



OECD Economics Department Working Papers No. 1812

Decarbonising Romania's economy

Ivana Capozza

<https://dx.doi.org/10.1787/256205df-en>

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No.1812



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ABSTRACT

Decarbonising Romania's economy

Romania's clean energy transition needs to accelerate for the country to decarbonise its economy by mid-century. Following an impressive decline from the early 1990s, emissions of greenhouse gases have stopped falling in recent years. Fossil fuel dependence, an increasing and ageing vehicle fleet and poorly insulated buildings increase energy use and carbon intensity. Moving away from fossil fuels in Romania calls primarily for more renewables; shifting to electricity in transport and buildings; substantial energy savings; and improved transport systems. This paper identifies policies that would help bring about these changes cost effectively, while minimising the socio-economic impact of the transition and contributing to improving people's quality of life. The policy package should include institutional reforms and public investment, regulatory changes, financial support and consistent price signals to encourage private abatement actions. Measures to alleviate the impact of the net-zero transition on vulnerable communities and to adapt to climate change are also required.

JEL Codes: H23; H30; O13; O18; Q32; Q41; Q42; Q43; Q48; Q54; Q58; R11; R41; R48.

Key words : Romania, climate policy, environment, carbon pricing, energy taxes and subsidies, clean energy transition, sustainable transport, energy efficient buildings, just transition.

RÉSUMÉ

Décarboniser l'économie roumaine

La Roumanie doit accélérer sa transition énergétique pour décarboniser son économie d'ici le milieu du siècle. Après une baisse impressionnante depuis le début des années 1990, les émissions de gaz à effet de serre ont cessé de diminuer ces dernières années. La dépendance aux combustibles fossiles, l'augmentation et le vieillissement du parc automobile, ainsi que les bâtiments mal isolés augmentent la consommation d'énergie et l'intensité carbone. S'éloigner des combustibles fossiles en Roumanie passe principalement par davantage d'énergies renouvelables, le passage à l'électricité dans les transports et les bâtiments, des économies d'énergie substantielles et des systèmes de transport améliorés. Ce document de travail identifie des politiques qui permettraient de réaliser ces changements de manière rentable, tout en minimisant l'impact socio-économique de la transition et en contribuant à l'amélioration de la qualité de vie. Le paquet de mesures devrait comprendre des réformes institutionnelles et des investissements publics, des changements réglementaires, un soutien financier et des signaux de prix cohérents pour encourager les actions privées de réduction des émissions. Des mesures visant à atténuer l'impact de la transition vers la neutralité carbone sur les communautés vulnérables et à s'adapter au changement climatique sont également nécessaires.

JEL: H23; H30; O13; O18; Q32; Q41; Q42; Q43; Q48; Q54; Q58; R11; R41; R48.

Mots-clés: Roumanie, politique climatique, environnement, tarification du carbone, taxes et subventions énergétiques, transition vers une énergie propre, transport durable, bâtiments à haute efficacité énergétique, transition juste.

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Romania's climate policy challenge

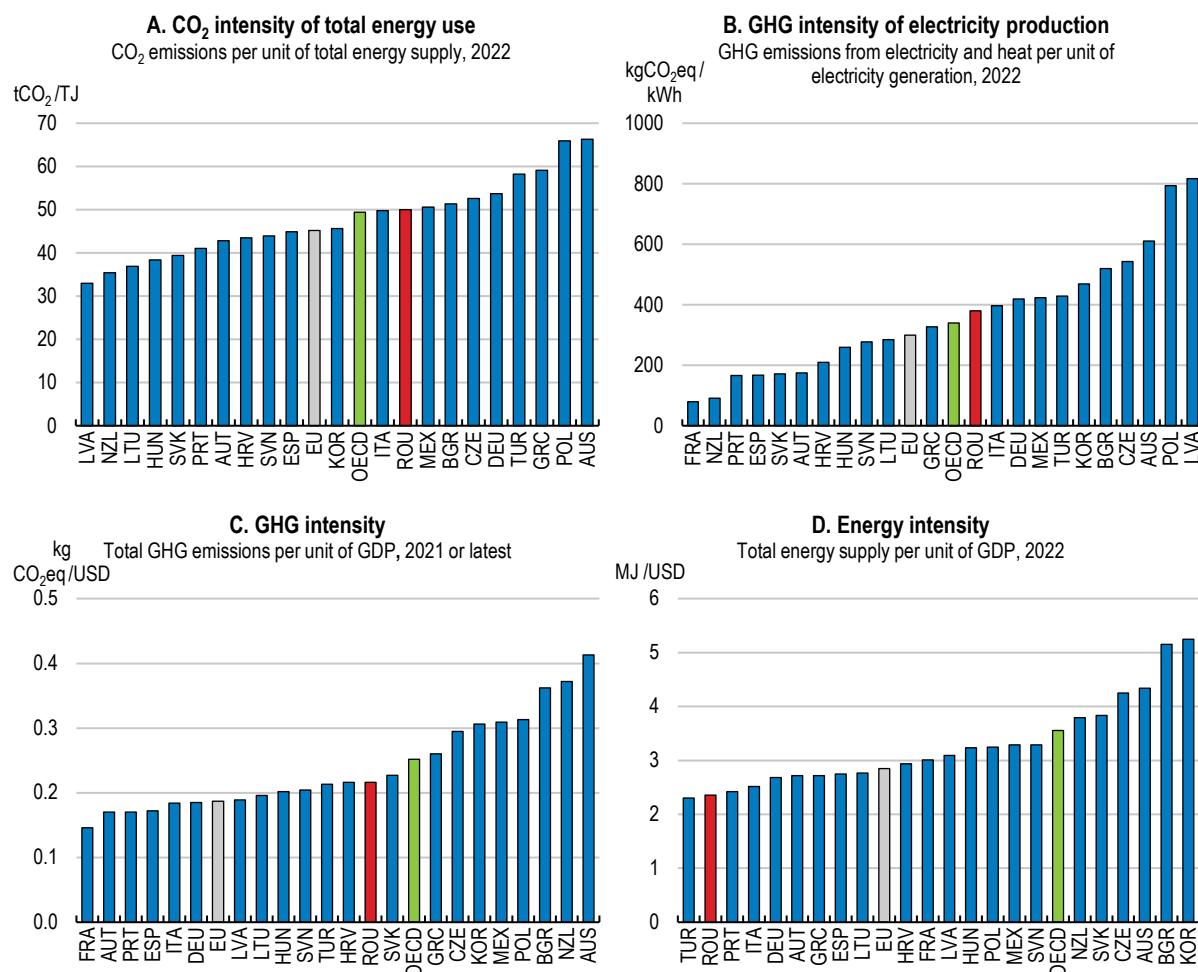
Ivana Capozza, OECD¹

Romania faces the challenge to continue to catch up to income levels in more developed economies, while reducing its greenhouse gases (GHG) emissions and preparing for climate change impacts. Mitigation action must accelerate for Romania to meet its commitment to net-zero GHG emissions by mid-century, in line with the Paris Agreement and the European Climate Law. This will also contribute to strengthen energy security, a policy priority for the country. After an impressive decline in the last three decades, emissions have stopped falling since the mid-2010s. Fossil fuel dependence, high reliance on road transport and poorly insulated buildings increase the emission intensity of energy use (Figure 1, Panel A). Despite substantial use of renewables, the electricity mix is still carbon intensive and based on the country's large resources of coal and natural gas (Figure 1, Panel B). In turn, the GHG emission intensity of the Romanian economy is higher than that of many other European countries (Figure 1, Panel C), despite relatively low energy use per unit of GDP (Figure 1, Panel D).

Accelerating the clean energy transition will be key to decarbonise the economy. Weaning off fossil fuels calls for more renewables to replace power production from coal and natural gas. This will enable Romania to shift to electricity in transport, buildings and industry. The country must also tackle wasteful energy consumption, especially from buildings and old vehicles, and improve transport systems to curb growing dependence on private cars. These changes carry significant economic and social implications, varying across regions, but remain imperative to avert the substantially greater consequences associated with failing to meet global climate mitigation goals (IPCC, 2023^[1]). To limit the costs of the transition, efficient and fair mitigation policies are needed. Stepping up emission abatement efforts will also bring life quality improvements. These include better housing conditions and lower energy bills arising from energy renovations of buildings, as well as less congested and polluted cities thanks to lower reliance on private cars and the shift to electric mobility.

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Figure 1. Carbon-intensive energy drives the GHG emission intensity of Romania's economy



Note: Panel A: CO₂ emissions from fuel combustion. Panel B: GHG emissions from fuel combustion. Panel C: Greenhouse gas (GHG) emissions excluding land use, land-use change and forestry (LULUCF). In Panel C and Panel D, GDP is measured in 2015 PPP USD.

Source: IEA CO₂ Emissions from Fuel Combustion Statistics; Greenhouse Gas Emissions from Energy database; OECD Environment Statistics database; IEA World Energy Balances database.

Alongside efforts to mitigate GHG emissions, Romania needs to build resilience to the impacts of rising temperatures and more frequent extreme weather events. The country's climate has already changed. The period between 2012 and 2022 was Romania's warmest decade on record. Climate change exacerbates the country's high vulnerability to natural disasters such as floods. Its impacts are expected to increase in the coming years, affecting human lives, ecosystems and the economy. More investment in risk management and climate resilience of physical and natural assets would help prevent and mitigate loss and damage from future extreme weather events.

