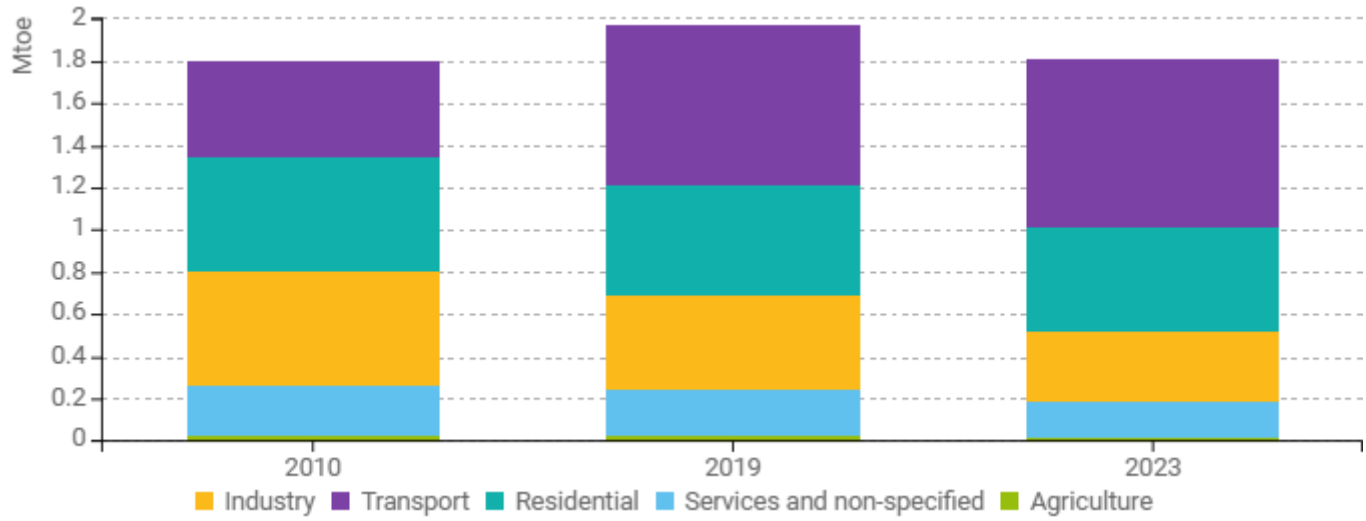
Energy efficiency trends and policies

Overview

Final energy consumption by sector as presented on figure 1 remained almost stable over 2010 - 2023, with a negligible average change. Transport consumption increased rapidly (+4.4%/year), becoming the largest consuming sector and raising its share from 25% in 2010 to 44% in 2023. In contrast, industry consumption decreased strongly (-3.8%/year), with its share falling from 30% to 18%. Residential energy use declined slightly (-0.7%/year), while services recorded a more pronounced decrease (-2.6%/year). Agriculture shows a moderate decline (-1.2%/year) and keeps a marginal share of around 1%.

Figure 1: Final energy consumption by sector (with climatic corrections)



Source: ODYSSEE

Figure 2 presents primary and final energy intensities through a clear downward trend over the period 2010 - 2023, indicating an overall improvement in energy efficiency. Final energy intensity decreased by about 24% over the period, corresponding to an average reduction of 2.1% per year. Primary energy intensity declined even more strongly, by around 28%, with an average annual decrease of 2.5% per year. Between 2010 and 2019, both indicators followed a steady declining trend, reflecting continuous efficiency improvements across the economy. After 2019, intensities fluctuated slightly, with a temporary increase in final energy intensity in 2021, followed by renewed reductions. Over 2019–2023, final energy intensity decreased by about 2.8%, while primary energy intensity fell by around 2.7%. Throughout the whole period, primary energy intensity remained consistently higher than final energy intensity, reflecting conversion and transformation losses in the energy system. The sustained decline in both indicators confirms progress in decoupling energy consumption from economic growth and highlights the positive impact of energy efficiency policies and structural changes in the economy.

