

**MEETING THE REVISED EFFORT SHARING
REGULATION TARGET IN ROMANIA.**

**MEASURES FOR THE BUILDINGS AND TRANSPORT
SECTORS**

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Measures for the buildings and transport sectors

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About EPG:

Energy Policy Group (EPG) is an independent think-tank specialized in energy and climate policies. Founded in 2014, EPG brings together experts working in international research projects. EPG is focused on the deeper context of European policies and of the global trends and is aiming to promote a dialogue among the decision makers and the larger audiences, bringing concrete solutions for the economy's decarbonisation.

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Executive Summary

The European Union has almost completed its recalibration of targets and measures for 2030 to align them with the goal of climate neutrality by mid-century. Important changes have been made through the Fit-for-55 legislative package to essential EU energy and climate files, including the Energy Efficiency Directive, the Renewable Energy Directive, the Emissions Trading System Directive, and the Effort Sharing Regulation. The revised levels of ambition are now moving to the implementation stages, which may pose some challenges in some Member States. Targets for Romania are assessed in this paper using 2050 Pathways Explorer, a specialised modelling tool.

Romania has one of the lowest targets under the revised Effort Sharing Regulation (-12.7% GHG emissions by 2030 compared to 2005) but given the relative neglect of the covered sectors over the past years, there will be distinct challenges for implementation, particularly in the buildings and transport sectors. At the very least, Romania should achieve its goal without overusing the available flexibility tools.

The scope and speed of renovations will have to be the main focus of the building sector's efforts. Romania may reduce its building-related emissions by 29% in 2030 compared to 2005 (and by 33% compared to 2020), depending on how aggressively it pursues this goal. A Fit-for-55 compatible scenario estimates that Romania's rate of residential building rehabilitation needs to be 2%/year, compared to the 1.5%/year baseline pace. Up until 2030, Romania ought to renovate almost 66 million square meters of habitable space in residential buildings annually and become a leader in the field of energy-efficient new construction, with deep energy efficiency a feature of half of new buildings. By then, the percentage of energy used for space heating with heat pumps should increase to 6.84% of total energy consumption. Romania should achieve a 3% yearly non-residential building renovation rate and, to further reduce the total energy consumption for space heating, it should significantly improve building codes. Lastly, a comprehensive strategy for Romania's construction sector should consider the pressing needs to solve the skills deficit in the industry and to tame the price increase of building materials.

Romanian electricity consumption in transports is expected to rise by more than four times by 2030 compared to 2020. About one-third of the country's automobile fleet in 2030 should be full-electric (or hybrid equivalent in terms of electricity consumption), consuming a total of 3.25 TWh of electricity. All new cars sold in Romania should have zero emissions by 2035, and all new trucks by 2040. Additionally, rail transport would need to increase its energy efficiency by 16% compared to 2015. New internal combustion engine (ICE) buses will need to become 10% more energy-efficient than the new ones sold in 2015. New cars sold in 2030, both diesel and petrol, should be 14% more energy-efficient than the new ones entering the fleet in 2015. Romania should improve freight transportation efficiency such that new heavy-duty diesel trucks consume 13% less energy per km by 2030 compared to 2015. Should significant changes be made to the fleet of passenger and freight vehicles, Romania may achieve a 29% renewable energy sources (RES) share of the total energy consumed in transportation by 2030. In transport, Romania would greatly benefit from aggregating its policies under the umbrella of a comprehensive short and mid-term national strategy.

Introduction

The European Union (EU) aims to reach climate neutrality¹ by 2050 and to reduce its greenhouse gas (GHG) emissions by at least 55% by 2030 compared to the 1990 levels. Despite a sizeable drop in emissions since 1990, mainly as a result of the post-communist economic adjustment and industrial closures, Romania has so far struggled to elaborate and implement effective national strategies for gradually eliminating its emissions and has thus faced difficulties when negotiating its position for the Fit-for-55 legislative files in both the European Parliament and the Council of the EU. One of the main changes going forward is that Romania will have to take active measures to reduce its emissions under the Effort Sharing Regulation (ESR). Romania's renewed ESR target stands at -12.7% GHG emissions compared to 2005, significantly more ambitious compared to its current -2% target, which is applied mainly to the transport and buildings sectors, laggard sectors in national emissions reductions.

The legislative acts in the Fit-for-55 package have drawn to a close the EU decision-making process (from Commission proposal to Parliament reporting, through Council negotiation and general approach, towards *trialogue*² negotiations and eventually to adoption and national implementation) or have only recently approached its end.

As there are overlaps in the sectors covered by the energy and climate files negotiated at EU level over the past couple years, the revisions made to files such as the Renewable Energy Directive (RED), the Energy Efficiency Directive (EED) or the Energy Performance of Buildings Directive (EPBD) will influence Romania's prospects of meeting its ESR target. Using the Pathways Explorer modelling tool³, this paper presents the quantitative results for a variety of scenarios applicable to Romania and the specificities of its national context. It explores different ways to reach the target of reducing GHG emissions by 12.7% in the ESR sectors in Romania – specifically buildings and transport – and assesses their implications.

With historically lower ESR targets compared to Western Member States (Cătuți, 2020), there is a real risk that Romania will 'fall behind the pack', making its decarbonization

¹ Climate neutrality refers to net zero greenhouse gas emissions.

² Discussions that bring together the European Parliament, the Council of the EU and the European Commission as a policy broker, in order to iron out their differences on the legislation and emerge with an agreed-upon piece. Trilogues may only start once the Parliament adopted its position in plenary, and the Council reached its general approach.

³ The web-based tool 2050 Pathways Explorer has been developed by Climact. Partner organisations refined the data in each country and developed scenarios. The tool can be accessed at:

<https://pathwaysexplorer.climact.com>

objectives more difficult to reach in the long run, unless urgent and decisive action is taken. A slower decarbonisation of these sectors would put the Romanian economy at a comparative disadvantage versus early movers which have had to implement deeper emissions cuts as part of the ESR. The national energy and climate plan (NECP) represents a key moment for ramping up this ambition, and its final version needs to put forward credible measures for reducing emissions in the buildings and transport sectors.

1. EU legislative context

In 2021, the European Commission issued the so-called Fit-for-55 package, comprising 13 interlinked proposals to revise existing EU climate and energy laws, and six proposals for new legislation. The package reflects the EU commitment to climate neutrality by 2050 and GHG emissions reductions of at least 55% by 2030 and includes revising directives and regulations on the emissions trading system, effort sharing, land use and forestry, renewable energy, energy efficiency, emission standards for new cars and vans, and energy taxation.

One of the most important legislative acts recently negotiated at the EU level is the **Effort Sharing Regulation (ESR)**, which applies to most emissions not covered by the ETS (namely buildings, transport, agriculture, small industrial installations, waste treatment, energy supply and product use), amounting to around 60% of EU GHG emissions. The European Commission's review proposal of 14 July 2021 referred to Regulation No (EU) 2018/842, which appeared in 2018 as the successor to the Effort-sharing Decision No 406/2009/EC (ESD⁴) and mandated cuts in all GHG emissions in sectors not covered by the EU ETS or by the land use, land-use change and forestry (LULUCF) Regulation.