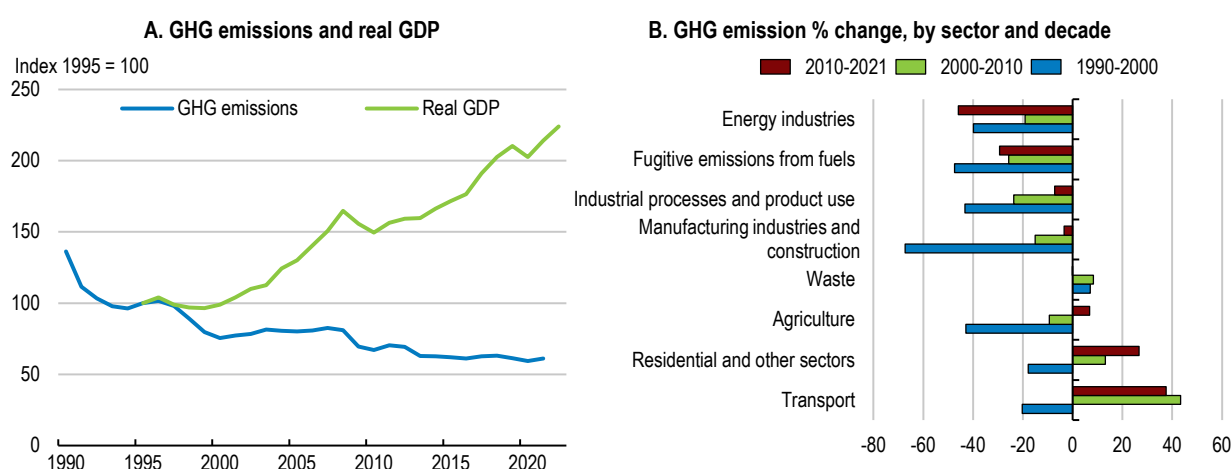
This paper identifies a mix of policies that would help Romania achieve a cost-effective and fair transition to net-zero. The first section of this paper discusses progress towards national climate targets. The second part examines gaps in climate governance in Romania, and the need for consistent pricing of carbon emissions while ensuring energy affordability. Subsequent sections focus on policies to decarbonise power generation, transport and buildings. After brief insights on policy options to reduce emissions from industry, agriculture and waste, the paper discusses measures to alleviate the consequences of the net-zero transition on vulnerable workers. It concludes by examining Romania's challenges to adapt to climate-related impacts.

Progress towards net zero

Progress in emission reduction has lost pace

Romania's GHG emissions decoupled markedly from economic growth in the last three decades (Figure 2, Panel A). Much of the emission reduction occurred in the 1990s and was associated with massive restructuring of the economy. Total emissions continued to decline with the progressive shift from heavy industry to services, as well as from coal and oil towards natural gas and renewable energy. Overall, in 2021, GHG emissions (excluding land use, land-use change and forestry, or LULUCF) were 55% below their 1990 level.

Figure 2. Romania's progress in reducing GHG emissions has slowed down in recent years

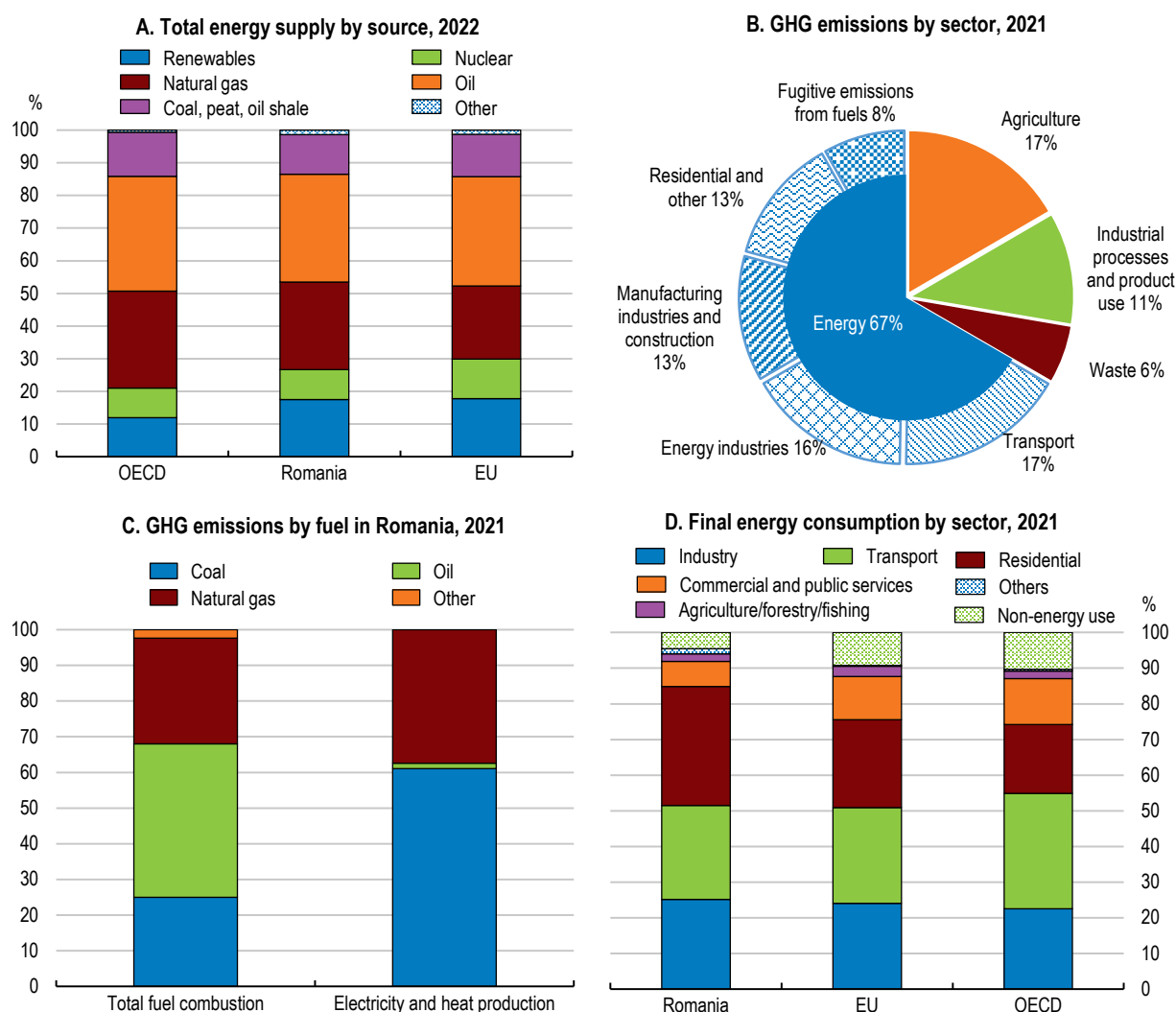


Note: GHG emissions excludes emissions and removals from land use, land-use change and forestry (LULUCF). Panel B: Residential and other sectors include GHG emissions from energy used in the commercial and institutional sectors and in agriculture, forestry and fishing.

Source: OECD Environment Statistics database; and OECD Economic Outlook database.

However, emission reductions have almost stalled in the last eight years (except for a drop in 2020 linked to the COVID-19 pandemic) (Figure 2, Panel A). Emissions from transport, services, households and, to a lesser extent, agriculture have risen since 2010 (Figure 2, Panel B). On the other hand, emissions from power generation and energy-intensive industrial production have continued to decrease (Figure 2, Panel B). Despite its declining use, coal remains the dominant source of GHG emissions from the country's electricity and heat generation sector (Figure 3, panel C). High reliance on fossil fuels across all sectors means that two-thirds of the country's GHG emissions are energy-related (Figure 3, panels A and B). This includes emissions from burning fossil fuels for power and heat generation (energy industries), and direct fossil fuel use in transport and buildings – both major energy consumers and GHG sources (Figure 3, panels B and D).

Figure 3. Romania's energy mix relies on fossil fuels and generates most GHG emissions



Note: Percentages may not total 100% due to rounding. Panel A: The breakdown of total energy supply excludes heat and electricity trade. Panel B: GHG emissions excluding LULUCF.

Source: IEA World Energy Balances database; IEA CO₂ Emissions from Fuel Combustion Statistics: Greenhouse Gas Emissions from Energy database; and OECD Environment Statistics database.

Deep emissions reductions are required for Romania to reach net zero

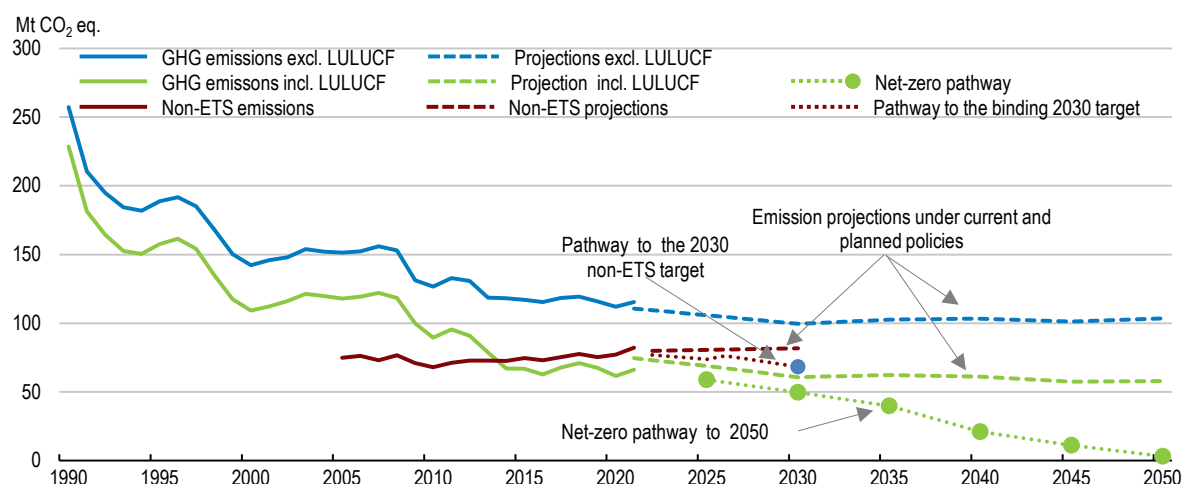
Romania must step up mitigation efforts to achieve its mid- and long-term targets. The country's Long-term Strategy for reducing GHG emissions envisages to achieve nearly net zero by 2050, by cutting emissions (net of removals) by 99% compared to 1990 levels (Government of Romania, 2023^[2]). In the shorter term, Romania faces a binding target for 2030 under EU legislation. This target covers 70% of the country's emissions, those from sectors not covered by the EU Emissions Trading System or ETS (transport, buildings, small manufacturing facilities, construction, agriculture and waste management). By 2030, the emissions outside the ETS (or non-ETS emissions) will have to be 12.7% below their level in 2005. This binding target is far more ambitious than the 2020 objective, which the country met easily. The remaining 30% of the country's emissions – mostly from energy generation and energy-intensive industry – are traded within the EU ETS. As such, they are subject to an EU-wide emission cap and are excluded from the national target.