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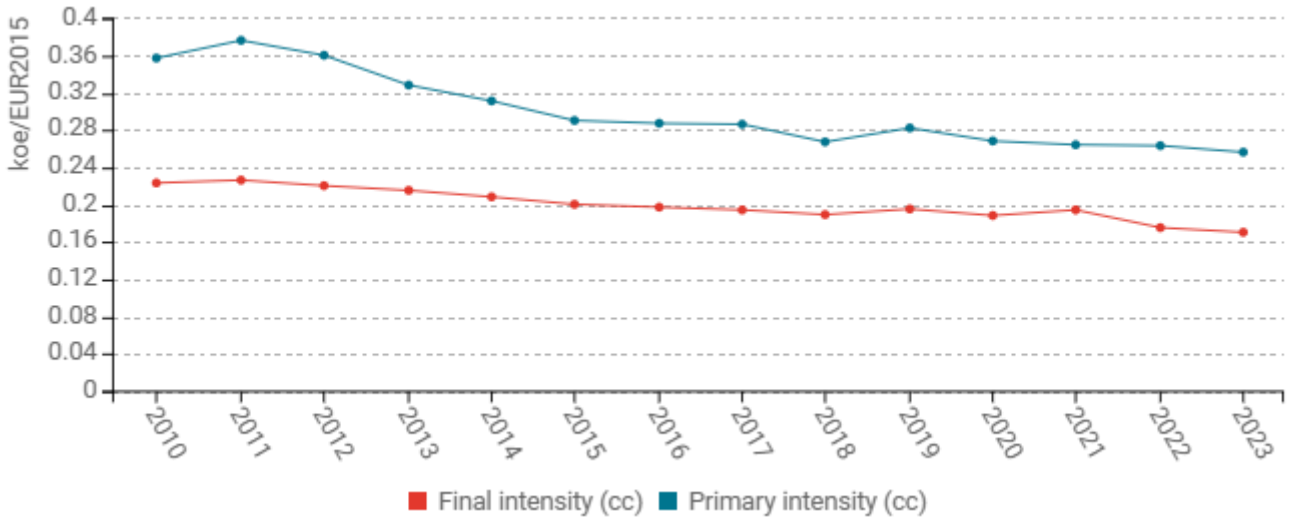
Figure 2: Primary and final intensities (with climatic corrections)



Source: ODYSSEE

Final energy intensity by sector (figure 3) shows contrasting trends over 2010 - 2023. Industry records the strongest improvement, with energy intensity decreasing by about 61% over the period, corresponding to an average reduction of 6.9% per year. Services also show a substantial decline of around 53%, with an average annual decrease of 5.7% per year, indicating significant efficiency gains.In contrast, agricultural energy intensity remains broadly stable over the whole period, showing no significant long-term change on average. However, notable short-term fluctuations are observed, including a strong increase in 2020 - 2021 (+24.8%), followed by declines in subsequent years. Between 2019 and 2023, energy intensity continued to decrease in industry (-20.7%) and services (-19.1%), confirming the persistence of efficiency improvements in these sectors. The base-100 index highlights that, by 2023, industrial and service intensities are well below their 2010 levels, while agriculture remains close to its initial level. Overall, the results point to major efficiency gains in productive and service activities, whereas agriculture shows limited structural progress in reducing energy intensity.

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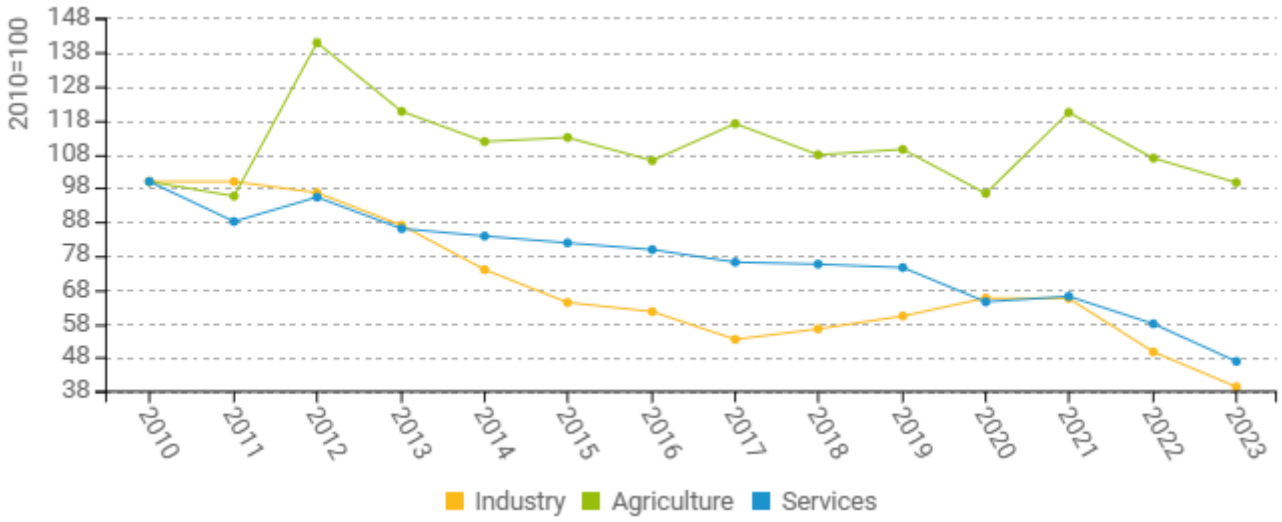
Figure 3: Final intensity by sector