The initial proposal to achieve an EU-wide emission reduction of 30% by 2030, compared to the 2005 baseline, was increased to 40% after negotiations. This agreement was voted on by the European Parliament on 14 March 2023, and adopted by the Council of the EU on 28 March 2023. The text maintains national targets assigned to each member state as high as those proposed by the Commission (to be updated in 2025)⁵. To meet them,

⁴ The ESD was adopted in April 2009 and set national targets for the period between 2013 and 2020, with the aim to collectively reduce the total EU-28 emissions from non-ETS sectors by 10% until 2020, compared with 2005. This was aligned to the EU target of a 20% reduction in all GHG emissions by 2020 (including those in the EU ETS), compared with 1990.

⁵ The Regulation, as amended in 2023, includes a modification that limits target increases for individual Member States, preventing some from exceeding the collective objective by a significant margin. The

Member States will be able to “bank and borrow” emission allocations, meaning that in the years when they emit at levels below annual allocations, up to 75% of their annual quota for that year can be banked to subsequent years until 2030 (applicable for 2021 emissions). This percentage will be 25% for 2022-2029. During this period, Member States that emit above the annual limit will be allowed to borrow allocations from the following year amounting to up to 7,5% of their annual emission allocations from 2021 to 2025 and up to 5% from 2026 to 2030.

Additionally, Member States will be able to buy and sell (from and to other Member States) up to 10% of their annual emission allocations from 2021 to 2025, and 15% from 2026 to 2030.

They will also be able to use a limited number of credits stemming from removals under the LULUCF sectors – within two-time intervals (2021-2025 and 2026-2030), with no carryover between them.

Brief overview of the EU climate policy architecture

The EU climate strategy rests upon two policy pillars: a market-based mechanism - the Emissions Trading System (ETS) and a governance tool - the Effort Sharing Regulation (ESR). While the ETS limits GHG emissions in the energy, heavy industrial and commercial aviation sectors (responsible for around 40% of total EU emissions) through decreasing caps and allowances, the ESR sets binding annual GHG emission targets for Member States in sectors not covered by the ETS (amounting for the remaining 60% of emissions) allowing national governments to choose which measures and policies to use.

A separate emissions trading system, covering fuel combustion in buildings, road transport and small industry not covered by the existing ETS, will be implemented. This “ETS 2” aims to complement other policies by ensuring an ‘upstream’ system that would regulate fuel suppliers rather than households and car drivers.

To enable the governance of EU climate policy, Member States submit their integrated national energy and climate plans (NECPs) covering 10-year periods starting from 2021 to 2030. In these plans, each country outlines its intended measures for energy efficiency, uptake of renewables, GHG emissions cuts, power grid development, research, innovation, and other measures it sees necessary to achieve climate goals.

EU-wide, sector-specific standards, regulations, and directives (e.g. in renewable energy, automotive sector, or energy taxation) complement these frameworks in order for climate policies across member states to be coordinated and consistent.

target increases for Member States were restricted to 12 percentage points, while the EU saw an increase of 11 percentage points. Targets were raised by 0.7 percentage points for Member States whose updated targets were not more ambitious than their cost-effective projections, that had already contributed to a target correction, or that were already at the limit of the target range in order to maintain the overall EU-wide ambition of the ESR.

Nine Member States⁶ will be allowed to use some ETS allowances to offset emissions in the ESR sectors from 2021 to 2030.

Romania's assigned ESR target corresponds to a **-12.7% emissions cut by 2030**, compared to the current 2% objective. While this is a sixfold increase in ambition, it is the second lowest target in the EU and significantly lower than the 50% objective for countries such as Denmark, Sweden, or Luxemburg. It is unlikely that this new target can still be met in a business-as-usual scenario, and it requires concrete actions at the national level. Romania should at the very minimum aim to meet its target without making excessive use of the available flexibility mechanisms.

Because the ESR establishes binding GHG emissions reductions for a variety of sectors, there is overlap with other EU legislative files that have been recently revised and which are essential for its successful implementation:

- The revision of the Regulation setting **CO2 emission performance standards for passenger cars and light commercial vehicles (vans)**, published in the EU Official Journal⁷ in April 2023.
 - ➔ aims for an EU fleet-wide target to reduce CO2 emissions produced by new passenger cars and vans by 100% (i.e. zero CO2 emissions) in 2035 compared to 2021. Intermediate emissions reduction targets for 2030 are set at 55% for cars and 50% for vans.
- The revised **EU Emission Trading System (ETS)** entered into force in June 2023 and is applicable as of 1 January 2024.
 - ➔ It was designed to achieve a reduction target for the EU ETS sectors of 62% below 2005 levels by 2030 (an increase from the previous 43% target); phase out of free allocation in some sectors accompanied by phase-in of the carbon border adjustment mechanism (CBAM) introduced through separate legislation; revised parameters for the Market Stability Reserve (MSR); the expansion of the EU ETS to cover maritime shipping; a new and separate ETS for buildings, road transport, and other fuel sectors (ETS 2); and a strengthened commitment to use ETS revenues to address distributional effects and spur innovation.
- The **Renewable Energy Directive (RED III)** negotiations were finalized in September 2023 with a positive vote in the European Parliament. The adopted legislation now only requires the EU Member States to transpose it in their national laws.

⁶ The nine Member States are Belgium, Denmark, Ireland, Luxembourg, Malta, the Netherlands, Austria, Finland, and Sweden.

⁷ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2023:110:FULL>

- ➔ The EU will have to collectively achieve a 42.5% share of renewables in its overall energy mix by 2030, with an additional 2.5% indicative top up that would allow it to reach 45%.
- ➔ For buildings, there will be an indicative target of at least a 49% renewable energy share by 2030. There will be a binding increase of 0.8% per year for heating and cooling at national level until 2026 and 1.1% from 2026 to 2030.
- ➔ In the transport sector, Member States will be able to choose between a binding target of 14.5% reduction of GHG intensity by 2030 or a binding target of at least 29% share of renewables within the final consumption of energy in all transport sectors by 2030. There is a binding combined sub-target of 5.5% for advanced biofuels and renewable fuels of non-biological origin (RFNBOs) in the energy supplied to the transport sector, with a minimum requirement of 1% RFNBOs in the share of renewable energies supplied to the transport sector in 2030.
- The recast **Energy Efficiency Directive (EED)** was published in the EU Official Journal in September 2023.
 - ➔ According to the deal struck by the co-legislators, the target is set to reduce final energy consumption at EU level by at least 11.7% in 2030 (compared with the energy consumption forecasts for 2030 made in 2020).
 - ➔ The annual energy savings target for final energy consumption from 2024 to 2030 will gradually increase, Member States ensuring new annual savings of 1.49% of final energy consumption on average during this period, gradually reaching 1.9% by 2030.
 - ➔ The public sector would lead by example and renovate each year at least 3% of the total floor area of buildings owned by public bodies, as well as reduce its annual energy consumption by 1.9% (not including public transport and armed forces).
- The revision of the **Energy Performance of Buildings Directive (EPBD)** is approaching its conclusion, with the European Parliament and the Council of the EU having reached a provisional agreement on 7 December 2023, the formal adoption process being expected in the first half of 2024.
 - ➔ According to the deal, all new buildings should be Zero Energy Buildings (ZEB) starting in 2030.
 - ➔ Member States will have to renovate the 16% worst-performing non-residential buildings by 2030 and the worst-performing 26% by 2033 to comply with the minimum energy performance requirements.
 - ➔ Member States plan to ensure that the residential building stock will reduce the average energy consumption by 16% in 2030 and by a range between 20-22% in 2035.

