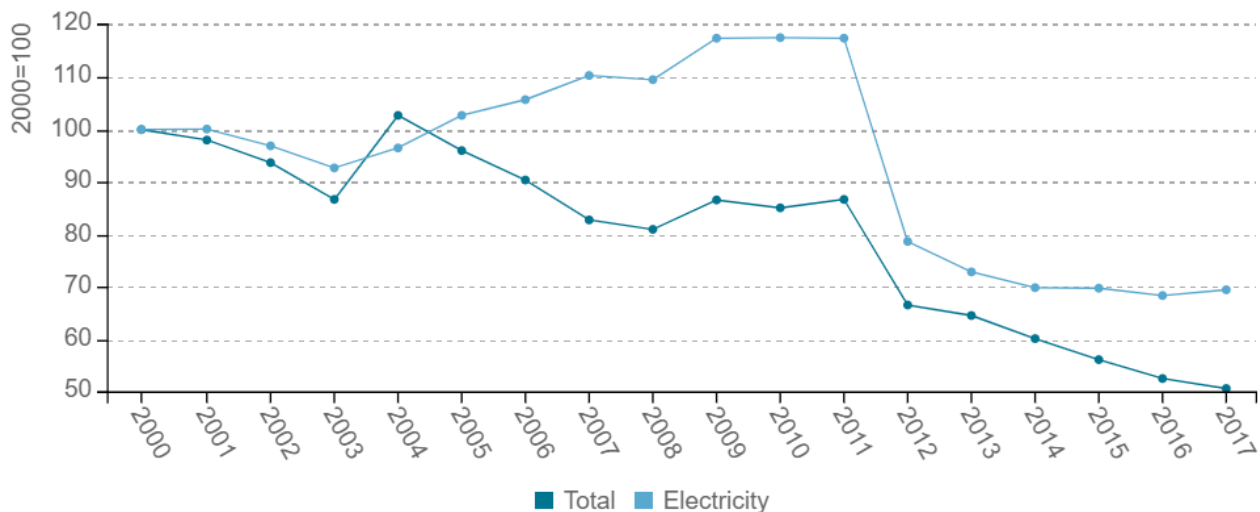
Figure 5: Main drivers of the energy consumption variation in households



Source: ODYSSEE

Due to a diffusion of electrical appliances in offices an increasing trend of electricity consumption can be observed over the period 2000-2010. No robust data are available afterwards. There was a regime change in data in 2012, efficiency improvement is observed afterwards.

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



Source: ODYSSEE



The 2002/91/EC directive (EPBD) was implemented in Hungary by the 7/2006 (V.24.) TNM Decree and the 176/2008 (VI.30.) Governmental Decree. In 2008, a building certification scheme was introduced. Due to the new regulations, technical heat requirements became 30% stricter than before. The recast directive of 2010/31/EU introduced stricter requirements that were implemented through several amendments of the 7/2006 TNM decree. An important amendment of the decree in 2014 made the cost-optimal energy efficient requirement a pre-condition for obtaining funding from either state budget or EU funds. Implementing Article 5 of the 2012/27/EU Directive a national building registry system was set up in 2013 (NÉeR) by the ÉMI Nonprofit Kft. As a result of panel house refurbishment programmes, that started in the 2000's, 35% of all panel buildings have been renovated till 2015. An interest-free loan scheme was introduced in 2017 for homeowners, multi-apartment buildings and housing cooperatives to trigger energy efficient building renovations and the use of renewable energy solutions in the residential building sector. The loan is financed through EU Funds, by two different operational programmes (OP). The loan is provided by the state owned MFB Hungarian Development Bank Plc.