Source: ODYSSEE

Total energy supply decreased slightly between 2010 and 2023, from around 2.87 Mtoe to 2.69 Mtoe (figure 4). The decomposition analysis shows that this reduction is mainly driven by efficiency improvements and structural changes in the energy system. The variation in final energy consumption contributes marginally to the overall decrease, with a small negative effect (-0.01 Mtoe), indicating that changes in final demand had a limited influence on total energy supply. A larger negative contribution comes from the power sector (-0.06 Mtoe), reflecting improvements in electricity generation efficiency, fuel switching, and reduced transformation losses. The strongest decreasing effect is associated with other transformations (-0.12 Mtoe), which include changes in energy conversion processes and system losses, pointing to efficiency gains in the transformation sector. In contrast, non-energy uses have a very small positive contribution (+0.01 Mtoe), slightly increasing total energy supply, but this effect remains negligible compared to the other drivers. Overall, the combined negative effects from the power sector and other transformations more than offset the limited increase from non-energy uses, resulting in a moderate decline in total energy supply. These results highlight the important role of improvements in energy transformation efficiency in shaping the long-term evolution of total energy supply.

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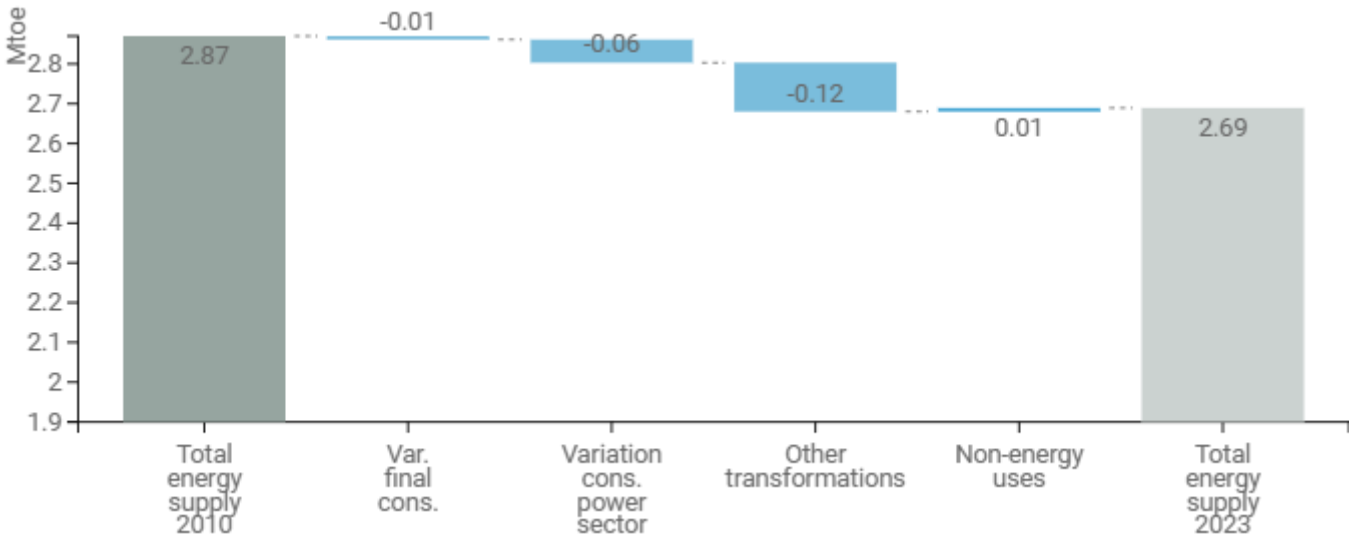
Figure 4: Main drivers of the total energy supply variation



Source: ODYSSEE

The Integrated National Energy and Climate Plan (NECP) for the period 2021–2030 builds on existing national strategies and plans. The plan was prepared based on recommendations from the Energy Community Secretariat, and North Macedonia was the first Contracting Party to prepare an NECP. However, since the current NECP was developed before the COVID-19 pandemic and the energy crisis, it does not consider the impacts of these events. Developments that have occurred in the meantime — including the gradual phase-out of coal, changes in the Energy Community legislation, and the growing importance of energy security — represent the key drivers for the ongoing update of the National Energy and Climate Plan. The crosscutting measures in table 1 are based on the inputs in MURE database as included in current NECP.