Romania is not on track to achieve its 2030 target for non-ETS emissions and the net-zero goal by mid-century (Figure 4). In 2030, non-ETS emissions are projected to exceed their 2005 level by more than 4%, even with full and timely implementation of reforms and investments outlined in the National Energy and Climate Plan, the Recovery and Resilience Plan and the EU Cohesion Policy 2021-27 programmes (see next section). Meeting the non-ETS emission reduction target requires annual emission cuts of 1.2% from 2020 and 2030, while the previous decade saw annual average emission growth of 1.3% (Figure 4). According to the Long-term Strategy, Romania would need to reduce net GHG emissions (i.e. including LULUCF) by 25% between 2021 and 2030 to be on the net-zero trajectory. This implies more than tripling the rate of emission reduction compared to forecasts based on existing and planned additional measures. Emission removals from Romania's large old-growth forests and the land-use sector will be essential to meet the 2030 target and 2050 net-zero goal (Figure 4).

A full and cost-effective policy package is needed to bring down GHG emissions in line with targets. The policy package should include institutional reforms, public investments, stronger regulatory enforcement, financial support for private abatement and the establishment of consistent price signals, including through the elimination of distortive fossil fuel subsidies. The authorities should also alleviate the impact of climate policies on low-income households and displaced workers.

Figure 4. Romania is not on track to achieve its 2030 and 2050 climate mitigation goals

Historic and projected GHG emissions, and pathway to the 2030 non-ETS target and net zero by 2050



Note: 'non-ETS' refers to GHG emissions outside the EU Emissions Trading System, i.e. emissions from transport, buildings, small manufacturing facilities, construction, agriculture and waste management. 'LULUCF' stands for land use, land-use change and forestry. The solid lines show historical GHG emissions. The marker lines show the indicative pathways of emissions reductions required to meet the 2030 target for non-ETS emissions – as per the EU Effort Sharing Regulation (EU 2023/857) – and the 2050 net-zero goal, as described by Romania's Long-term Strategy. The dashed lines show emission projections with current and planned additional measures foreseen by the National Energy and Climate Plan, the Recovery and Resilience Plan and the investment programmes funded by the EU Cohesion Policy 2021-27.

Source: OECD calculations based on EEA Greenhouse gas emissions under the Effort Sharing Legislation 2005-2022 dataset; (Government of Romania, 2023^[2]); (Ministry of Environment, Water and Forests, 2023^[3]); and OECD Environment Statistics database.

Enhancing climate governance and the climate policy framework

Romania's climate governance has improved but implementation gaps persist

Romania's climate policy is largely shaped at the European Union's level. The country is committed to participating in the EU's joint effort to reduce emissions by at least 55% by 2030, compared to 1990 levels,

and achieve net-zero by 2050 (Figure 1). In late 2023, the government submitted its draft updated National Energy and Climate Plan to the European Commission, which outlines measures to achieve EU-agreed targets on GHG emissions, renewable energy and energy efficiency by 2030. The draft plan broadly aligns the 2030 climate and energy targets and policies with the trajectory to climate neutrality identified in Romania's Long-term Strategy. However, not all the policy measures needed to reach the 2030 climate and energy targets are well defined. The expected emission reductions are the estimated results of both firmly planned policies and potential abatement from hypothetical measures or objectives (Figure 4).

Romania needs to strengthen governance, administrative capacity and the policy framework for climate change mitigation and adaptation. The country has often been late in implementing key EU climate-related policies and legislation. This is partly due to fragmented administrative capacity and gaps in expertise in line ministries and local governments. For example, the government has no internal capacity for developing its own GHG emission projections or assessing the effectiveness of climate policies, both of which are essential for evidence-based policy making. Initiatives to strengthen the Centre of Government's climate leadership and enhance cross-sectoral policy coherence, notably through the establishment of the Inter-ministerial Committee on Climate Change in 2022, are welcome (OECD, 2024^[4]).

Table 1. Key climate mitigation and clean energy transition targets and milestones

Targets and milestones on GHG emissions, renewables and energy efficiency to 2030

	Romania ^(a)	EU wide
Total GHG emission reduction (incl. LULUCF)	-78% from 1990 level	-55% from 1990 level
GHG emissions outside the EU ETS	-12.7% from 2005 level	-40% from 2005 level
GHG emissions under the EU ETS	n.a.	-62% from 2005 level
Share of renewables in gross final energy consumption	36.2%	40%
Primary energy consumption (% change compared to 2030 reference scenario projections)	31.4 Mtoe (-46%)	993 Mtoe (-11.7%)
Final energy consumption (% change compared to 2030 reference scenario projections)	23.1 Mtoe (-45%)	763 Mtoe (-11.7%)
LULUCF removals	25 665 kt CO ₂ eq	310 000 kt CO ₂ eq

Note: (a) as set by the draft updated National Energy and Climate Plan (3 November 2023); the targets for GHG emissions outside the EU ETS and for LULUCF removals are legally binding targets as set by the EU Effort Sharing Regulation (EU 2023/857) and the LULUCF Regulation (EU 2023/839). LULUCF indicates land use, land-use change and forestry.

Source: (European Council, 2023^[5]); and (Government of Romania, 2023^[6]).

Contrary to many other countries in Europe, Romania has not set its economy-wide GHG emission reduction targets in legislation. Legally binding targets can clarify policy intentions and reduce uncertainty for businesses and households (Ciminelli and D'Arcangelo, forthcoming^[7]). The experience of other countries shows that climate laws promote evidence-based policy making, stimulate public debate, maintain focus on long-term climate goals and, in turn, help enhance accountability across governments. Climate laws typically establish mechanisms for defining and reviewing interim targets, allocating ministerial responsibilities and ensuring accountability. Additionally, these laws often create independent advisory bodies to support policymaking and monitor implementation and progress (Box 1).

Box 1. Examples of climate framework laws

Greece's National Climate Law (2022) sets targets to reduce national GHG emissions by 55% by 2030, by 80% by 2040 and to reach net zero by 2050. It defines key mitigation measures, including the phase out of lignite-fired power generation by 2028. The law adopts the five-year sectoral carbon budget approach. It foresees the establishment of a National Observatory for Climate Change Adaptation and the mandatory insurance of housing in highly vulnerable areas from 2025 onwards.

Ireland's Climate Action and Low Carbon Development (Amendment) Act (2021) commits the country to reach net zero by 2050. It requires the adoption of five-year carbon budgets, annual revisions of the Climate Action Plan and the development of a national long-term climate action strategy every ten years. The Act strengthens the role of the Climate Change Advisory Council in reviewing progress towards targets. Ministers must report to Parliament. The Act also incorporates the principles of climate justice and a just transition.

New Zealand's Climate Change Response (Zero Carbon) Amendment Act (2019) enshrines the goal of carbon neutrality by 2050 and sets targets on biogenic methane emissions. The Act sets the obligation of five-year rolling carbon budgets and mandatory consultation of indigenous communities. It establishes a Climate Change Commission, which provides independent expert advice to the government and reviews progress towards emissions reduction and adaptation goals. The government must adopt national adaptation plans based on periodic national climate risk assessments.

In 2019, the **UK** amended its longstanding **Climate Change Act** (2008) to align it with its net-zero ambition. The law requires the government to set binding five-year carbon budgets. While there are limited penalties for non-compliance, the Act sets out a transparent process and an accountability framework, which includes the Climate Change Committee – an independent expert body reporting to parliament. The Committee's mandate extends beyond parliamentary elections, which has helped ensure focus on long-term goals. Additionally, the Act mandates a climate risk assessment and a national adaptation programme every five years.

Source: (Grantham Research Institute at the London School of Economics and Climate Policy Radar, 2023^[8]); (IEA, 2023^[9]); (OECD, 2021^[10]); and (OECD, 2022^[11]).

Adopting a climate framework law, as mentioned in the programme of government, could help Romania raise its ambition and commitment to climate mitigation policy, take ownership of EU's climate policy framework and better implement it. So far, climate mitigation has been a relatively low priority for Romanian governments. This has partly been because emissions have declined with the transition to a market economy (Figure 2), allowing the country to meet its international commitments without substantial additional policy effort. With the easily attainable gains already reaped, Romania needs to undertake more determined and targeted action, which could encounter political and social opposition. Ensuring climate policy momentum requires raising awareness and involving affected communities and economic sectors in policy decisions. The initiation of "partnerships for energy transition" as a platform for systematic dialogue between the government and representatives of various economic sectors is a positive step forward.

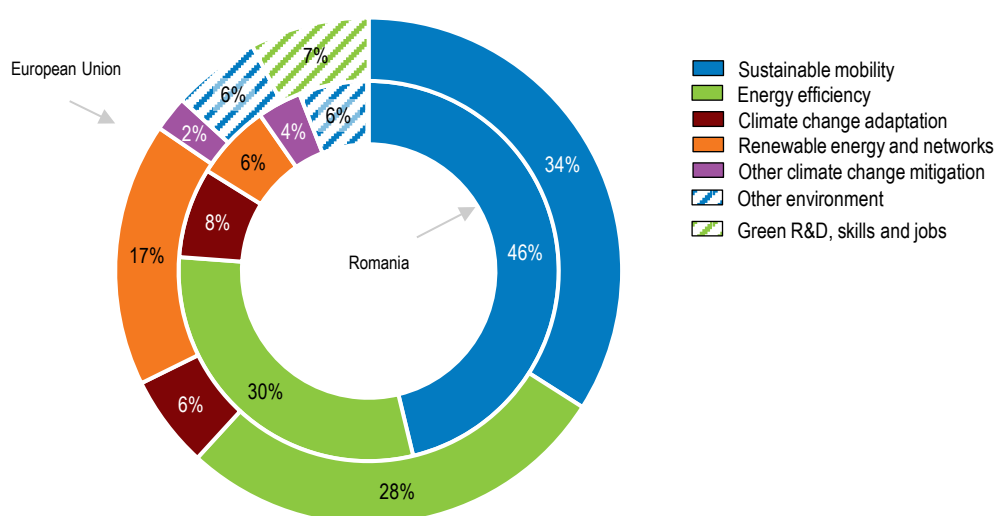
Improving the efficiency of public low-carbon investment is paramount

Achieving the 2030 energy and emission targets (Figure 1) and, in the longer term, carbon neutrality will require considerable investment in infrastructure, equipment and technology. Investments needed to decarbonise electricity, transport and buildings are estimated at 4.7% of GDP in 2023-30 (World Bank,

2023^[12]), with national public financing amounting to 1.2% of GDP (OECD, 2024^[13]). A large portion of Romania's planned mitigation and adaptation efforts relies on EU-funded investment in energy and transport infrastructure, building renovations and risk prevention (Figure 5; Box 2). Over 2021-27, about EUR 34 billion or nearly 45% of the financial allocations to the country from the Recovery and Resilience Facility and EU Cohesion Policy funds target investment for transitioning to a net-zero, circular and resilient economy (Box 2). This allocation is nearly 2.5 times higher than the outlays for the green transition in the previous EU seven-year programming period (EC, 2023^[14]), which the country did not manage to entirely spend.