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

Measures	Description	Expected savings, impact evaluation	More information available
Stricter building regulations	The 2002/91/EC directive was implemented in Hungary by the 7/2006 (V.24.) TNM Decree and the 176/2008 (VI.30.) Governmental Decree. These regulate the energy performance of buildings for new construction and major renovation of buildings above 1000 m2. It also introduced a building certification scheme. Due to the new regulations, technical heat requirements became 30% stricter than before. The recast directive of 2010/31/EU introduced stricter requirements that were implemented through several amendments of the 7/2006 TNM decree. An important amendment of the decree in 2014 made the cost-optimal energy efficient requirement a pre-condition for getting funding through grants from either state budget or EU funds. Implementing 2012/27/EU Article 5 a national building registry system was set up in 2013 by ÉMI Nonprofit Kft.	-	4th NEEAP of Hungary
Residential soft loan scheme provided by MFB, Hungarian Development	A soft loan scheme with zero interest was introduced in April 2017 in order to trigger energy efficient building renovations in the residential building sector. An interest-free loan is introduced for home owners, multi-apartment buildings and housing cooperatives to overcome difficulties	-	4th NEEAP and here

Bank	<p>associated with high investment costs and low financing capability. The loan is financed through EU Funds, by two different operational programmes (OP). Economic Development and Innovation Operational Programme (GINOP-8.4.4/A-17) has a budget of 339 million euro (HUF 105,2 billion), while Competitive Central Hungary Operational Programme has a budget of 30 million euro (HUF 9,41 billion). For each OP, max. 25% of the budget can be applied for multi-apartment buildings. The loan is provided by the state owned MFB Hungarian Development Bank Plc. The loan can be used for energy efficiency investments, such as thermal insulation, heating and cooling system modernization, summer heat protection, etc., and renewable energy projects, such as installation of solar energy system or solar panel, heat pump, or other renewable energy based heating system.</p>		
Green Investment System and Green Economy Financing (Warmth of Homes program)	<p>The Green Economy Financing Scheme (GEFS) is financed from state budget and EU-ETS revenues. GEFS finances the 'Warmth at Homes' programme, which ensures non-refundable funding for energy efficiency in the residential sector, for e.g. for heating system modernization, replacement of old household appliances and complex building modernization.</p>	<p>Total annual end-use savings achieved in 2017: 0,96435 PJ 2020 expected: 5,21431 PJ</p>	<p>4th NEEAP of Hungary</p>

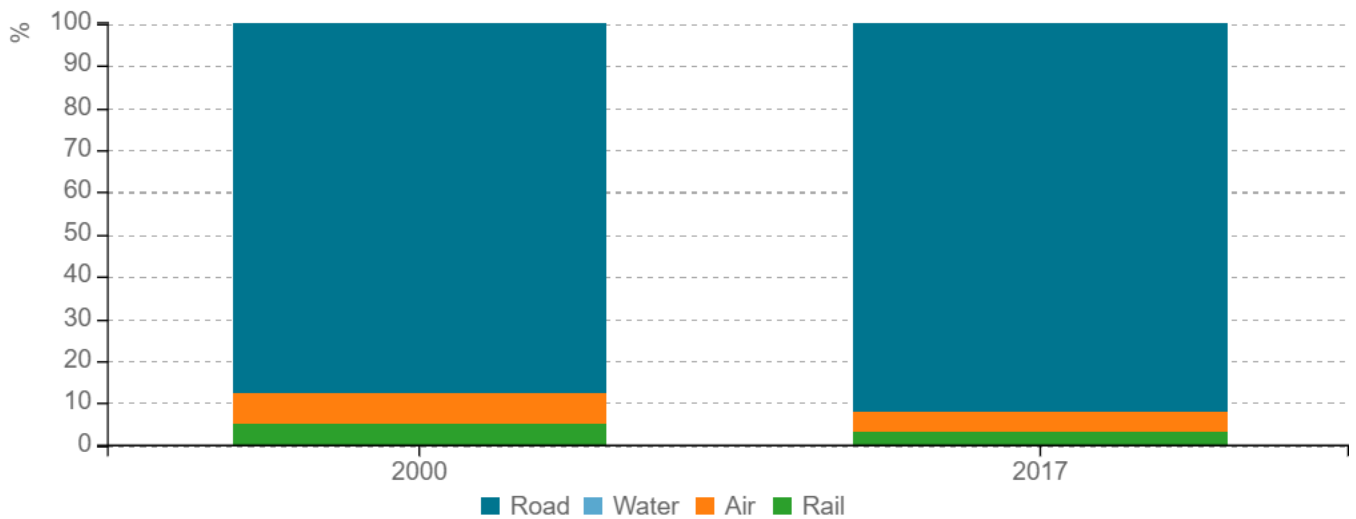
Source: MURE



Transport

Road transport dominates transport energy consumption: its share in the total final energy consumption of road transport by 4 percentage point from 88% in 2000 to 92% in 2017. The energy consumption share of rail transport decreased from 5% to 3%, the share of air transport decreased from 7% to 5% in the period 2000-2017.