Table 1: Sample of cross-cutting measures

Measures	NECP measures	Description	Expected savings, impact evaluation
Introduction of CO2 tax	Yes	The Republic of North Macedonia, a non-Annex I party to the United Nations Framework Convention on Climate Change (UNFCCC), ratified Paris Agreement in November 2017, with the following nationally determined contribution (NDC) to the global efforts for GHG emissions reduction (initial NDC, submitted 2015): "To reduce the CO2 emissions from fossil fuels combustion for 30%, that is, for 36% at a higher level of ambition, by 2030 compared to the business as usual (BAU) scenario." The focus of the initial NDC is put on climate change mitigation, and particularly to CO2 emissions from fossil fuels combustion which covers almost 80% of	Since the measure is still in phase of developmen t - defining which mechanism to be used, at this

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		the total GHG emissions in the country. The following sectors are of dominant share: energy supply, buildings and transport.	moment impact evaluation cannot be achieved
Amendments on Energy Efficiency Law/ Изменување на Законот за енергетска ефикасност	Yes	For the first time in 2020, a separate law on Energy efficiency was adopted in the country. Before the adoption of the separate law, energy efficiency was part of the Energy Law. The law mainly transposes the Energy Efficiency Directive 2012/27/EU and the Energy Performance of the Buildings Directive 2018/844. Fully transposition is achieved with the preparation and adoption of secondary legislation arising from the Law. Following the amendments to the energy efficiency directive in the EU and obligations that come from the status as a Contracting Party in the Energy Community, amendments to the Energy Law are needed. For that reason, the draft Law that amends the Energy efficiency Law is prepared to aim transposition of 2018/2002 Directive and planned for adoption. The amendment of the law was adopted in September 2025.	Adopted

Source: MURE

Buildings

Final energy consumption in buildings on figure 5 shows a declining trend over the period 2010 - 2023, reflecting improvements in energy efficiency and changes in building energy use. Total building consumption decreased from around 0.78 Mtoe in 2010 to about 0.66 Mtoe in 2023. Residential energy consumption, which represents the largest share of building energy use, declined slightly over the period, with a total reduction of about 9%, corresponding to an average decrease of 0.7% per year. After a small increase in 2020 - 2021, residential consumption resumed a downward trend, decreasing by 1.1% over 2022 - 2023. Energy consumption in services decreased more strongly, by around 29% between 2010 and 2023, corresponding to an average annual reduction of 2.6%. Short-term variations are observed, including an increase in 2020–2021 (+7.1%), followed by sharp decreases in 2021–2022 (-9.9%) and 2022 - 2023 (-4.7%). Throughout the whole period, residential buildings remain the dominant component of building energy consumption, while the share of services declines. Overall, the reduction in building energy use is mainly driven by the strong decrease in the services sector, complemented by a moderate but continuous decline in residential consumption, highlighting the impact of efficiency improvements and renovation activities in buildings.

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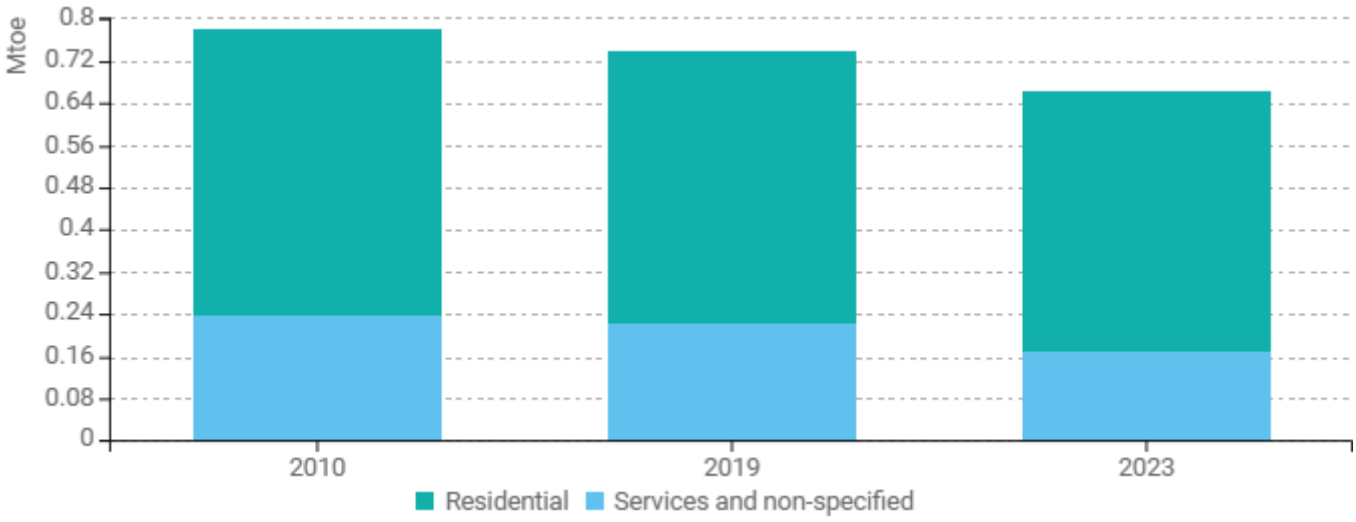
Figure 5: Final energy consumption in buildings (with climatic corrections)