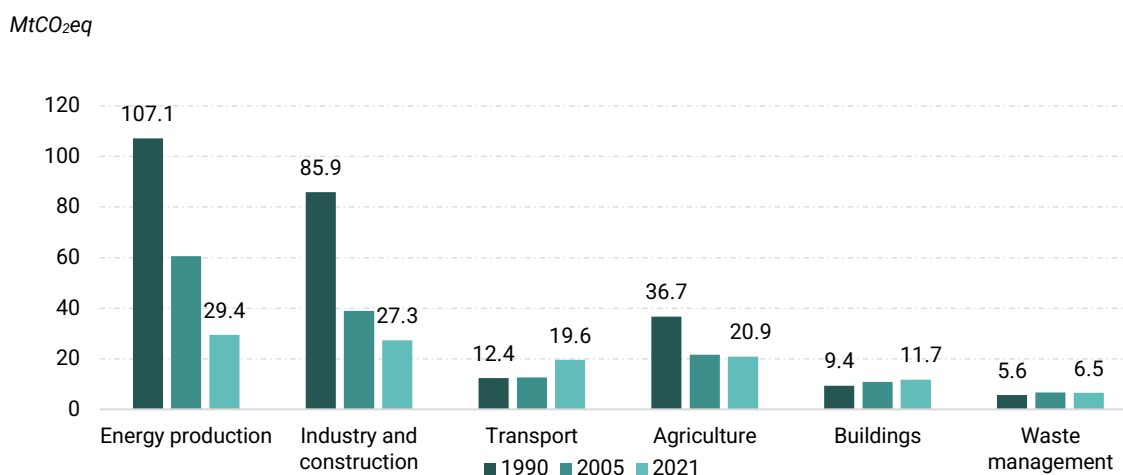
- 55% of the energy reduction will have to be achieved through renovation of the worst performing buildings.
- ➔ Finally, both institutions agreed on including in the National Building Renovation Plans a roadmap with a view to phase out of fossil fuel boilers by 2040.
- ➔ Member States will have to introduce a methodology for the calculation of embedded carbon emissions based on Life Cycle Assessment, and subsequently introduce upper limits for the embedded carbon emissions.
- On the revision of the Regulation setting **CO₂ performance standards for heavy-duty vehicles (HDVs)**, the European Parliament and the Council of the EU reached a provisional agreement on 18 January 2024.
 - ➔ The emission reduction targets (applicable to heavy trucks over 7.5t and coaches) set by the European Commission in its proposal for 2030 (45%), 2035 (65%), and 2040 (90%), were maintained (in addition to the 2025 reduction target of 15% already stipulated in existing legislation).
 - ➔ The co-legislators introduced a 100% zero-emission target for urban buses by 2035, with an intermediate target of 90% by 2030 (exempting inter-urban buses).
 - ➔ They also extended the scope of the regulation to vocational vehicles such as garbage trucks or concrete mixers, to be applied at a later stage (2035).

2.Meeting the ESR target in Romania

According to Romania's official reporting (Ministry of Environment, Waters and Forests, 2022), the country's total GHG emissions in 2020 amounted to 110 MtCO₂eq (excluding removals by sinks), 64.09% lower in 2020 than the peak of 1989. The decline to less than half of the 1990s levels of emissions happened at a rate of 6% per year between 1990 and 2000 and by 1.1% per year between 2000 and 2019 (Jensen, 2021). Today, Romania is responsible for about 3% of the EU-27's total GHG emissions.

There are multiple reasons that explain this trend. First, the massive decline of energy intensive industries along with agriculture. Together, agriculture, industry and constructions accounted for 67.8% of gross value added in 1990 (Ministry of Environment, Waters and Forests, 2022). According to Eurostat, this share has halved over the next thirty years, reaching 33.9% in 2020. Second, the population decreased from 23.2 million inhabitants reported in Romania in 1990 to 19.3 in 2020 (World Bank, World Development Indicators).

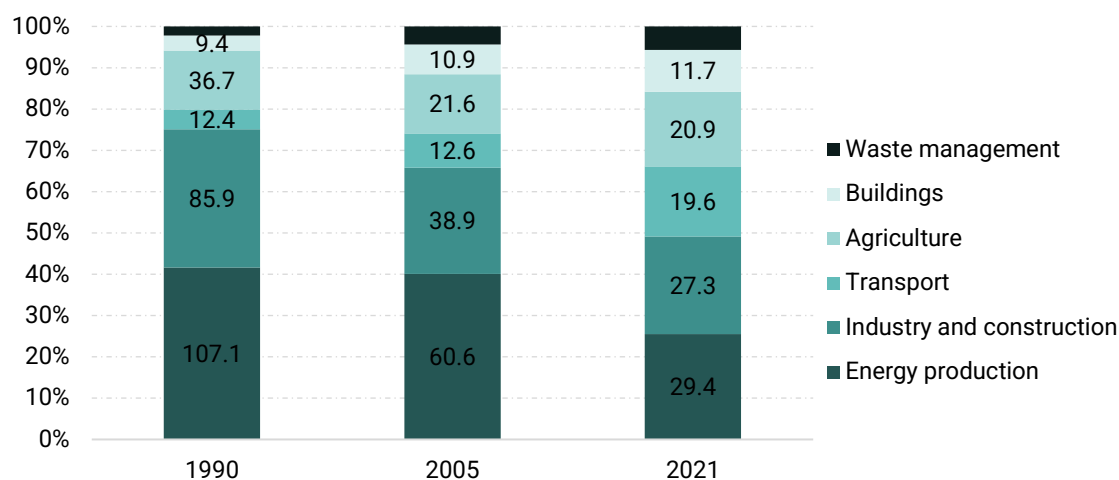
Figure 1. GHG emissions in Romania by source in 1990, 2005 and 2021



Source: own computations based on Eurostat data

The most recent data show a 72.5% reduction of emissions between 1990 and 2021 in the energy sector. Also, the industrial sector saw a 68.2% emissions reduction. These two sectors combined amounted in 2021 to 56.7 Mt CO₂eq, significantly less than the 193 Mt CO₂eq in 1990. In addition, the agricultural sector emissions fell by 43.1%. On the other hand, GHG emissions increased in transport (with 57%, from 12.4 Mt CO₂eq to 19.6), buildings (24.8%) and waste (15.8%).

Figure 2. Share of GHG emissions by sector in 1990, 2005 and 2021 (in % and MtCO₂eq)



Source: own computations based on Eurostat data

According to its previous NECP, Romania aims to cut its GHG emissions by around 44% in 2030 compared to 2005 (-43.9% for emissions under the ETS scheme and -2% for non-ETS emissions) (Romanian Ministry of Energy, 2020). Compared to the 2019 GHG emissions levels in these sectors, Romania would have even been able to slightly increase its non-ETS emission and still meet this ambition level. Romania has been able to also use LULUCF credit flexibility to cover a significant share of its target reduction of non-ETS emissions. For this reason, it could have met its legal obligations with even less action. However, that is no longer the case in light of the new ESR.