Figure 5. Romania's Recovery and Resilience Plan focuses on decarbonising transport and improving energy efficiency

Climate-related expenditure planned in the Recovery and Resilience Plan by policy area, percentage, 2021-26



Note: The percentage relates to the share of each expenditure category in the planned expenditure targeting climate-related objectives. The category "Other environment" includes expenditures on circular economy, biodiversity, water and marine resources, and pollution prevention and control. Data as of 20 November 2023.

Source: European Commission (2023), Recovery and resilience scoreboard.

The government should enhance the management and appraisal of investment projects, use available financing sources more efficiently and improve absorption of EU funds (IMF, 2022^[15]) (OECD, 2022^[16]). Implementation and spending of EU funds allocated to the country in 2014-20 accelerated recently, but absorption in the initial years was below the EU average (OECD, 2024^[13]). Investment cycles were long, due to the low quality of project preparation and political interference (OECD, 2022^[16]). Performance was particularly poor for funds allocated to the low-carbon economy (mainly support to renewables and energy efficiency), with only 46% of the allocated funds spent until September 2023. As a result, many of the expected outcomes were not achieved, such as targets on smart grid users, building renovations and upgrades to urban transport systems (EC, 2024^[17]). Enhancing administrative capacity, for instance through tailor-made capacity building roadmaps, and effectively prioritising projects will be key to improve the efficiency and quality of public spending (OECD, 2022^[16]). Consistently incorporating a shadow carbon price into cost-benefit analyses would help guide public investment decisions and align them with climate goals.

Box 2. The Recovery and Resilience Plan and EU Cohesion Policy are set to help decarbonise Romania's economy

Romania directed 44% of its Recovery and Resilience Plan (RRP) grant and loan allocations (or nearly EUR 12.5 billion) to climate mitigation and adaptation objectives, well above the EU requirement of 37%. Within the RRP, the government committed to meeting 34% of its energy needs from renewables by 2030; phase out coal mining and coal-fired power generation by 2032; accelerate the decarbonisation of transport; massively renovate the building stock; and develop a hydrogen strategy. The RRP's climate-related investments mostly focus on transport and energy efficiency and, to a lesser extent, renewable energy generation (Figure 5). The new *REPowerEU* chapter, added to the RRP in November 2023, speeds up the implementation of measures aimed at facilitating investment in renewables and energy renovations of buildings, while also increasing the financing for green skill training. The RRP reforms and investments are expected to bolster energy security and decarbonise energy generation and use, marking a significant stride towards achieving climate neutrality by 2050.

Romania is set to invest EUR 21.7 billion in the green transition as part of the EU Cohesion Policy in 2021-27. This corresponds to 47% of total planned climate investments of EUR 46.6 billion, including EU funds for EUR 31 billion and national co-financing. These allocations include investment in climate change mitigation and adaptation, risk prevention, sustainable urban mobility and the circular economy.

Source: (EC, 2023^[18]).

A broader, more cost-effective and fairer policy mix is needed

Various climate mitigation measures are in place in Romania. These include regulatory instruments such as energy efficiency standards for buildings and equipment, and CO₂ emission standards for vehicles. Romania also provides financial support for energy efficiency, renewables and electric vehicles. While no explicit carbon tax applies in the country, energy-related GHG emissions are priced through the EU Emissions Trading System (ETS) (Box 3) and taxes on energy products are in line with the EU Energy Taxation Directive (see next section).

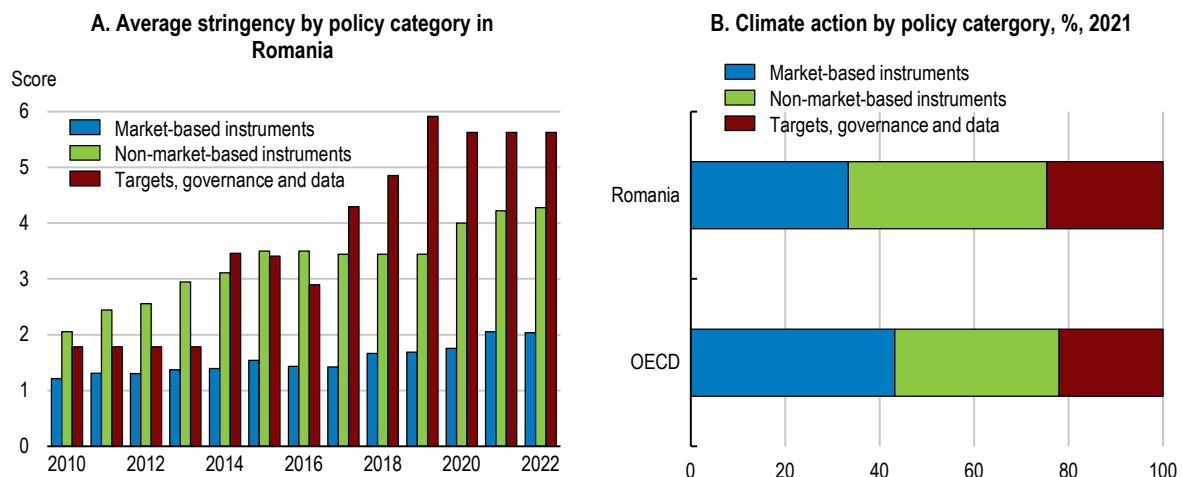
The stringency of Romania's climate action has progressively increased with the implementation of EU policies, especially the EU ETS (Figure 6, panel A). However, the stringency and scope of pricing instruments such as energy and vehicles taxes remains modest – a feature common to other Central and Eastern European countries (D'Arcangelo, Kruse and Pisu, 2023^[19]). As in the average OECD country, non-market-based and governance-type instruments have played the main role in strengthening national climate policy (Figure 6, panel B).

Meeting Romania's emission targets will need a more consistent use of pricing measures, as part of a broader policy mix. OECD analysis indicates that a diverse set of policy instruments can best harness synergies and amplify the effectiveness of the mitigation strategy (D'Arcangelo, Kruse and Pisu, 2023^[19]). The government should give priority to removing support to fossil fuels, which weakens incentives for energy savings or fuel switching (see below). It should also extend carbon pricing to sectors outside the EU ETS. OECD simulations suggest that broad-based carbon pricing is effective in reducing emissions in most sectors and can accelerate coal phase-out (D'Arcangelo et al., 2022^[20]). In addition to encouraging production and consumption choices that reduce GHG emissions in a cost-effective way, carbon pricing can generate government revenues, at least until higher prices achieve their goal of substantially lowering emissions.

Box 3. Romania's participation in the EU ETS

Since its introduction in 2005, the EU Emissions Trading System (ETS) has stimulated a switch from coal to natural gas in the Romanian electricity market, with a consequent reduction in CO₂ emissions. However, free allowance allocations have reduced the effectiveness of the system (Dechezleprêtre, Nachtigall and Venmans, 2023^[21]). As in all countries participating in the ETS, most of Romania's energy-intensive industrial facilities (e.g. aluminium, cement, fertilisers and steel) have received part of their allowances for free to prevent carbon leakage. In addition, Romania is one of only three countries (with Bulgaria and Hungary, out of 10 eligible countries) that opted to continue to provide free allowances to the power generation sector in the 2021-30 ETS phase, contrary to the general auctioning rule. The free allocation is a low share of available allowances for the energy sector. However, it effectively represents a subsidy to fossil fuel-based power generation, weakens abatement incentives and could contribute to delay the country's phase out of coal power. Results from the previous ETS phase (2013-20) show that free allocations did not contribute to modernise power sectors in countries, including Romania, that made use of them (ECA, 2020^[22]).

Figure 6. Climate policy has become more stringent but could better embrace market-based mitigation approaches



Note: The OECD Climate Actions and Policies Measurement Framework defines policy stringency as the degree to which policies incentivise emission reductions. The stringency score ranges between 0 (not stringent) and 10 (very stringent) for each policy variable based on the in-sample distribution across all countries and years of the policy variables' level (e.g. tax rate, emission limit value, government expenditure). As policy stringency is based on a relative measurement, high stringency values in a particular country indicate that the policy in this country and year was more stringent compared to all other countries and years. Hence, high policy stringency does not necessarily suggest that the policy is stringent enough to meet mitigation goals.

Source: (Nachtigall et al., 2022^[23]).