Source: ODYSSEE

Energy consumption of households per capita shows (figure 6) a slight downward trend over the period 2010 - 2023. Total household energy consumption per capita decreased by about 3% over the period, corresponding to an average annual reduction of 0.3% per year. This indicates a modest improvement in energy efficiency and changes in household energy behavior. Electricity consumption per capita, in contrast, increased slightly over the same period, by around 1%, corresponding to an average growth of 0.1% per year. This suggests a gradual electrification of household energy uses, partly offsetting efficiency gains. Between 2010 and 2018, both total and electricity consumption per capita declined, reaching their lowest levels around 2016–2018. From 2019 onwards, a rebound is observed, particularly for electricity consumption, which increased strongly in 2019 - 2021 (+3.0% in 2020–2021). This increase was followed by a decline in 2021 - 2022 (-4.3%) and a further small decrease in 2022 - 2023 (-0.5%). Total household energy consumption per capita also increased in 2019 - 2020 (+2.4%), before declining again in the following years. Overall, the contrasting trends indicate that while households are gradually reducing their total energy use per capita, electricity is taking a slightly larger role in the household energy mix.

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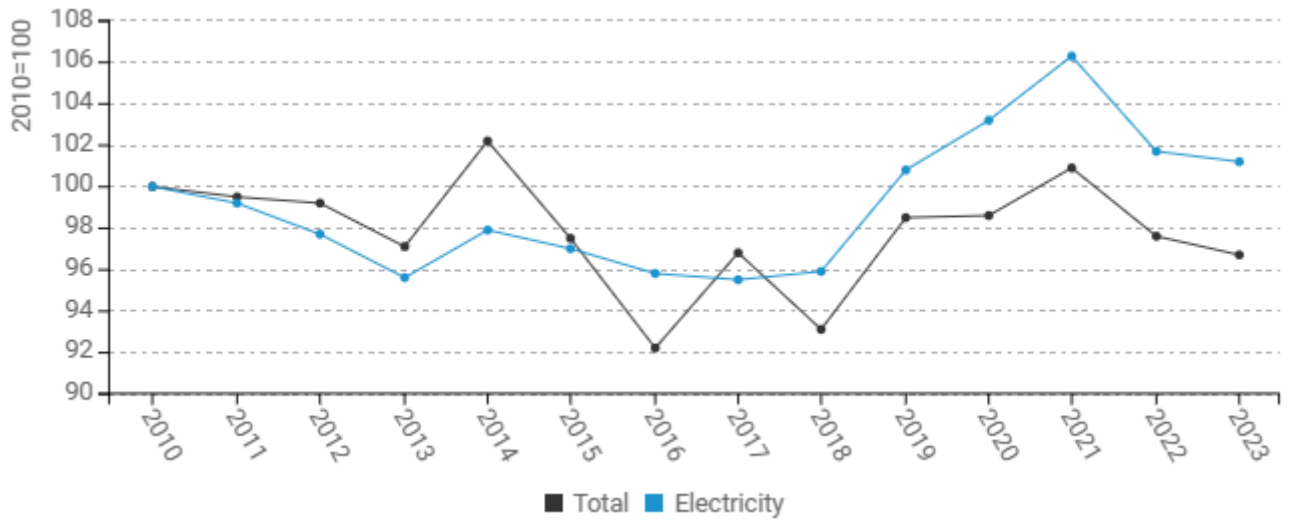
Figure 6: Energy and electricity consumption in households per capita (with climatic corrections)



Source: ODYSSEE

Figure 7, energy consumption per capita for space heating shows an overall increasing trend over the period 2010 - 2023. Unit consumption per capita rose by about 26% between 2010 and 2023, corresponding to an average annual increase of 1.8% per year. This indicates that, despite efficiency improvements in buildings, space heating demand per person has increased over the long term. During the first part of the period, consumption fluctuated around 0.15–0.17 toe per capita, before reaching a higher level in 2014. A temporary decline is observed between 2015 and 2017, followed by a renewed increase from 2018 onwards. The highest values are recorded in the period 2019–2023, when consumption remains close to 0.19 toe per capita. Short-term variations are relatively limited. Between 2020 and 2021, unit consumption increased slightly (+0.7%), followed by another small increase in 2021–2022 (+0.4%). In 2022 - 2023, a moderate decrease is observed (-1.6%), although consumption remains well above the levels observed at the beginning of the period. Overall, the rising trend suggests that factors such as climatic conditions, increased heated floor area per capita, or changes in comfort levels may have outweighed the impact of energy efficiency improvements in space heating.