The Fit-for-55 scenario defined below, using the web-based tool 2050 Pathways Explorer, captures all the measures needed to implement RED III, EED and EPBD. Results show a reduction of GHG emissions in the ESR sectors of 15.2% in 2030 versus 2005, meeting the official national target of 12.7%. This happens without the need to use LULUCF or ETS2.

2.1 Measures and targets for the Romanian buildings sector

Based on changes to the EPBD and EED, the main measures in the sector will have to be focused on renovation rate and depth. The amended directives introduce new build efficiency requirements for both residential and non-residential buildings, and for energy sources for heating and hot water in residential buildings. According to data collected for the National Long-term Renovation Strategy (NLRS) (Romanian Ministry for Public Works, Development and Administration, 2020), there are approximately 5.6 million buildings in Romania, about 90% of which are residential.

- Half of all the buildings in Romania were built before 1970 and 36% between 1970 and 1990.
- The total heated floor area covers 644 million m² of useful floor area.
- Among the residential buildings, a majority of 58% are single-family houses, and 33% are multi-family buildings.
- About 47.5% of residential buildings are in rural Romania, and over 63% of residential dwellings have a useful floor area of less than 50 m².

The NLRS estimated that 77% of the total floor area of the building stock would need renovation by 2050 (91% in the residential sector). Romania's national stock of buildings is responsible for an

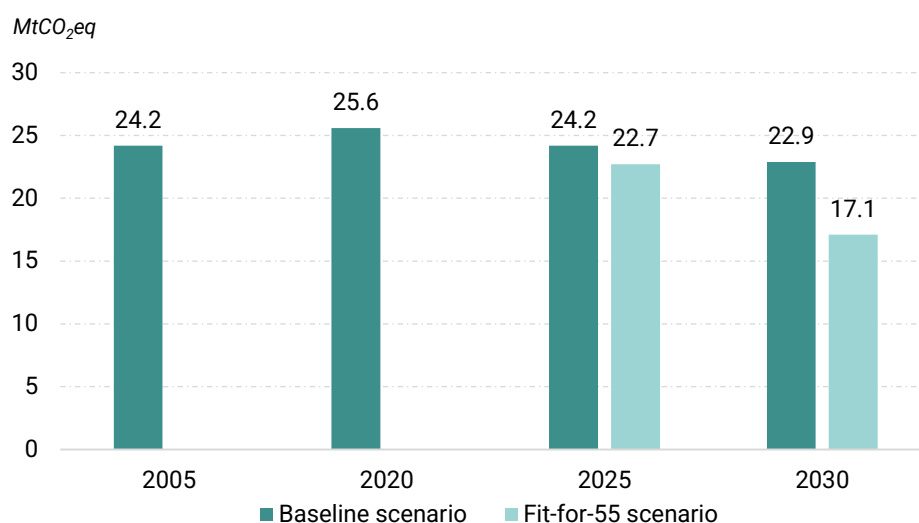
Depending on its level of ambition, Romania could decrease its emissions from buildings by 29% in 2030 compared to 2005 (and by 33% compared to 2020).

estimated energy consumption of 9.52 Mtoe, representing 41.64% of the final consumption (values estimated for 2019). According to 2050 Pathways Explorer, the buildings sector was responsible for emissions amounting to 24.2 MtCO₂eq in 2005 and 25.6 MtCO₂eq in 2020.

In a baseline scenario (based on existing measures before the changes introduced by Fit-for-55), the emissions from buildings would remain stable at 24.2 MtCO₂eq in 2025 and reach 22.9 MtCO₂eq in 2030. A Fit-for-55 compliant scenario would see emissions from buildings reaching 22.7 MtCO₂eq in 2025, and 17.1 MtCO₂eq in 2030 (as outlined in Table 2 below).

The following sections describe the specific measures needed for reaching these emissions reductions in the buildings sector.

Figure 3. GHG emissions in the buildings sector in 2005, 2020, 2025 and 2030



Source: 2050 Pathways Explorer, EPG

2.1.1 Residential buildings

The renovation rate of residential buildings (single family homes or apartments) in Romania should increase to 2.0 %/year by 2035 in a Fit-for-55-compatible scenario, compared to 1.5%/year by 2035 in the baseline (and compared to 1.4%/year in 2015), according to Pathways Explorer, which uses data from the JRC database. The NLRS sets the current renovation rate at just 0.5% and puts forward three scenarios for renovation until 2030. Scenario 2, the one selected as optimum, sets as target 95.36 million m² for

renovation between 2020 and 2030. This represents 18.8% of unrenovated buildings, meaning the average annual rate would be 1.88%.

EU uses standards to assess the energy performance of new and existing buildings. The main indicator used is primary energy consumption per area, expressed in kWh/m² per year. For a given building, this corresponds to its specific level of primary energy used for heating, cooling, ventilation, hot water, and lighting divided by the total useful area.

For easy evaluation, monitoring and reporting, energy classes for buildings are defined by each country. In Romania, the latest energy standards for all types of buildings were listed in Calculation methodology of the energy performance of buildings⁸, issued by the Romanian Government. According to it, to fit in energy class A, a single-family home should use in a full year between 91 and 129 kWh/m².

Table 1. Energy performance classes for single-family homes

Total primary energy, kWh/m ² /year														
Technical utilities	Energy performance classes													
	A+	A		B		C		D		E		F		G
Heating	≤49	49	69	69	138	138	239	239	340	340	425	425	510	>510
Cooling	≤13	13	18	18	36	36	47	47	57	57	72	72	86	>86
Ventilation	≤5	5	7	7	14	14	18	18	21	21	26	26	32	>32
Hot water	≤18	18	26	26	51	51	60	60	70	70	87	87	104	>104
Lighting	≤6	6	9	9	18	18	26	26	34	34	42	42	51	>51
TOTAL	≤91	91	129	129	257	257	390	390	522	522	652	652	783	>783

Source: The Ministry of Development, Public Works and Administration

According to Romanian legislation⁹ and in line with EU Law¹⁰, deep renovation reduces primary energy consumption by more than 60%. In order to have the highest impact on energy savings, the renovation should start with the least efficient buildings. For example,

⁸ Monitorul Oficial, partea I, nr. 46bis/17.01.2023.

⁹ Law nr. 101/July, 1 2020

¹⁰ Commission Recommendation (EU) 2019/786 of 8 May 2019

if a building with an annual primary energy consumption of 700 kWh/m², corresponding to energy performance of class F¹¹, goes through deep renovation, its primary energy consumption should drop to at most 280 kWh/m², making it class C. But this threshold of 60% reduction can be exceeded and the building can attain even class A.

Approximately 66 million m² of useful floor area in residential buildings should be renovated in Romania each year until 2030.

Based on the foreseen revision of the EPBD, the large majority of current buildings will still exist in 2050, which poses a challenge as nearly three quarters of them do not meet current energy performance standards.