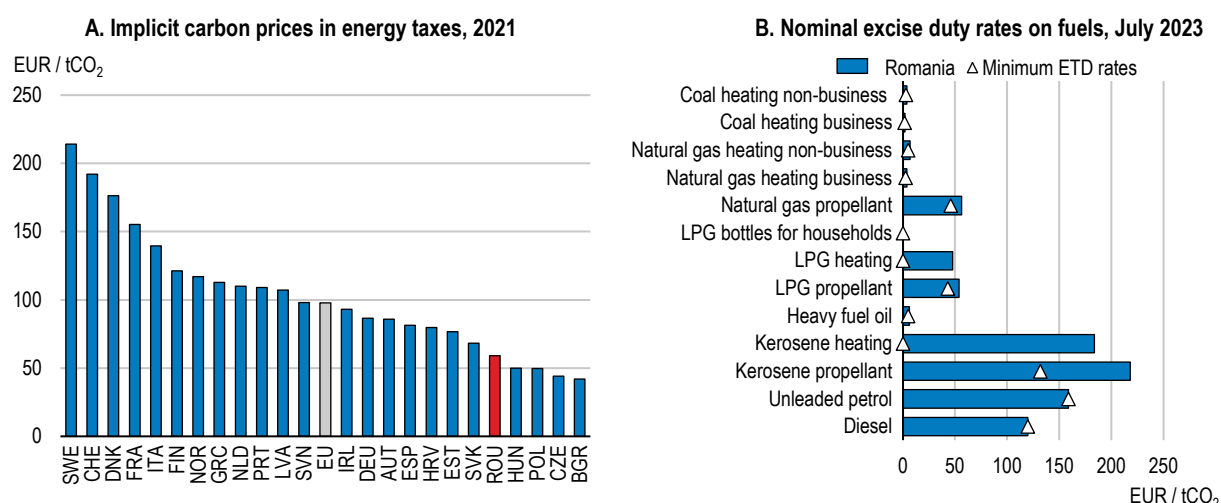
Introducing carbon pricing and removing subsidies generally face political challenges, due to concerns about economic competitiveness, potential job losses, and the impact of higher energy prices on consumers. Part of the additional revenue from carbon pricing and subsidy removal should be used to ease impacts of the transition on vulnerable households, workers and businesses (see below). Designing the subsidy removal and carbon taxation reforms as a package of taxation and spending measures that yields multiple benefits (such as lower GHG emissions, reduced inequality, better air quality) could help increase public acceptance (Dechezleprêtre et al., 2022^[24]) (World Bank, 2023^[25]). Popular support for

climate policy is weak in Romania compared to more advanced European economies. A 2023 opinion survey found that only 54% of the country's respondents considered climate change to be a very serious problem, compared to more than three-quarters of EU respondents (EC, 2023^[26]).

There is scope to increase and harmonise carbon prices outside the ETS

Increasing the price of GHG emissions across fuels and sectors by adjusting effective energy tax rates would provide more consistent price signals to businesses and households. Excluding the EU ETS price, and assuming energy taxes aim to internalise GHG emission costs, the energy tax rates applied in Romania yield an average implicit carbon tax of about EUR 59 per tonne of CO₂. This is among the lowest rates in the European Union (Figure 7, panel A). It is also below the benchmarks of EUR 60/tCO₂ and EUR 120/tCO₂, which are the low-end and mid-range estimates, respectively, of the carbon prices that would be needed by 2030 for consistency with net-zero emission targets (OECD, 2023^[27]). Romania's low economy-wide implicit carbon tax is linked to two main factors. First, excise duties on diesel and petrol, the largest source of energy tax revenue, are set at the minimum levels prescribed by the EU Energy Taxation Directive, while most EU countries apply higher rates. Second, uses of natural gas and coal – which together make up 55% of CO₂ emissions from fuel combustion (Figure 3, panel C) – are taxed at very low rates (Figure 7, panel B).

Figure 7. Romania's implicit carbon tax is among the lowest in Europe and uneven across fuels



Note: Panel A: The implicit carbon tax is calculated as the ratio between revenue from taxes on energy products (including explicit carbon taxes for countries that implement them) and GHG emissions from fuel combustion. It excludes prices emerging in the EU ETS. The carbon prices implied by energy taxes tend to be overestimated for two main reasons. First, the revenue data include revenue from electricity taxes, which, albeit usually negligible, should be excluded (OECD, 2019^[28]). Second, as calculations are based on actual energy tax revenue, they factor in favourable tax treatments (discounts, exemptions) but not direct budgetary support to fossil fuels use or tax refunds. The average implicit carbon prices are largely driven by the excise rates on transport fuels, which are higher than on other fuels. Panel B: ETD = EU Energy Taxation Directive; emission factors based on Commission Decision 2007/589/EC establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council.

Source: OECD calculations based on European Commission, Taxes in Europe database; Eurostat; IEA World Energy Balances database; and IEA CO₂ Emissions from Fuel Combustion Statistics: Greenhouse Gas Emissions from Energy database.

As in all countries, the price of CO₂ emissions varies widely across fuels and users, leading to inconsistent abatement incentives (Figure 7, panel B). Tax rates are based on volume and not on the carbon content of fuels or other environmental externalities such as air pollution. In all countries, tax rates on transport fuels are higher than on other fuels, because taxes on petrol and diesel have traditionally been levied for

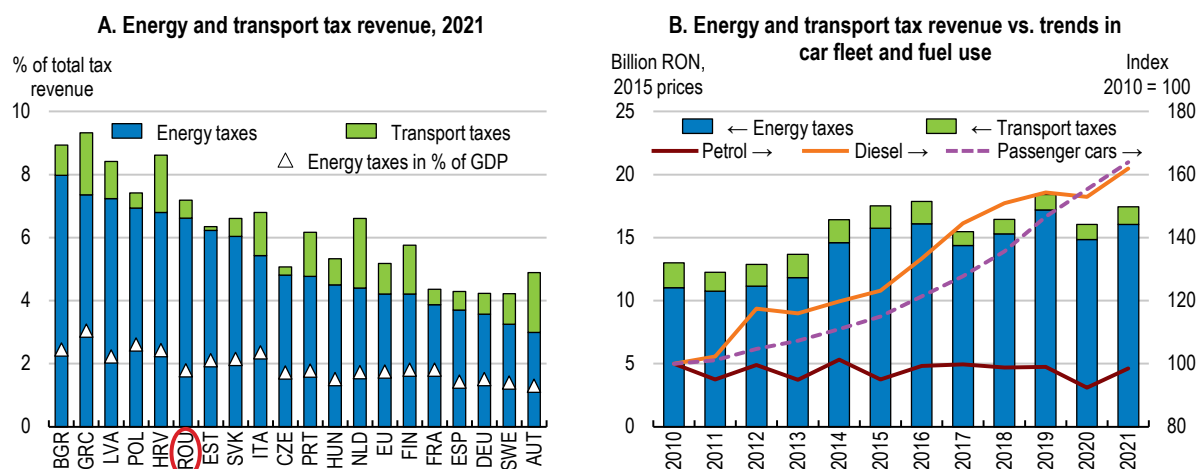
revenue raising purposes. Higher tax rates on transport fuels may be justified to reflect other externalities of road transport (air pollution, noise, accidents and congestion) in addition to GHG emissions (OECD, 2023^[27]). As in most OECD countries, petrol faces a higher implicit carbon tax than diesel (OECD, 2022^[29]). This preferential tax treatment for diesel is unjustified on environmental grounds as the fuel has higher carbon content than petrol, and diesel vehicles generally produce higher emissions of local air pollutants. CO₂ emissions from heating with natural gas and coal are taxed at a near-zero rate (Figure 7, panel B). Several exemptions and discounts apply, including for heating fuels and diesel used in agriculture, fishery and forestry, on the grounds of competitiveness or social concerns. These concessions further reduce effective carbon prices, thereby weakening price signals for abatement.

The government should consider introducing carbon pricing in sectors not covered by the EU ETS. Modelling suggests that internalising externalities in fuel prices would drive substantial emission reductions and bring net welfare gains (World Bank, 2023^[25]). Carbon pricing could take the form of a carbon tax element in the fuel excise levies. Its rate should be set at a low level and gradually be raised according to a pre-determined schedule until it reaches its full level in the next few years, to bring emissions down in line with the 2030 target (Figure 4). Setting a credible path of future carbon tax rates would provide an incentive for low-carbon consumption and investment without immediately imposing a large cost burden on households and firms. As a pre-requisite to introducing carbon pricing, the government should phase out current price caps on electricity and natural gas, which are planned to be in place until March 2025 (see below).

Romania should not wait for the EU reform of the Energy Taxation Directive to unilaterally introduce excise duties based, at least in part, on the carbon content of fuels. While discussions on the directive were ongoing at the time of writing, the current revision proposal envisages to set tax rates based on the energy content and environmental performance of fuels. Fifteen EU countries have already unilaterally implemented a national carbon pricing scheme, in the form of carbon tax or emission trading (Austria and Germany). Carbon taxes cover from 3% of national GHG emissions in Latvia to 65% in Luxembourg, with headline rates ranging between EUR 2/tCO₂ in Estonia and EUR 115/tCO₂ in Sweden (World Bank, 2023^[30]). While a new EU-wide emission trading system will extend carbon pricing to transport and heating fuels from 2027 (European Council, 2023^[5]), this does not prevent Romania from introducing a national carbon tax. Until end-2030, fuel suppliers can be exempt from the new trading system where there exists a national carbon price scheme with a price level equivalent or higher than in the EU system.

Energy taxation should be a pillar of the government's strategy to increase revenue. Compared with other countries, energy taxes account for a significant share of total tax revenue in Romania (Figure 8, panel A). Rather than indicating high energy taxation, this reflects the low level of revenue raised from other taxes (OECD, 2024^[13]). So far, energy tax rates have been too low to encourage a reduction in energy use. In the past decade, revenue rose in line with energy consumption (especially from transport activities) and car fleet (Figure 8, panel B). There is also room to introduce or adjust other environment-related taxes such as on vehicles (see section on decarbonising transport) and waste landfilling, which is the main disposal method in Romania and generates 6% of GHG emissions (Figure 3, Panel B). World Bank modelling suggests that raising fuel excise rates to reflect all climate and non-climate related externalities could raise revenue by 1.3% of GDP by 2030 (OECD, 2024^[13]) (World Bank, 2023^[25]). Even if the carbon tax revenue will decrease over time with the decarbonisation of the economy, it can help finance adjustment costs at the start of the transition (see below). As transport progressively shifts to electromobility, Romania will eventually need comprehensive road use charging to internalise costs of car use and substitute transport fuel tax revenues (van Dender, 2019^[31]) (see section on decarbonising transport).