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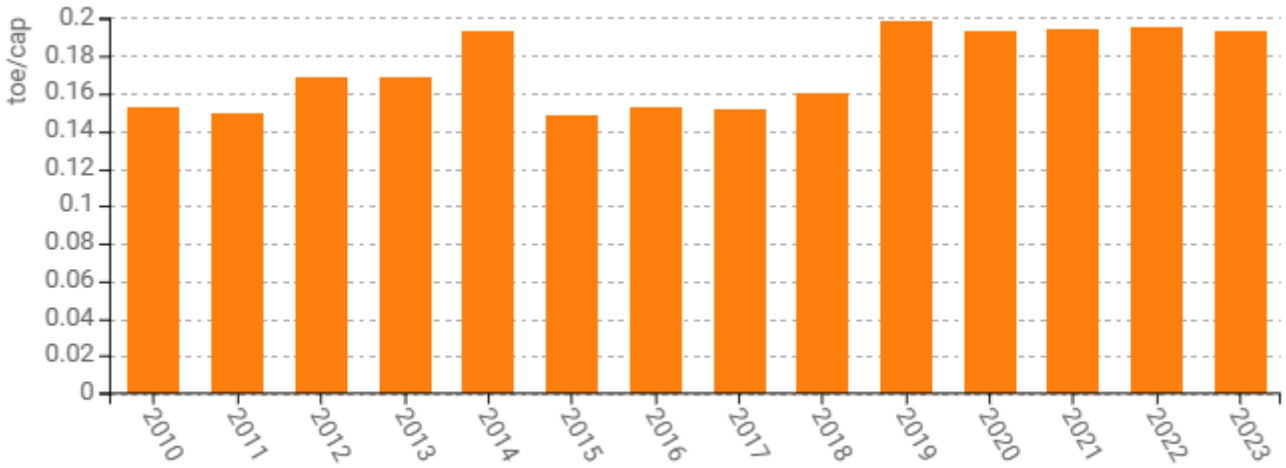
Figure 7: Energy consumption per capita for space heating in households (with climatic corrections)



Source: ODYSSEE

Energy consumption per capita by end-use in households (excluding space heating) (figure 8) shows an overall declining trend between 2010 and 2022. Total consumption per capita for these end-uses decreased by about 22% over the period, corresponding to an average annual reduction of around 2.0% per year. This reflects significant efficiency improvements in household appliances and end-use equipment. Unit consumption per capita for water heating decreased by around 21% (-2.0% per year), while cooking energy consumption declined by about 23% (-2.1% per year), indicating efficiency gains in water heating systems and cooking appliances.Electricity consumption per capita for electrical appliances and lighting shows the strongest decrease, falling by around 25% (-2.4% per year). Despite this decline, it remains the largest end-use in 2022, accounting for about 37% of total consumption, slightly down from 38% in 2010. In contrast, unit consumption per capita for air cooling increased by around 6% (+0.5% per year), and its share rose from 5% to about 7%, pointing to a growing importance of cooling demand. Overall, the results highlight substantial efficiency gains for most household end-uses, partly offset by rising cooling needs, which slightly modify the structure of household energy consumption.

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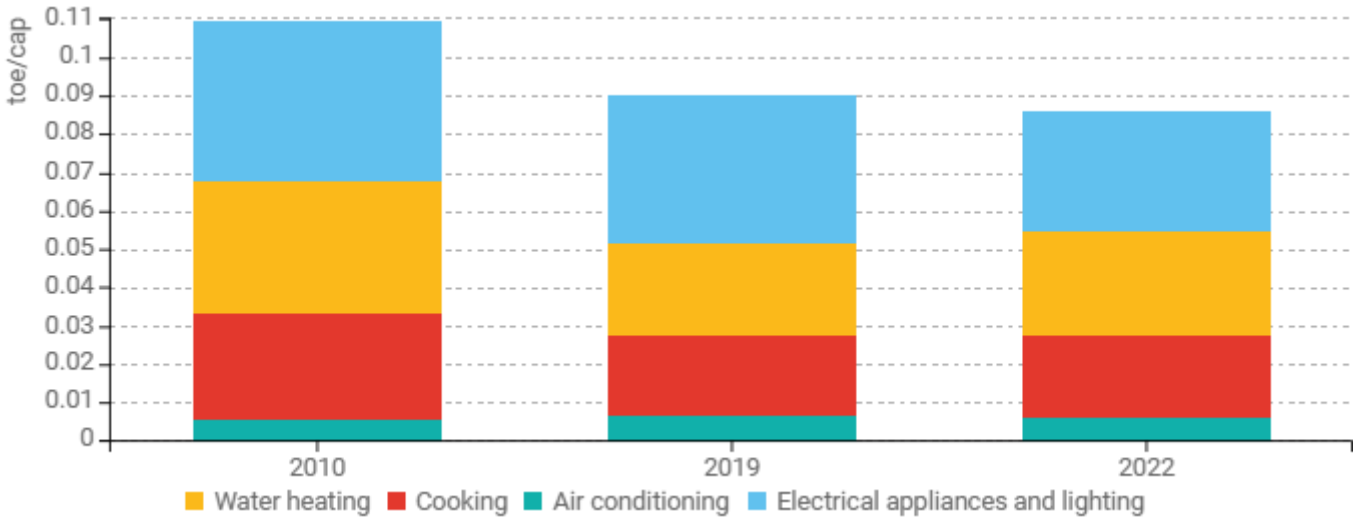
Figure 8: Energy consumption per capita by end-use in households (except space heating)