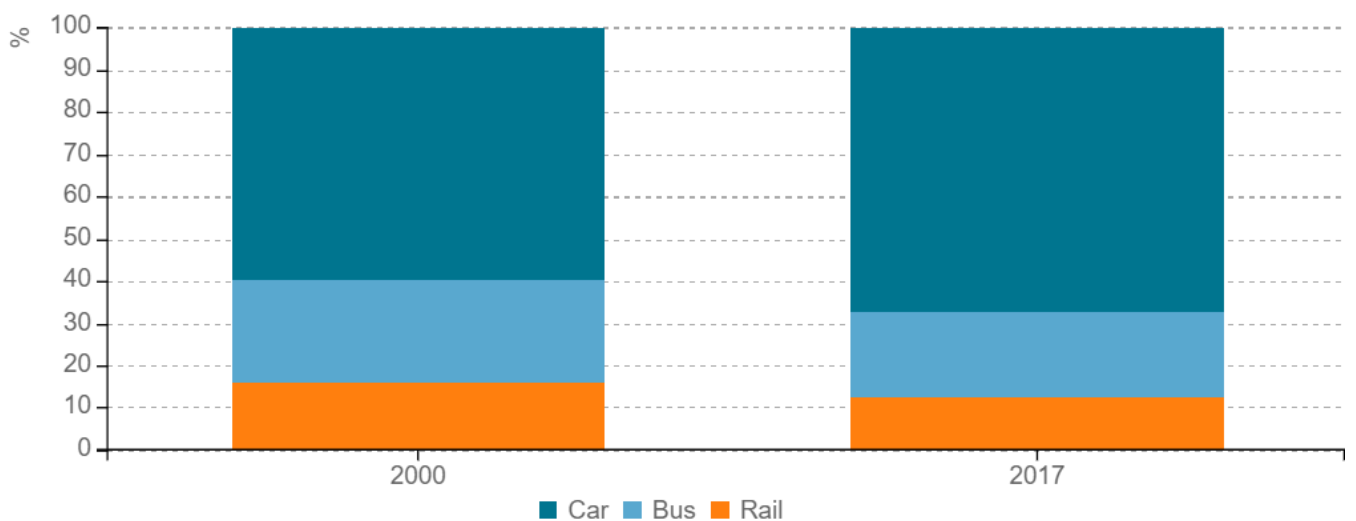
Figure 7: Split of the transport energy consumption by modes



Source: ODYSSEE

The stock of cars has been steadily growing since 2000, except for 2009 and 2010, as an impact of the recession. The average age of the car stock was 14 year in 2017, with a growing trend in the last ten years. Cars accounted for 68% of total passenger traffic in 2017, while the share of public transport further decreased from 40% in 2000 to 33% in 2017.