Figure 8. Energy tax revenue grew with fuel use and is a high share of total tax revenue



Source: Eurostat; IEA; UNECE, Transport Statistics database.

Removing support to fossil fuels should be a priority

Removing support to fossil fuels and using the revenue gain for social spending, reductions in distortive taxes and productive investments can contribute to curbing Romania's GHG emissions while delivering better economic and distributional outcomes. Romania has long provided, directly or indirectly, support to fossil fuels. Conservative estimates put the fiscal costs of this support at 0.42% of GDP in 2021 (Bon-Mardion et al., 2023^[32]). These subsidies consist of a mix of tax incentives and direct budgetary support for coal, natural gas and district heating, often via support to state-owned enterprises (World Bank, 2023^[25]). Tax reductions, exemptions or allowances apply to heating fuels, as well as fuels used in agriculture, fishery and forestry. Other subsidies include a reduced VAT rate of 5% (compared to the standard 19% rate) for district heating and firewood used in residential and public buildings. Romania is lacking accurate data on fossil fuel subsidies, including tax expenditures and budgetary transfers (World Bank, 2023^[25]).

Romania should develop a clear plan to gradually remove fossil fuel subsidies. This is also essential for carbon taxation to deliver effective price signals. Tax exemptions and discounts for fossil fuels reduce effective carbon prices, encouraging inefficient fuel consumption and higher emissions. Subsidies also have sizable fiscal costs and are generally not well targeted to the people and businesses most in need of government support. In addition, improving the efficiency of state-owned enterprises in the energy sector would contribute to reducing producer subsidies (IMF, 2023^[33]) (OECD, 2024^[13]).

Better data and communication on fossil fuel subsidies is needed. A transparent and systematic mapping of fossil fuel subsidies and other potentially environmentally harmful support measures – with an evaluation of their economic, social and environmental impacts – will be essential to identify reform priorities. Extensive communication and consultation with stakeholders regarding the reform process and the costs and benefits thereof will be key to improve social acceptability and reduce the risk of backtracking. Subsidies should be phased out according to a pre-defined schedule, so that energy prices rise incrementally (Elgouacem, 2020^[34]) (IMF, 2023^[33]). The subsidy reform plan should foresee measures to protect the poor (see below) and to support the competitiveness of the affected economic sectors.

The phase out of fossil fuel support related to the energy-crisis should be accelerated

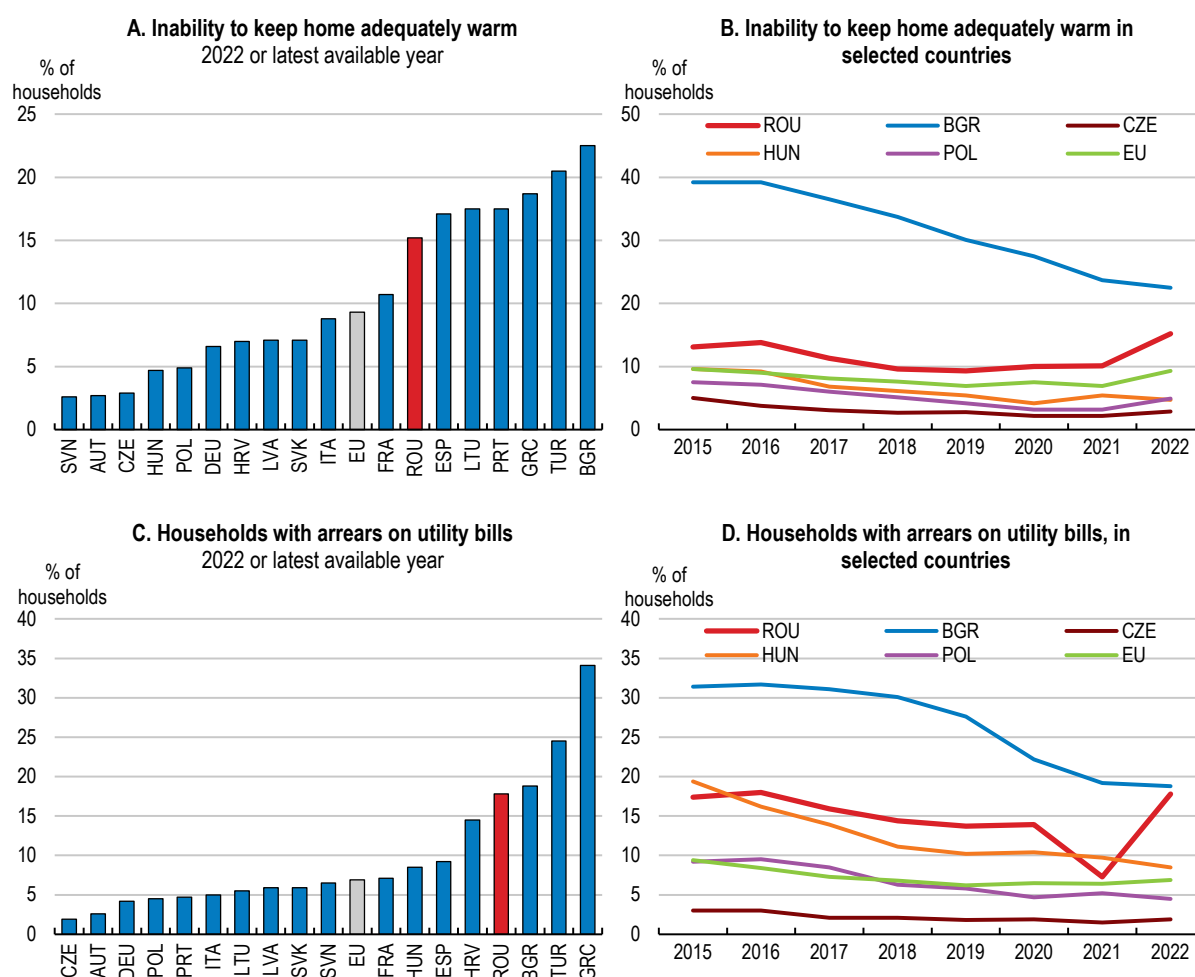
As in most countries, the Romanian government implemented several measures to shield the economy and vulnerable households from the steep hike in energy prices (which started in the second half of 2021 and peaked in August 2022). Estimates of the fiscal costs of these support measures in 2022-23 range between 1% and 3.8% of GDP (OECD, 2023^[35]) (Sgaravatti et al., 2021^[36]). In 2022, the government initially introduced a direct compensation scheme on electricity and gas bills that was expected to benefit most household consumers of electricity and gas. The compensation scheme was superseded by a cap on electricity and natural gas prices, which was initially introduced for one year but later redefined and extended to March 2025. As from January 2023, retail prices of electricity and natural gas for households and small and medium-sized enterprises are set by law at levels prevailing before the surge in energy prices. These measures tend to benefit not just vulnerable groups but also better-off segments of the population. Wholesale prices are also capped. The fiscal cost of the price cap (through reimbursements to energy suppliers) is expected to be covered by windfall profit taxes on energy producers, as well as higher dividend payouts of state-owned enterprises (IMF, 2022^[15]). However, repeated changes to the price capping scheme, taxes on windfall profits and revenue caps for energy producers have heightened energy market uncertainty and may discourage private investment in renewables (IEA, 2022^[37]).

The Romanian authorities should bring forward the phase out of the energy price capping scheme. The cap on retail energy prices and several other measures – such as discounted and frozen excise duties on diesel and petrol and reduced VAT rates on electricity, natural gas and transport fuels – numb the incentive for consumers to save energy or to switch to cleaner fuels. The price caps effectively reversed the liberalisation of the retail markets of natural gas and electricity that had been completed for all energy customers in 2020 and 2021, respectively. Targeted and temporary income relief or other lump-sum payments that are disconnected from energy consumption (see next section) could shield vulnerable households from harm if energy prices spike again, while maintaining the integrity of the price signal.

Stronger emission pricing should go along with measures to alleviate energy poverty

Carbon pricing and fossil fuel subsidy removal can have important distributional implications in Romania, as in other countries (D’Arcangelo et al., 2022^[38]). They would lead to higher energy costs, with potentially heavier impacts on the large proportion of the country’s population that is already at risk of energy poverty. Even before the energy crisis, 53% of the population spent more than 10% of their household budget on electricity, gas and other fuels, compared to the EU average of 27%. The energy crisis temporarily set back progress Romania had made on tackling energy poverty, documented in the previous *Economic Survey* (OECD, 2022^[16]). The share of households that reported not being able to keep their home adequately warm and that of households with arrears on utility bills rose dramatically in 2022, and more so than in regional peers (Figure 9, Panels B and D). Both shares are among the highest in the European Union (Figure 9, Panels A and C). Many households in rural areas display low electricity consumption and are not connected to the natural gas grid. They mostly use wood stoves for heating and often procure firewood informally (see section on reducing emissions from buildings).

Romania needs to further improve the cost-effectiveness and targeting of its mechanisms to reduce energy poverty risks. The 2021 law on social protection measures for vulnerable energy consumers is a step in the right direction, as it provides an operational definition of households at risk of energy poverty. It offers vulnerable households monthly aid for heating during the cold season (between November and March), with the amount depending on income and type of heating. However, in 2022, the aid reached some 10% of households (883 000), less than the estimated 15% that do not manage to keep their homes warm (Figure 9, panel A). As support is tied to heating expenses and non-refundable, it encourages higher energy consumption to get the maximum aid amount. Also, it tends to distort the choice of heating systems, as the aid is the most generous for electric heating and least for natural gas, with wood and coal falling in between. More than 85% of beneficiaries use the carbon-intensive and polluting solid (wood and coal) and oil fuels.

Figure 9. A large and increasing share of the population cannot afford to pay for energy

Source: Eurostat.

Support for heating and, more generally, for the energy needs of the poor should be designed to avoid interfering with energy prices and consumption decisions. Ideally, it should be untied from energy bills and provided as means-tested lump-sum transfers. Better targeting support to the people most in need requires improving data collection and ensuring good means-tested cash transfer mechanisms. Strengthening Romania's tax administration (OECD, 2024^[13]) and digitalising government services and energy systems would enable better data collection and targeting. Accelerating the smart meter rollout is essential to digitalise the country's energy networks. Speeding up energy efficiency improvements in buildings and redesigning transport systems to reduce car-dependence would durably mitigate exposure to high energy prices (Hemmerlé et al., 2023^[39]) (OECD, 2021^[40]).