There are different definitions of deep renovation across the EU Member States, therefore Pathways Explorer tries to define thresholds that are easy to apply on any country and defines four levels of renovation depth:

1. Shallow renovations: 25% energy savings
2. Med-low renovations: 50% energy savings
3. Med-high renovations: 75% energy savings
4. Deep renovations: 90% energy savings

However, there are two limitations of this classification that make it difficult to compare to the official definition of deep renovation. The energy reduction thresholds in Pathways Explorer apply to **final** energy consumption and only to energy used for space heating. As mentioned previously, though, the European and Romanian standards are based on primary energy consumption and for almost the complete range of utilities: space heating, hot water, space cooling, ventilation, lighting.

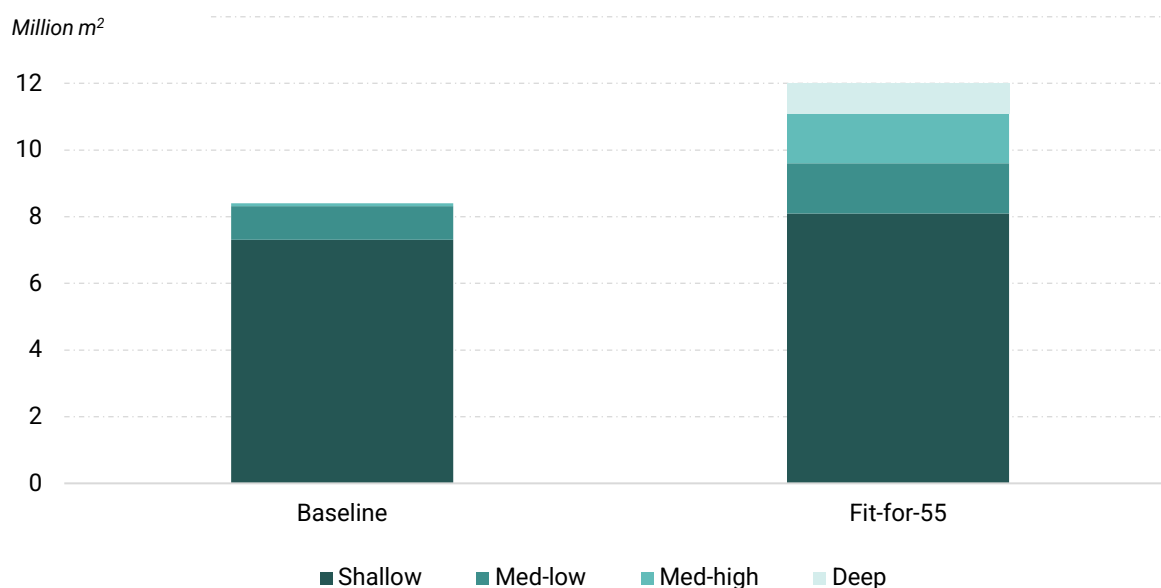
According to Pathways Explorer, the extent of renovation depth of current residential buildings in Romania should:

- increase to 7.5% by 2030 (from 0% in 2015) for deep energy efficiency, meaning that by 2030, 7.5% of all renovations should be classified as deep;
- increase to 12.5% by 2030 (from 1% in 2015) for medium to high energy efficiency,
- increase to 12.5% by 2030 (from 12% in 2015) for the low to medium energy efficiency,

¹¹ contains single-family homes with total primary energy consumption between 652 kWh/m² and 783 kWh/m²

- decrease to 67.5% by 2030 (from 87% in 2015) for shallow energy efficiency.

Figure 4. Residential area renovated each year in the baseline and Fit-for-55 scenarios



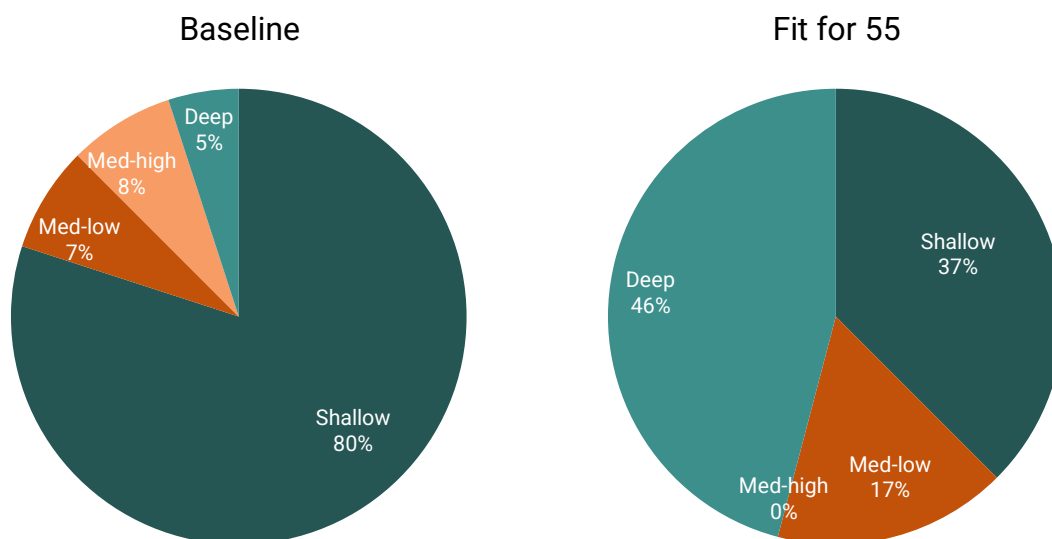
Source: 2050 Pathways Explorer, EPG

Romania should significantly increase its ambition level regarding new build efficiency. The new construction mix should comprise:

- at least 45.9% deep energy efficiency new buildings by 2030 (from 5% in 2015)
- 0% medium to high energy efficiency new builds by 2030 (compared to 7.5 % in 2015)
- at most 16.6% low to medium energy efficiency new builds by 2030 (from 7.5 % in 2015)
- at most 37.5% shallow energy efficiency new builds by 2030 (from 80% in 2015)

The EPBD will require that all new buildings meet ZEB requirements starting from January 1, 2030.