Figure 8: Share of transport modes in passenger traffic

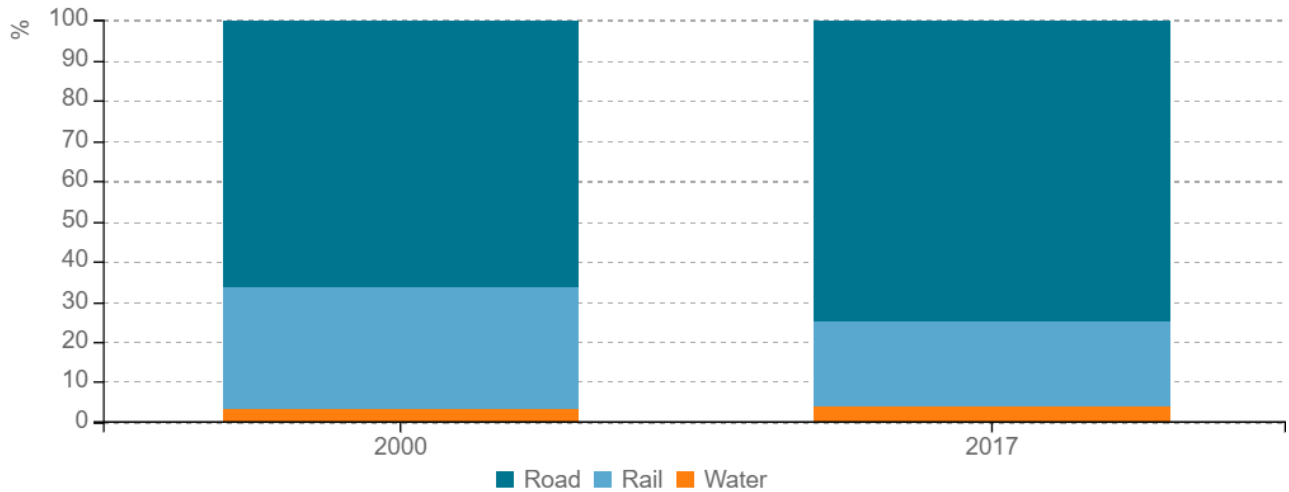


Source: ODYSSEE



Freight traffic (in tonne-km) has been rapidly growing by 84% in the period 2000-2017, due to the 5% yearly expansion of goods transported on roads. The share of freight traffic on road increased from 66% in 2000 to 75% in 2017, while the share of rail transported goods decreased from 31% to 21%. The share of goods transported on water is below 4%.

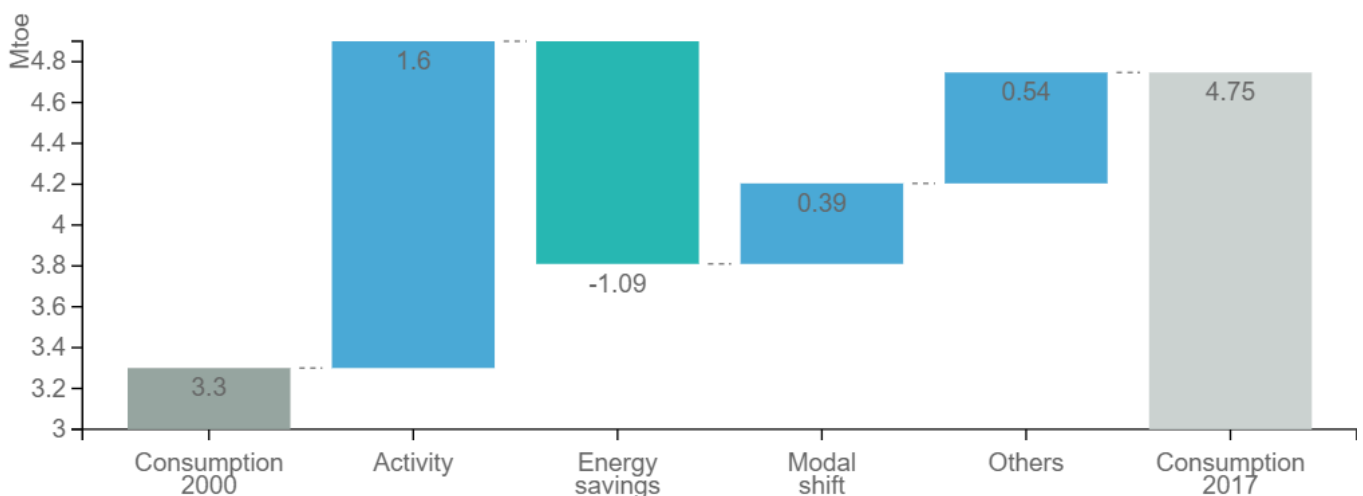
Figure 9: Share of modes in freight traffic



Source: ODYSSEE

Energy consumption of transport grew by 48 % in the period of 2000-2017, by an average rate of 2.8% per year. The rise of consumption was mainly due to increased activity (+ 1.6 Mtoe). The growing share of car in passenger traffic explains the increase of consumption by 0.4 Mtoe (modal shift). After the recovery from the impact of the economic recession, both road passenger and freight transport are steadily growing, and have reached the pre-recession level in 2017. The increase of energy consumption due to activity was in part compensated by energy savings (-1.1 Mtoe).