Recycling of potential revenues from carbon pricing and subsidy reforms to finance energy poverty reduction programmes should be considered. Between 2013 and 2022, auctioning of EU ETS emission allowances contributed over EUR 4 billion to Romania's state budget (EC, 2023^[41]). In many countries, transferring a third of carbon pricing revenues to poor households through means-tested benefits is sufficient to mitigate energy affordability risk due to higher energy prices (Flues and van Dender, 2017^[42]). For example, Ireland raised its carbon tax rate and committed to use the extra revenue to improve energy affordability (Box 4). Modelling suggests that using the potential extra revenue from a carbon tax to compensate vulnerable households can reduce consumption inequality in Romania (EPG, 2023^[43]) (World

Bank, 2023^[25]). Transparency and clear communication of carbon pricing revenue use decisions are essential to reduce the risks of spending inefficiency linked to earmarking (Marten and van Dender, 2019^[44]).

Box 4. Recycling carbon tax revenue for an equitable transition: The case of Ireland

Ireland introduced a carbon tax in 2010. The carbon tax applies to all fuels used in sectors not covered by the EU ETS. The carbon tax scope was gradually extended and the rate progressively increased from EUR 15/tCO₂ to EUR 33.5/tCO₂ in 2021. The government committed to raise the carbon tax by EUR 7.50/tCO₂ per year over the subsequent decade, to reach EUR 100/tCO₂ by 2030.

The government pledged to use the revenue from the carbon tax increase until 2030 (EUR 9.5 billion over ten years) to prevent fuel poverty, support workers displaced by the phase out of peat and finance climate-related investment. In line with this commitment, the government allocated part of the carbon tax revenue to enhance some social welfare schemes in 2021. These included an increase in benefits for children and people living alone, as well as a higher fuel allowance (a means-tested lump sum aiming to support vulnerable households with heating expenses). These increases were expected to mitigate the impact of the carbon tax on vulnerable households, as well as contributing to reducing poverty.

Source: (OECD, 2021^[10]).

Decarbonising electricity generation

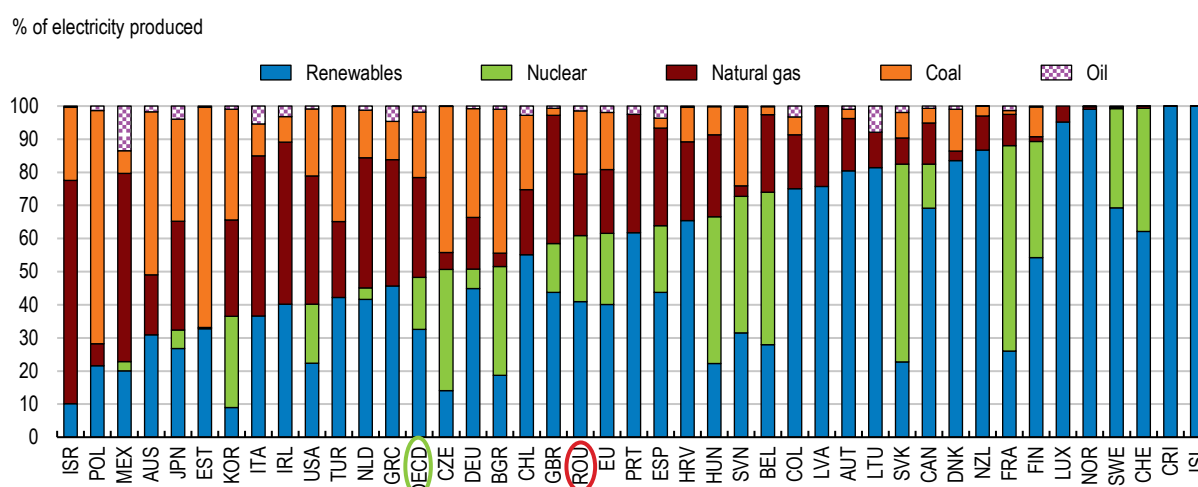
Decarbonising power production will be key for reducing GHG emissions. A quarter of Romania's energy-related GHG emissions come from energy industries' own production; the rest coming from burning fossil fuels in other sectors (Figure 3, panel B). Romania's reliance on coal and natural gas for electricity production has declined in the last decade to be in line with the EU average. Nonetheless, it remains high (40% of electricity generation) (Figure 10). Decarbonising may also improve energy affordability and will strengthen the security of energy supply, which was put under pressure by Russia's war of aggression against Ukraine. Romania is the second largest gas producer in the European Union but depends on imports during peak demand periods in winter.

In addition to decarbonising electricity supply, Romania needs to expand electricity generation to allow for the electrification of sectors such as transport, buildings and industry (IEA, 2023^[45]). Romania thus needs to stick to its coal phase-out plans (see below) and significantly expand its low-carbon power capacity. Electricity accounts only for around 15% of final energy consumption in Romania, compared to the OECD average of 23%. As is typical across the OECD, direct combustion of fossil fuels is still the dominant source of energy use in most sectors, especially transport (Figure 11).

As elsewhere, the government has strong steerage over the capacity and technology-mix of electricity production facilities. Romania's strategy for decarbonising electricity generation focuses on gradually phasing out coal and expanding power generating capacity by about one third compared to 2020, mostly with photovoltaics and wind. Significant investment is under way in nuclear, with the expansion of the Cernavoda nuclear complex and the planned installation of the first small modular nuclear reactor in the European Union. Romania is also investing in offshore natural gas fields. Timing and coordinating the increase in clean energy investment and divestment in fossil fuel supply is vital to avoid price spikes (IEA, 2023^[45]) and ensure security of energy supply.

Figure 10. Much of Romania's electricity still comes from burning fossil fuels

Electricity generation by energy source, 2022

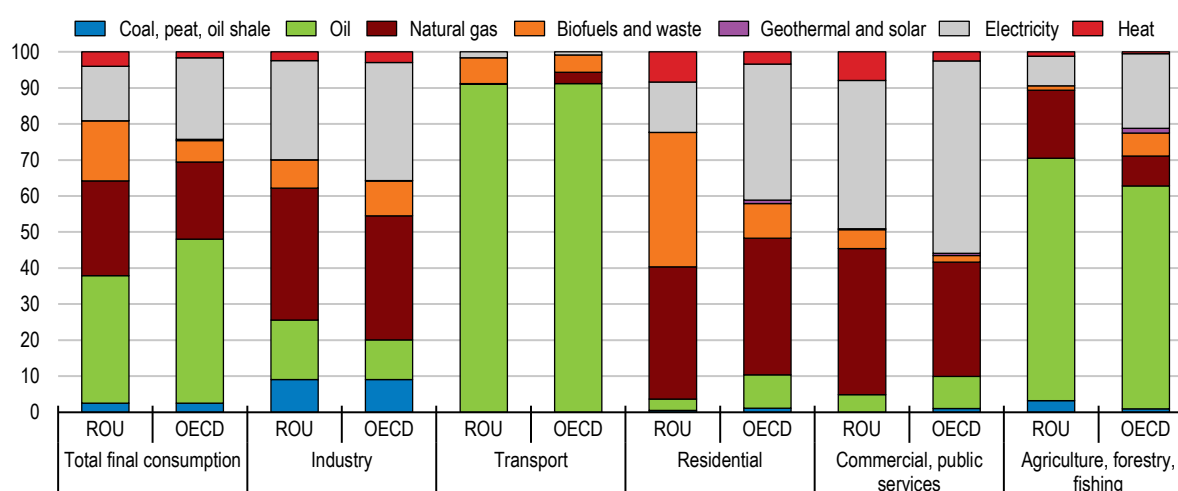


Note: Renewables include biofuels and waste, hydro, wind, solar, geothermal and other energies.

Source: IEA Electricity Information database.

Figure 11. Electricity still plays a relatively little role in Romania's final energy use

Total final energy consumption by source and sector, 2021



Note: Total final energy consumption includes non-energy uses and consumption not elsewhere specified.

Source: IEA World Energy Balances database.

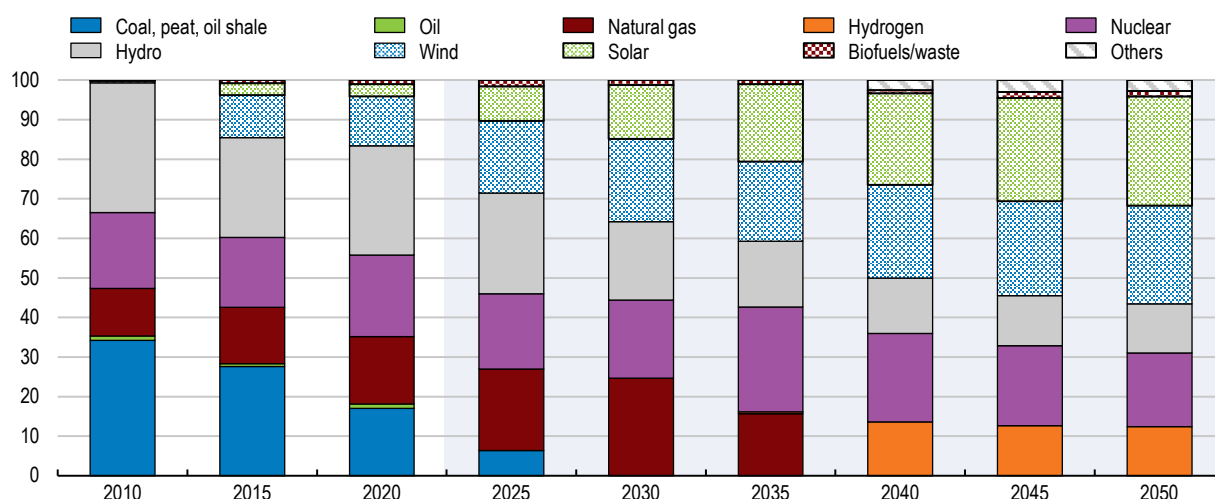
Phasing out coal is imperative to get on track to net zero

Complete coal phase-out is now legislated. In late 2022, Romania approved a law on the decarbonisation of the energy sector committing to a stepwise phase out of coal mining and coal power production by 2032. The country has already reduced its reliance on coal. Electricity production from coal halved between 2012 and 2022, replaced by natural gas, wind and solar (Figure 12), as carbon pricing in the EU Emissions Trading System made coal less competitive than other electricity sources. However, coal still accounts for

nearly one fifth of power generation and is the largest single contributor to GHG emissions from electricity and heat generation in Romania (Figure 12 and Figure 3, panel C).