Source: ODYSSEE

Republic of North Macedonia is planning to implement a number of policies and measures over the period 2020 – 2040, in order to reduce the energy consumption in buildings (households, commercial and public buildings).The policies and measures relevant to the building sector will focus on improving the energy performance of buildings by refurbishing the existing and constructing new buildings (including passive buildings), as well as through promotion and introduction of more advanced end-use technologies (if possible in combination with RES), utilization central heating systems, green procurements, etc. In February 2020, the Energy Efficiency Law (Official Gazette 32/2020)10 has been adopted and amendments ongoing, which, with the relevant by-laws, warrants transposition of the Energy Efficiency Directive 2012/27/EU, Energy Performance of Buildings Directive 2010/31/EC and package of regulation for energy efficient products (labelling and eco-design), as well as introduces a number of regulatory measures, such as building renovation strategy, EE obligation scheme, monitoring and verification of savings, comprehensive assessment of potential for efficient heating and cooling etc. Ongoing is the transposition of EED from the Clean Energy package as an amendment to the existing EE Law. The measures in table 2 are examples of successfully implemented measures that improve EE in buildings.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
Retrofitting of existing residential buildings	Yes	The measure considers reconstructions of residential buildings including windows replacement, initiated by the owners and/or supported by commercial banks and funds. This measure will provide certificates for energy performance of buildings, as a prerequisite for putting the reconstructions into operation. The	Estimated savings in 2040 0.272 PJ; estimated

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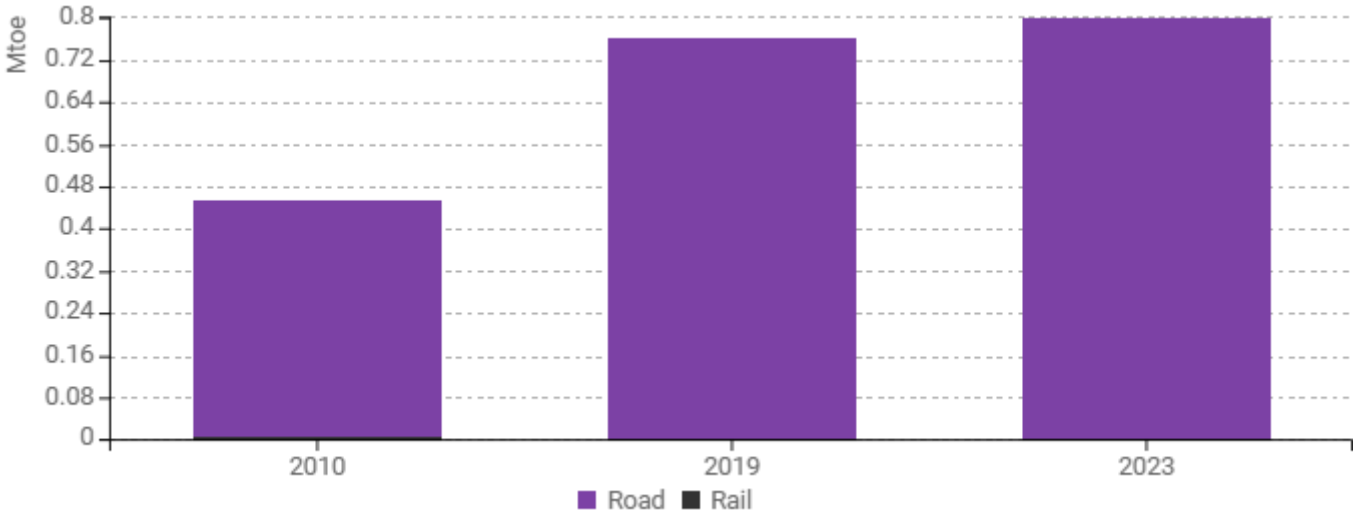
		measure provides technical and regulatory activities for improving the energy efficiency of residential buildings. Aim of this measure is the existing residential buildings to meet the standards in accordance with the national legislation. 2% annual renovation rate is considered	reduction in CO2 emissions in 2040, 5.7 ktCO2e.
Adoption of annual program for vulnerable consumers	Yes	New energy Law was adopted in May 2025, and according to this law, the Ministry of Energy, Mining and Mineral resources has adopted a Methodology for measuring the level of energy poverty in the Republic of North Macedonia. Also according to the Energy Law the Government adopts annual program for protection of vulnerable consumers.	According to the methodology energy poverty in 2023 was calculated 29.7%

Source: MURE

Transport

Transport energy consumption increased strongly between 2010 and 2023 (+76%, 4.4%/year), driven almost entirely by road transport. Road accounts for nearly 100% of transport energy use in 2023. In contrast, rail consumption declined sharply (-81%), reducing its share to almost zero.