Figure 5. Energy efficiency of new residential buildings in the baseline and Fit-for-55 scenarios



Source: 2050 Pathways Explorer

Table 2. Overview of compared measures for residential buildings, according to levels of ambition in Romania

		Baseline	Fit-for-55
Renovation rate		Maintain at 1.5%/year	Increase to 2%/year by 2035
Renovation depth of current buildings	Deep renovation (Passive standard)	Increase to 5% by 2030 (vs. 0% in 2015)	Increase to 7.5% by 2030
	Medium to high energy efficiency	Decrease to 0% by 2030 (vs. 1% in 2015)	Increase to 12.5% by 2030
	Low to medium energy efficiency	Increase to 15% by 2030 (vs 12% in 2015)	Increase to 12.5% by 2030
	Shallow energy efficiency	Decrease to 80% (vs. 87% in 2015)	Decrease to 67.5% by 2030
Energy efficiency of new buildings	Passive standard	Maintain at 5% until 2030	Increase to 45.9% by 2030
	Medium to high energy efficiency	Decrease to 0% by 2030 (vs. 7.5% in 2015)	Decrease to 0% by 2030
	Low to medium energy efficiency	Decrease to 15% by 2030 (vs. 7.5% in 2015)	Increase to 16.6% by 2030

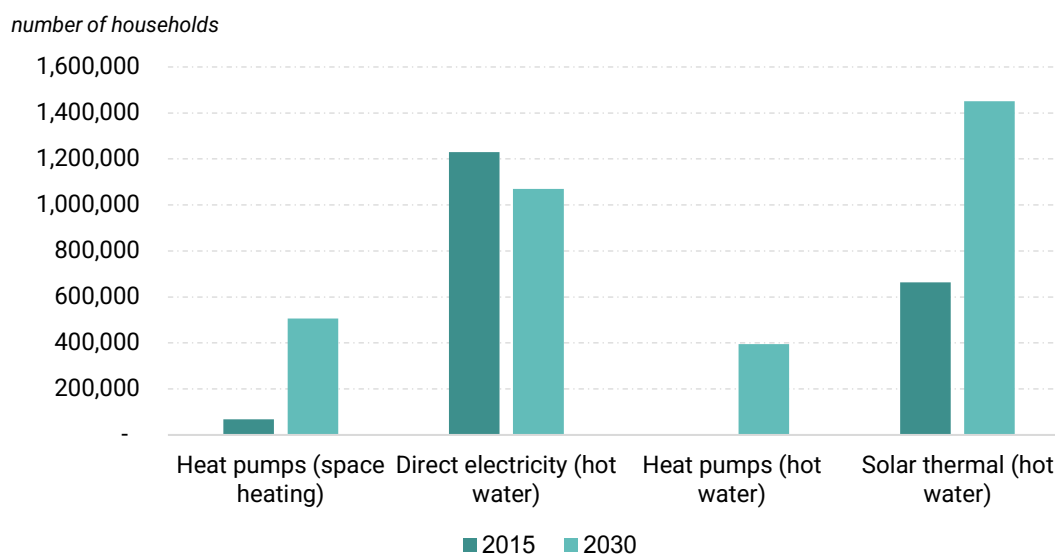
	Shallow energy efficiency	Maintain at 80% until 2030	Decrease to 37.5% by 2030
Heating and hot water	Space heating	Maintain heat pumps uptake at 0.9%	Increase heat pumps uptake to 5.85% until 2030
	Hot water production	Maintain heat pumps uptake at 0% until 2030 Increase solar thermal to 94.07% by 2030	Increase uptake of heat pumps to 5.33% by 2030 Increase solar thermal to 19.61% by 2030

Source: 2050 Pathways Explorer, EPG

The technology mix for **heating and hot water in residential buildings** in Romania should change:

- For **space heating**, heat pumps¹² uptake should increase to cover 6.84% of the final energy consumption until 2030 (up from 0.9% in 2015).
- For hot water production, direct use of electricity should decrease to 14.45% by 2030 (from 16.4 % in 2015), the uptake of heat pumps should increase to 5.33% (from 0% in 2015), and solar thermal should increase to 19.61% by 2030 (compared to 0% in 2015)

Figure 6. Technology changes for space heating and water heating in Fit-for-55 scenario (number of households)



Source: 2050 Pathways Explorer, EPG

¹² Only all-electric heat pumps were modeled. The share of heat pumps by 2050 is considered within individual heating systems not covered by solid biomass nor district heating.

Based on the recast EPBD, Member States will need to set up minimum energy performance standards (MEPS) for the maximum amount of energy that buildings could use. According to RED III, renewable energy should reach a 49% share in the heating and cooling of buildings by 2030. The target of 49% share in the heating and cooling of buildings by 2030 is integrated in the scenario mentioned above.

Based on the modelling results, higher renovation rates and more efficient technologies for heating would mean that energy demand in households could decrease by 12.5 TWh (-11.6%) between 2020 and 2030. The impact of these measures would decrease emissions in the buildings sector (residential and commercial) to 17.1 MtCO₂eq in 2030 from 25.6 MtCO₂eq in 2020 and the percentage of RES in total energy used in buildings would increase by 7%. The number of heat pumps necessary to achieve this result is 0.43 million (5.85% of all households).

Figure 7. Energy demand in the residential buildings

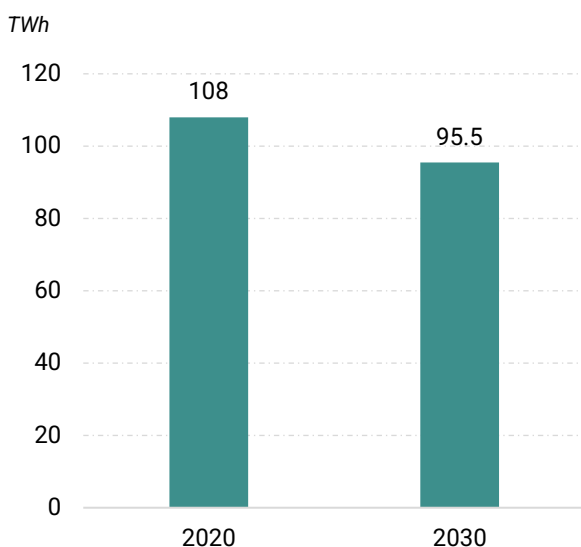
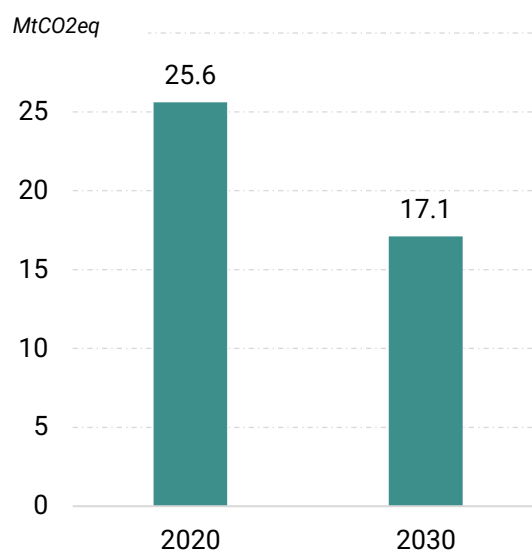


Figure 8. Total emissions in buildings



Source: 2050 Pathways Explorer, EPG

2.1.2 Non-residential buildings

The annual **renovation rate of non-residential buildings** in Romania should likewise increase to 3%/year by 2035, compared to 2.3%/year in 2019 (and compared to decreasing to 2.1%/year in the baseline scenario).

The recast EED requires buildings owned by public authorities to sustain renovations of at least 3% of their total floor area yearly.¹³ The EPBD will possibly set a target of 15% of

¹³ Calculated on the total floor area of buildings having a total useful floor area over 250 m²

all non-residential buildings to reach a nZEB standard by 2030 (0.65% of the total building stock in EU) and 25% by 2034 (1.1% of the total buildings stock in EU).