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



Source: ODYSSEE



Measures targeting the transport sector include the Jedlik Ányos Plan supporting electro-mobility, a toll road system, various transport infrastructure projects, vehicle purchase support and infrastructural development projects in the Transport Operational Programme, financed by European Union Funds. The development of infrastructure for bicycle also played a role.

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

Measures	Description	Expected savings, impact evaluation	More information available
Toll road system	An electronic, distance-based toll system (DTS) has been introduced on the road network (motorways, highways, main routes). Energy savings are attributable to traffic rationalization, better capacity utilization, and division of labour of transport modes.	Cumulative energy savings expected is 10.6 PJ for 2020.	
Jedlik Ányos Plan to support electro-mobility	In 2015 the Hungarian Government approved the Jedlik Ányos Plan that aims to promote electro mobility. The goal is to have 30 000 alternative vehicles in 2020 on the Hungarian roads. The Plan is implemented through the Jedlik Ányos Cluster, which includes various stakeholders related to electro-mobility in Hungary. The Plan aims at planning and implementing a supportive legal and financial framework for the spread of electric vehicles, such as the deployment of charging infrastructure, developing of measurement and accounting system for electricity used to charge vehicles, ensuring the operation of charging appliances, establishing direct and indirect financial incentives.	2017: 0,06 PJ, 2020 expected: 0,3 PJ	Link
Operative programmes for transport development	In the programming period of 2007-2013 various infrastructure projects were developed related to public transportation in urban and suburban regions, e.g. finalizing the 4th metro	2017: 4.87 PJ 2020 expected: 28,75 PJ	https://www.palyazat.gov.hu/doc/356



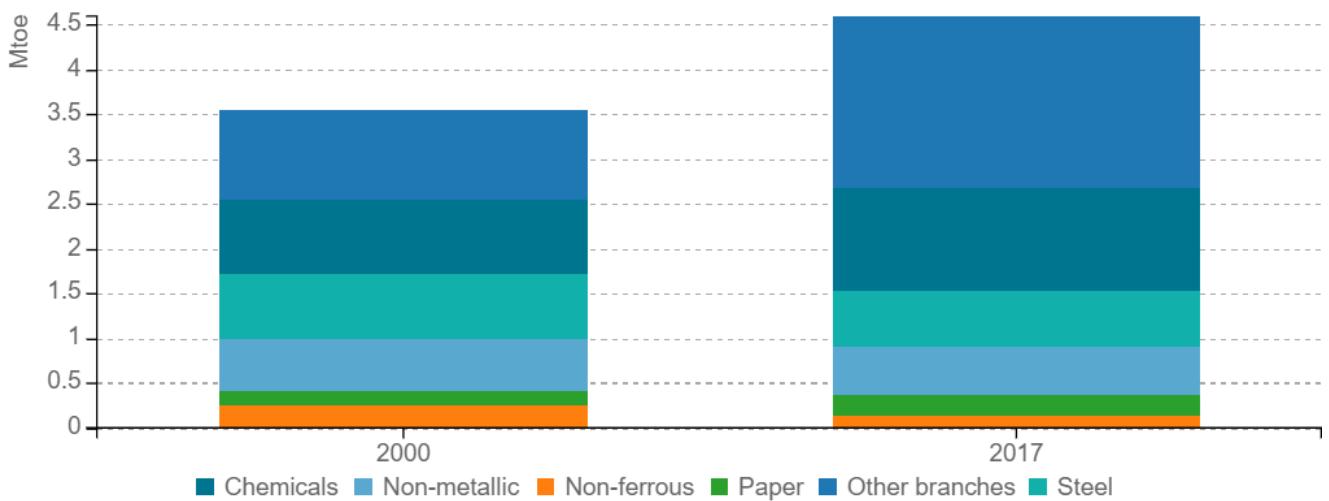
line in Budapest. The budget within the Transport Operative Programme for these projects was HUF 544.6 billion. The Integrated Transport Operative Program provides funding in the period 2014-2020.

Source: MURE

Industry

Energy consumption in the industry sector increased by 33%, at an annual average rate of 2% between 2000 and 2017. After the economic recession, final energy use increased again between 2010 and 2017, at an annual average of 10% due to the continuous growth of the economy, which offset the energy savings in the industry sector.