Figure 9: Transport energy consumption by mode



Source: ODYSSEE

NECP provides implementation of EE measures in final energy consumption for transport sector that include replacement of old vehicles with energy-efficient ones, electrification of road transport, as well as modal shift from road to rail for freight transport and from car to bus for passenger transport, and more biking/walking in urban areas, and accelerating RES consumption (biofuels) in transport.

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

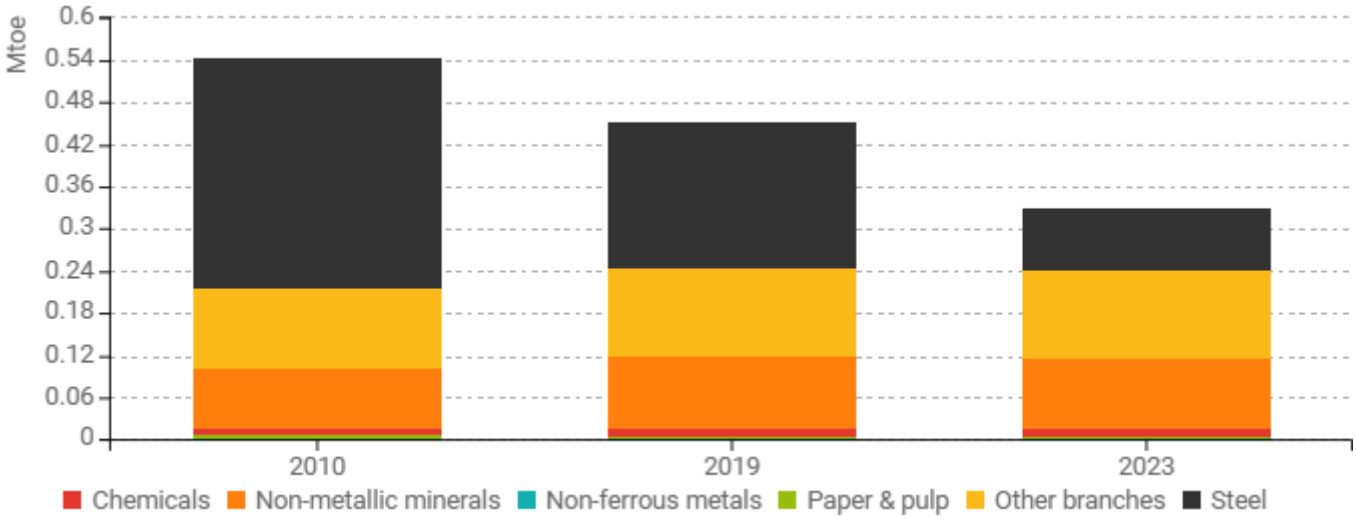
Measures	NECP measures	Description	Expected savings, impact evaluation
Advanced mobility	Yes	The main goal of this measure is the reduction of the local air pollution. The measure includes conducting campaigns/providing subsidies and systems for the use of new bicycles, and electric scooters, promoting walking, and introducing parking policies that would reduce the use of cars in the city area. People, especially in smaller towns where a lot of them use cars for short distances, would increase the use of bicycles/electric scooters or walking.	NECP includes cumulative annual savings based on calculations for 2018-2040

Source: MURE

Industry

Industrial energy consumption declined by 39% between 2010 and 2023. Steel shows the strongest decrease (-73%), reducing its share from 61% to 26%. In contrast, non-metallic minerals (+17%) and other branches (+14%) increased, gaining importance in the industrial energy mix.

Figure 10: Final energy consumption of industry by branch



Source: ODYSSEE

NECP for industry sector gives priority to the improvement of the processes by using more efficient and advanced technologies, in combination with the energy management of the processes. Implementation of EE measures in final energy consumption for industry sector like utilization of efficient technologies that will enable fuel switch

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(from coal to gas) and use of efficient electric motors (in industry) as well as energy management in manufacturing industries.

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

Measures	NECP measures	Description	Expected savings, impact evaluation
Energy management in manufacturing industries	Yes	The main goal is efficient management of manufacturing processes in the industry aiming to increase production using the same energy consumption. This measure considers the implementation of obligatory energy audits of large companies and the implementation of ISO 50001 standard, as well as advanced measurement and introduction of new IT technologies. This will enable the prevention of defects, better process control ,and quicker response times in manufacturing using advanced data analysis and predictive technologies.	Improvement of the systems efficiency in manufacturing industries at 0.15%/year. for the period 2020-2040

Source: MURE

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