The mix of **renovation depth for non-residential buildings** in Romania should:

- increase to 5% by 2030 for deep energy efficiency, up from 0% in 2015
- increase to 15% by 2030 for medium to high energy efficiency, from 5% in 2015
- decrease to 16.5% by 2030 for low to medium energy efficiency, from 23% in 2015
- decrease to 63.5% by 2030 for shallow energy efficiency, from 72% in 2015

Romania should improve **building codes for new constructions in the non-residential sector** to reduce the final energy demand for space heating:

- increase to 45.9% deep energy efficiency new builds by 2030 compared to 5% in 2015 (passive standard, 95% energy savings in comparison with 2015^{*14})
- decrease to 0% medium-high energy efficiency new builds by 2030 compared to 7.5% in 2015 (70% energy savings in comparison with 2015^{*})
- increase to 16.6% medium-low energy efficiency new builds by 2030 compared to 7.5% in 2015) (30% energy savings in comparison with 2015^{*})
- decrease to 37.5% for shallow energy efficiency compared to 80% in 2015 (no energy savings in comparison with 2015^{*})

Besides the reductions in energy consumption and GHG emissions, renovations also have an important positive impact on lifestyle, health, and productivity. Lower energy bills, reduced fuel poverty and increased resale and rental values are also among the expected benefits of improved building codes and renovation rates. To implement such revised ambitions, however, also requires addressing the skills shortages in the construction sector. The rising prices for building materials is another issue that needs to be considered when constructing a much-needed comprehensive strategy for the buildings sector in Romania.

2.2 Measures and targets for the Romanian transport sector

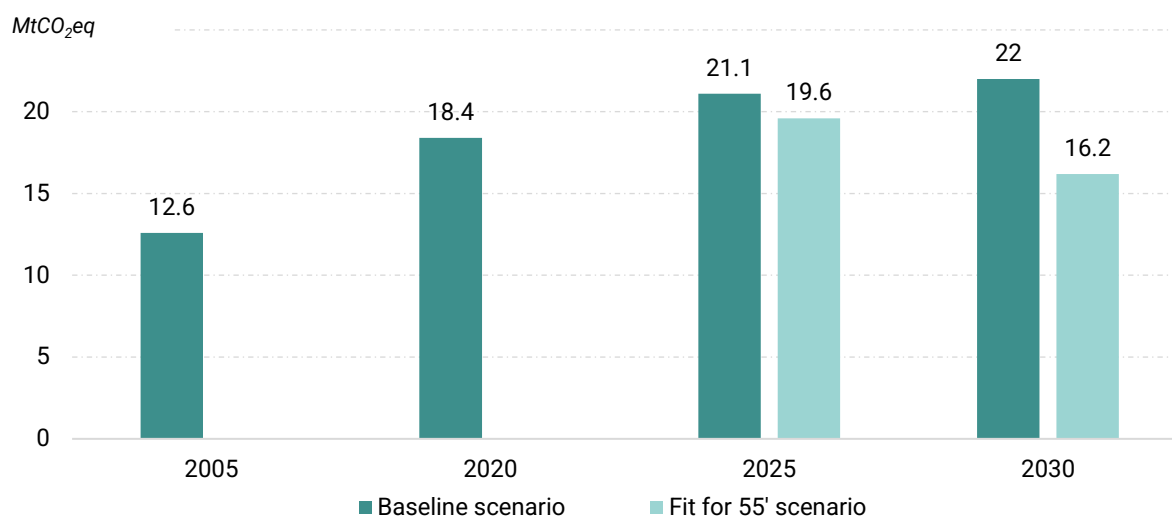
Implementing important changes to legislative files on the CO2 emissions performance of passenger vehicles and heavy-duty vehicles, the RED III, and the ETS will have important contributions to reaching the renewed ESR objective. As opposed to the buildings sector, the transport sector's GHG emissions have generally been expected to rise in Romania over the coming decade (Deloitte, 2022). Significant efforts are needed

¹⁴ *Specific final energy consumption before renovation (space heating only)

not only to reach peak emissions in the transport sector in the following decade but also to reverse a potential trend of emissions increases.

According to Eurostat, in 2005, GHG emissions in the transport sector in Romania accounted for 12.57 MtCO₂eq and 18.4 MtCO₂eq in 2020. Based on current measures, emissions are projected in Pathways Explorer to reach 21.1 MtCO₂eq in 2025 and 22 MtCO₂eq in 2030. Meeting the Fit-for-55 ambitions would mean that emissions would decrease to 19.6 MtCO₂eq by 2025, and 16.2 MtCO₂eq by 2030.

Figure 9. GHG emissions in the transport sector in 2005, 2020, 2025 and 2030



Source: 2050 Pathways Explorer, EPG

2.2.1 Passenger transport

The rate of renewal of the passenger car fleet in Romania is one of the lowest in the European Union. According to Eurostat, in 2021 only 3.1% of cars had an age of 2 years or less, the second lowest in the EU. In addition, Romania also had one of the lowest shares of full electric or hybrid cars, of just 1.3% compared to the EU average of 3.8% (European Automobile Manufacturers' Association - ACEA, 2023).

- The Fit-for-55 scenarios would require the rapid switch to full electric cars with increasing yearly rates, to ensure that all new cars and vans registered in Europe will be zero-emission by 2035.
- The energy efficiency of new internal combustion engine (ICE) vehicles would also need to increase:
 - ➔ new ICE buses in 2030 would need to use 10% less energy than in 2015
 - ➔ cars (both diesel and gasoline) would need to be 14% more energy efficient than in 2015.
- Rail transport would also need to become 16% more efficient than in 2015.

All these tasks should be considered against the backdrop of Romania's transport sector characteristics: the country has the lowest motorization rate in the European Union, with 379

Romania has the lowest motorization rate in Europe, one of the lowest shares of alternative fuels and a significantly aged vehicles fleet.

cars per 1000 inhabitants compared to the EU average of 560 cars. Yet, the number of registered cars has grown by 41% over the period 2015-2020.

2.2.2 Freight transport

In freight transport, meeting the required emission reductions means that Romania should increase the **efficiency of new vehicles** to lower their fuel consumption so that, by 2030:

- new heavy-duty vehicles (diesel) use 13% less energy per km;
- light-duty vehicles, both diesel and gasoline, use 13% less fuel per km;
- rail transport (diesel) use 11% less energy per ton-km;
- aviation use 6% less energy per ton-km;
- marine shipping use 12% less energy per ton-km.

By 2040, all new trucks sold in Romania should be zero emission.

At the same time, to meet the new ESR objective, Romania would need to increase the proportion of **newly sold vehicles with electric powertrains** in ships and trains, so that:

- inland waterways ships reach a share of 4.79% in 2030 (vs 0% in 2015)
- planes reach 1.58% by 2030
- marine ships reach 2.39% by 2030 (vs 0% in 2015)

Regarding the increase in the share of Zero-Emission Vehicles in new trucks sales, in the Fit-for-55 scenarios, Romania would need to increase the share of ZEV in new trucks sales to 1.5% by 2030 (vs 0% in 2015). This increase would be steep compared to the baseline, which would only reach a share of 0.38% ZEVs in 2030.