Figure 11: Final energy consumption by branch (2000,2014)

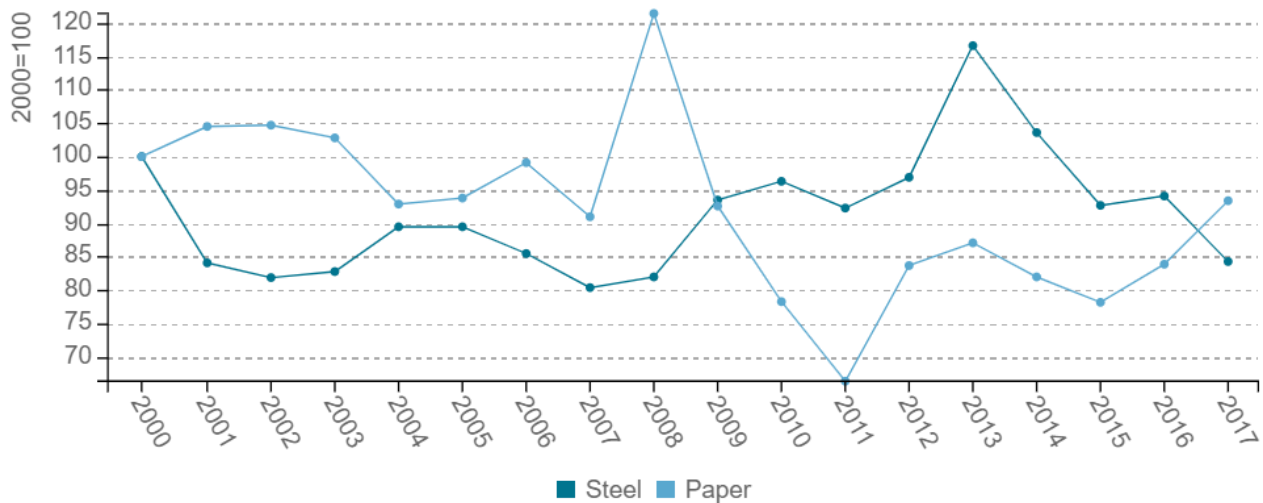


Source: ODYSSEE, steel including blast furnaces

Specific energy consumption per tonne of steel had a decreasing trend until 2007. Energy efficiency deteriorated after the crises due to lower utilization rates, after which specific consumption decreased again. The unit consumption figure of 0.33 toe per tonne in 2017 ranks Hungary in the medium range among EU countries. Unit consumption in the paper industry has a growing trend after the recovery from the 2008 crises, reaching 0.3 toe/t in 2017.



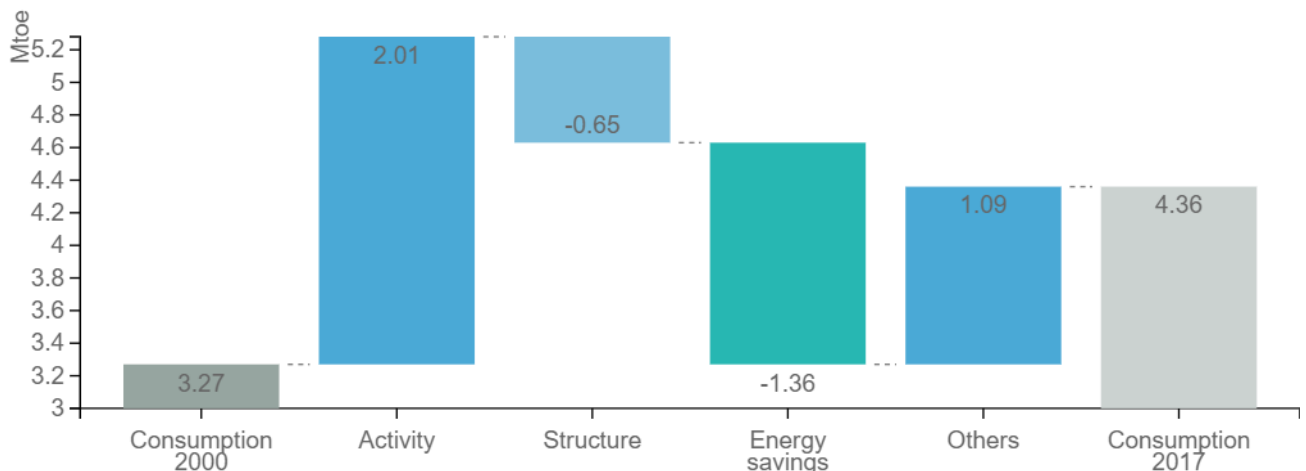
Figure 12: Unit consumption of energy-intensive products (toe/t)