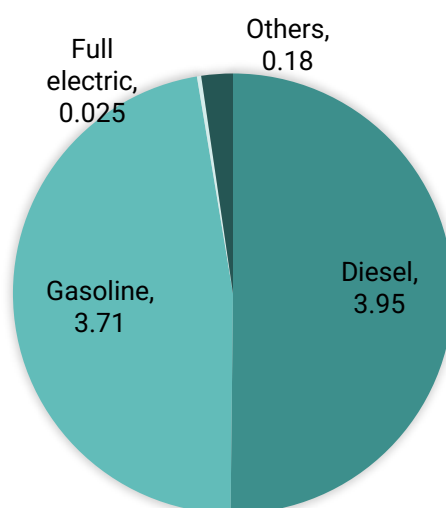
According to the European Automobile Manufacturers' Association the average age of medium and heavy commercial vehicles in Romania in 2021 was 18.6 years, making it the third oldest fleet in the EU. The average age of light commercial vehicles was 13.9 years, the seventh highest in the EU.

By 2035, all new cars sold in Romania should be zero emission vehicles.

2.2.3 Technology and fuels

Regarding fuel, at the end of 2022 there were 3.95 million diesel cars (up from 1.33 million in 2010), and 3.71 million gasoline cars (up from 2.99 million in 2010). All other types of fuel (petrol + LPG, petrol + CNG, petrol + electric, full electric, etc.) were used in 206,600 cars. By the end of 2022, there were only 24,691 fully electric cars.

Figure 10. Number of cars by fuel in 2022 (millions)



Source: Eurostat

The age of the fleet is reflected in its overall high inefficiency and one of the highest car fuel consumptions in the EU. Second-hand vehicles purchases are higher than new buys by a factor of 4.

In 2020, transport activity in Romania used 1 TWh of electricity, almost entirely in rail transport. In the Fit-for-55 scenario, the electricity consumption in transport is projected to increase in 2030 to 4.4 TWh. This includes a 15% increase in rail transport and a significant electrification of road

By 2030, the electricity used in Romanian transport should increase more than four times compared to 2020.

transport, especially passenger cars.

The average movement of passenger vehicles in 2021 in Romania was 6200 km. Electric motor vehicles use about 0.15 kWh/km. Assuming the average goes up to 0.2 kWh/km to include heavier passenger or freight LDVs, this would translate to 2.6 million electric cars in 2030 using 3.25 TWh. No type of hybrid vehicles is modelled in Pathways Explorer, meaning that the tool only uses full-electric-equivalent cars. In other words, the car fleet in 2030 could be made of different combinations of full electric, full hybrid and plug-in hybrids, using in total 3.25 TWh of electricity.

- ➔ Thus, to reach 3.25 TWh of electricity in the passenger and light freight vehicles, one third of the national fleet would have to be full electric, or different combinations of electric and hybrids using a total of 3.25 TWh/year by 2030.
- ➔ GHG intensity in transport would fall from 20.4 MtCO₂eq in 2020 to 16.2 MtCO₂eq in 2030 and energy use from 64.2 TWh to 61.1 TWh in 2030 (-16.6%).

In 2030, Romania can reach a share of 29% RES within final energy consumption in transport if major changes are made in the passenger and freight vehicles fleet. At least one third of the fleet, equivalent to 2.6 million full electric vehicles, should be added to the market in seven years. Based on new cars entering the fleet in the last years, it is estimated that about 1.1 million new vehicles will be purchased in Romania until 2030. Even if all of these are full-electric, it is not enough to reach the target set by Fit-for-55. At least 1.7 million used full-electric vehicles (or hybrid equivalent in terms of electricity consumption) should replace current fossil fuel cars. Even if all these changes were to happen, Fit-for-55 targets would not be met. Large lorries, road tractors and long-distance busses use about 25% of fuel¹⁵ and they are unlikely to be converted to electric. Therefore, to meet the 29% RES in transport target, in addition to one third of light duty vehicles going full electric (or equivalent), one quarter of heavy-duty trucks and long-distance busses must be switched to advanced biofuels or RFNBOs. This corresponds to approximately 6% of final energy consumption in transport, thus reaching the target of 5.5% adopted through RED III.

3. Recommendations

While the current European policy framework is being amended to enable meeting the climate targets, EU Member States also need to update domestic strategies for GHG emissions reductions and simultaneously negotiate a high number of legislative files. The first step is the revision of the NECP to meet the new ESR target. Romania then

¹⁵ Estimation based on Eurostat data

needs to transpose and implement national legislation, as well as develop the suitable programs for achieving the significant changes outlined in this document.

Going further, Romania must design and implement a coherent policy and regulatory framework to enable the actions aimed at significantly reducing GHG emissions in different sectors.

Below we summarize this paper's recommendations for the buildings and transport sectors in Romania, respectively.

3.1 Recommendations for the buildings sector

1. The primary focus of the building sector's efforts will need to be on the depth and pace of renovations, given the introduction of new build efficiency standards for both residential and non-residential structures, as well as energy sources for residential buildings' hot water and heating. A Fit-for-55-compatible scenario calls for an increase in Romania's residential building renovation rate to 2.0%/year until 2035, compared to the baseline's 1.5%/year (and 1.4%/year in 2015). Until 2030, Romania should renovate about 66 million m² of useful floor area in residential buildings annually.
2. By 2030, Romanian residential buildings should reach a level of 7.5% for deep energy efficiency, and 5 % for non-residential ones.
3. By 2030, Romania ought to substantially raise the bar for new construction efficiency, with at least 45.9% of new buildings featuring deep energy efficiency.
4. Heat pump use for space heating has the potential to rise to 6.84% of total energy consumption by 2030, and to 5.33% for hot water production.
5. The annual renovation rate of non-residential buildings in Romania should increase to 3%/year by 2035 and building codes for new constructions in the non-residential sector should be significantly improved to reduce the final energy demand for space heating.
6. Finally, to make all of the above possible, several other conditions should be met, including tackling skills shortages in the construction sector, and the price increases for building materials.

3.2 Recommendations for the transport sector

1. Romania needs to stop any potential trend of rising emissions and reach peak emissions in the transport sector over the next ten years.

2. By 2030, the electricity used in Romanian transport sector should increase more than four times compared to 2020. One third of the Romanian car fleet in 2030 should be full-electric (or hybrid equivalent in terms of electricity consumption), using in total 3.25 TWh of electricity.
3. By 2035, all new cars sold in Romania should be zero emission vehicles, and by 2040, the same would apply to all new trucks.
4. Romania should significantly improve energy efficiency of internal combustion engines used in cars (14% more efficient compared to 2015), busses (10%), rail (16%), heavy-duty diesel vehicles (13%).
5. Inland waterways ships should reach a share of 4.79% of newly sold vehicles with electric powertrains, planes reach 1.58% and marine ships reach 2.39% by 2030 (compared to 2015).
6. According to the Fit-for-55 scenarios, Romania would have to raise the percentage of Zero-Emission Vehicles (ZEVs) in new truck sales to 1.5% by 2030 (up from 0% in 2015).
7. In 2030, Romania can reach a share of 29% RES within final energy consumption in transport if major changes are made in the passenger and freight vehicles fleet.
8. To meet the 29% RES in transport, one quarter of heavy-duty trucks and long-distance buses must be switched to advanced biofuels or RFNBOs.

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