Source: ODYSSEE

The increase of industrial energy consumption was 33% from 2000 to 2017. This was to a large extent due to the expansion of industrial production (2.01 Mtoe), with a yearly 4% growth rate of energy consumption after 2010. This was partly compensated by efficiency improvements of production and processes (-1.36 Mtoe). The economy has been continuously restructured from the 90's by less energy intensive branches gaining larger share. Structural changes continued in the 2000's, and to a smaller extent also after 2010, contributing to a decrease of energy consumption by 0.65 Mtoe.

Figure 13: Main drivers of the energy consumption variation in industry (2000-2014)



Source: ODYSSEE

There are several new measures targeting large enterprises based on the Energy Efficiency Act of 2015, including mandatory audit for large enterprises (EED Art. 8.), the mandatory appointment of an energy manager in large energy consuming enterprises, and a corporate income tax incentive introduced in 2017 for the implementation and operation of investments aimed at improving energy efficiency. The Economic Development and Innovation Operational Programme finances various energy efficiency measures for SMEs.



Table 4: Policies and measures into force in industry

Measures	Description	Expected savings, impact evaluation	More information available
Economic Development and Innovation Operational Programme (GINOP)	Energy efficiency of the industry, with special focus on SMEs is supported through the Economic Development and Innovation Operational Programme, funded by EU Funds and state budget. Priorities of grants and supportable projects and budget are summarized yearly in government decrees.		3rd NEEAP of Hungary
Mandatory energy audit for large enterprises	Implementation of EED Art. 8 into Hungarian law. There is an obligation for large enterprises to register at the Hungarian Energy and Public Utility Regulatory Authority (HEA) and to carry out an energy audit every four years. Every year there is a new registration obligation and data provision obligation on energy savings. Energy auditors also have to be registered at HEA. Compliance with the law is controlled by HEA, which may check the quality of energy audits and sanctions registered enterprises and/or auditors.		Link
Mandatory appointment of an energy manager at enterprises with large energy consumption	Measure is based on the Energy Efficiency Act of 2015. Goal of the measure is to support energy efficient behaviour, planning and investments at large enterprises. According to the EE Act of 2015 large enterprises are determined according to the following criteria: if consumption exceeds a) 400 000 kWh electricity or b) 100 000 m ³ natural gas or c) 3 400 GJ heat Enterprises have the obligation to report yearly energy saving data to the Hungarian Energy and Public Utility Regulatory Authority (HEA). HEA verifies energy savings due to specific measures according to EED Art.7 methodology	2017: 0,64 PJ, 2020 expected: 2,5552 PJ	Link
Corporate income tax incentive to trigger energy efficiency investments	A tax incentive was introduced in 2017 for the implementation and operation of investments aimed at improving energy efficiency by reducing final energy consumption. Goal of the measure is to promote energy efficiency investments all over the business sector at large, medium and small enterprises. The tax incentive can be up to 30% of eligible costs, but not more than the HUF equivalent of EUR 15 million at present value, which can be increased by 20% for small enterprises, and 10% for	2018: 269 TJ/year energy savings 2020 expected: 2,5552 PJ	



	<p>medium-sized enterprises The tax incentive may only be claimed in connection with projects aimed at energy efficiency improvement. No tax credit can be applied with respect to investments aiming at fulfilling the mandatory environmental protection standards or minimum mandatory energy efficiency standards. It is necessary for the taxpayer to obtain a certificate from an auditor registered at the Hungarian Energy and Public Utility Regulatory Authority that proves that the investment aims at improving energy efficiency by reducing energy consumption. The certificate should be based on the result of an energy audit. The taxpayer is obligated to provide data on the certified investment and the energy savings stemming from it.</p>		
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Source: MURE