Figure 12. Coal power generation declined and must be phased out

Historic and projected electricity generation by source



Note: The shaded area indicates the electricity generation mix required to be on the net-zero pathway modelled by Romania's Long-term Strategy.

Source: (Government of Romania, 2023^[2]); and IEA World Energy Balances database.

The energy crisis has seen government delay some coal-plant closures. Most mines and power capacity are scheduled to be closed by end-2025. However, in response to rising energy prices, the government postponed closures initially scheduled from end-2022 to October 2023 and approved the expansion of three lignite mines. This government decision risks delaying Romania's successful break from coal, which already lags behind many EU countries (Beyond Fossil Fuels, 2023^[46]).

Expansion of natural gas capacity, in addition to renewables, is planned to offset coal-generation phase out and manage energy supply risks. The government plans to nearly double natural gas generation capacity by 2026-27. More than half of the capacity addition is part of the EU-funded Restructuring Plan of the Oltenia Energy Complex, the country's major coal mining and electricity operator. All new gas capacity is expected to be compatible with hydrogen use, although, as elsewhere, there is uncertainty around the cost-competitiveness of powering these plants with low-emission hydrogen (IEA, 2022^[47]). Retrofitting gas generation plants with carbon capture utilisation and storage (CCUS) is another, last resort, option to abate emissions from gas-fired power plants. However, CCUS is still an expensive technology and Romania lacks the necessary regulatory framework and financial incentives (Miu et al., 2022^[48]).

The authorities are also planning a fast exploitation of the Neptun Deep gas field in the Black Sea, including to reduce import dependence and enhance energy security. Gas from the Neptun Deep field is expected to enter the market in 2026 and to increase Romania's gas production well beyond domestic needs. Romania will, therefore, position itself as an alternative to Russia for gas supplies in the region. Looking ahead, new gas exploration projects run counter to climate mitigation objectives. Scenarios indicate that global demand for gas, as well as oil and coal, should start declining before 2030 to be in line with global climate ambitions (IEA, 2023^[45]). Declining demand for fossil fuels could increase commercial risks to new projects. While Romania has not auctioned off new gas concessions in over a decade, the government should consider climate change and other environmental factors in licensing decisions for future oil and

gas explorations. Some countries – such as Denmark, France and Ireland – have announced bans on new oil and gas explorations (OECD, 2022^[49]). Such bans can signal a commitment to shifting away from fossil fuels and advancing climate change goals. They are in line with the IEA's assessment that no new long lead-time upstream oil and gas projects are needed in a net-zero scenario (IEA, 2023^[45]). They also align with the call agreed at COP28 in Dubai in December 2023 for parties to the United Nation Framework Convention on Climate Change to contribute to transitioning away from fossil fuels in energy systems.

Methane emissions need to be tackled more vigorously. In late 2023 Romania joined the Global Methane Pledge, which gathers 155 countries committed to act towards reducing global methane emissions by at least 30% in 2020-30. One third of Romania's methane emissions are linked to coal, oil and gas production. The country is the EU's second largest emitter of methane from fuel production after Poland. In exiting from coal and expanding natural gas production, Romania would benefit from developing and implementing an action plan to reduce emissions of methane – a short-lived and powerful GHG – as done by Canada, Norway and the United States (IEA, 2023^[50]). Abandoned underground coal mines continue to emit methane, especially in the first few years after operations cease (IEA, 2023^[50]). Therefore, it is important to install methane capture technology in both closed and operating mines that will close in the near future. The captured methane can be used for power and heat generation. Most methane emissions from fuel extraction can be abated or captured with existing technology and at relatively low costs (IEA, 2023^[50]). In addition to reducing GHG emissions, this avoids wasting a valuable resource.

Recent measures aim to remove barriers to renewables deployment

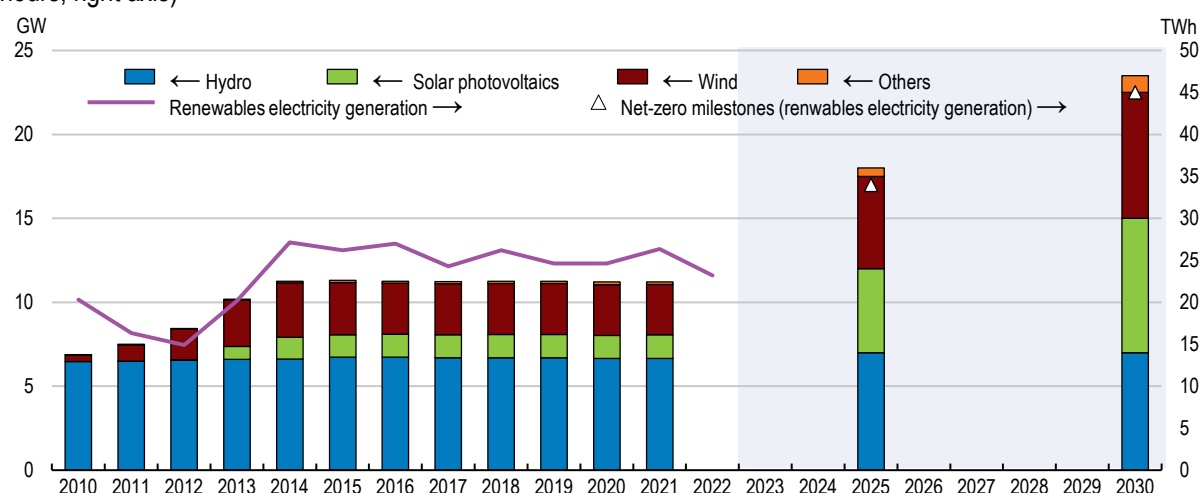
Renewable sources are already important in Romania's electricity mix, but much more capacity is needed to compensate for the exit from coal, produce low-emission hydrogen and enable the electrification of the economy. Renewables accounted for 42% of total electricity generation in 2022, above the OECD and EU averages (Figure 10). The share of power generated from wind and solar photovoltaics (PV) rose between 2010 and 2014 (Figure 12). However, installation of new capacity from renewables and corresponding power generation have since stalled. Renewables capacity must more than double by 2030 for Romania to stay on the net-zero trajectory outlined by its Long-term Strategy (Figure 13). The Recovery and Resilience Plan pledges to install 3 Gigawatts of wind and solar capacity by mid-2026, which is less than half the additional capacity needed to stay on the Long-term Strategy's net-zero path.

There is much private-sector interest in the renewable power sector in Romania, but various bottlenecks slow down investment. As of May 2023, there were more than 49 Gigawatts booked into the grid for wind and PV projects under development, or more than double the renewable capacity needed to reach the 2030 Long-term Strategy's milestone (Figure 13). To ensure that projects are actually completed, Romania must address key barriers common to most EU countries: notably the slow pace of transmission and distribution network upgrades and lengthy and complex permitting procedures (IEA, 2023^[51]). Shortage of skilled labour is another limiting factor (OECD, 2024^[13]). There is also a case for more cost-effective government support for not yet competitive renewables to help leverage the broader societal gains of technology development.

The government has taken steps to lower regulatory barriers (EC, 2023^[14]), but more policy action is needed. Measures taken so far aim to streamlining permitting procedures (see below), clarifying the status of small-scale renewables (self-consumers and energy communities), and promoting renewable-based hydrogen production and use (Box 5). The government committed under the Recovery and Resilience Plan to introducing offshore wind legislation by end-2023, which will kickstart offshore wind deployment (although a maritime spatial plan is yet to be developed) (Stavaru and Soltan, 2023^[52]). However, in general, the regulatory framework remains incomplete and fragmented. Uncertainty resulting from frequent legal changes, coupled with inconsistent and opaque application of regulations by various authorities, has held back investments in renewable power projects (Stancu Bîrsan, Cazacu and Porojan-Gheajă, 2023^[53]).

Figure 13. Investment in renewables capacity stalled and needs to accelerate

Net capacity of renewable electricity plants (Gigawatt) and electricity generation from renewable sources (Terawatt hours, right axis)



Note: Others include geothermal, solar thermal, solid biofuels and biogases.

Source: (Government of Romania, 2023^[2]); and IEA (2023), Renewables Information database.

Box 5. Romania's measures to promote renewable-based hydrogen

Romania aims to be a lead country in developing low-emission hydrogen. Low-emission hydrogen could be best used in industry – including steel, fertilisers, refineries and chemicals – and transport (EPG, 2021^[54]). This would require massive investment in renewables and electrolysis capacity. As a first step, the government allocated EUR 111 million of its Recovery and Resilience Plan to a state aid scheme for the construction, by the end of 2025, of at least 60 Megawatts of electrolyzers for hydrogen production from renewable sources. As of end-2022, 32 projects had applied for the aid scheme (Stavaru and Soltan, 2023^[52]).

The country's draft National Hydrogen Strategy (under public consultation at the time of writing) and the 2023 "Hydrogen Law" provide a clear signal to investors. They aim to stimulate investments, thereby reducing production costs. The draft strategy envisages a substantial increase in renewable power capacity (8 Gigawatts by 2030) exclusively to feed electrolyzers. It also identifies five potential "hydrogen valleys", i.e. geographical areas that host the whole hydrogen value chain in an integrated manner. The law sets a mandatory renewable-based hydrogen quota of at least 42% of industrial consumers' hydrogen needs as from 2030, increased to 65% from 2035. Tradable low-carbon hydrogen certificates will complement the quota system. This measure aims to create demand for low-emission hydrogen to encourage investments in the sector, in line with IEA recommendations (IEA, 2022^[47]).

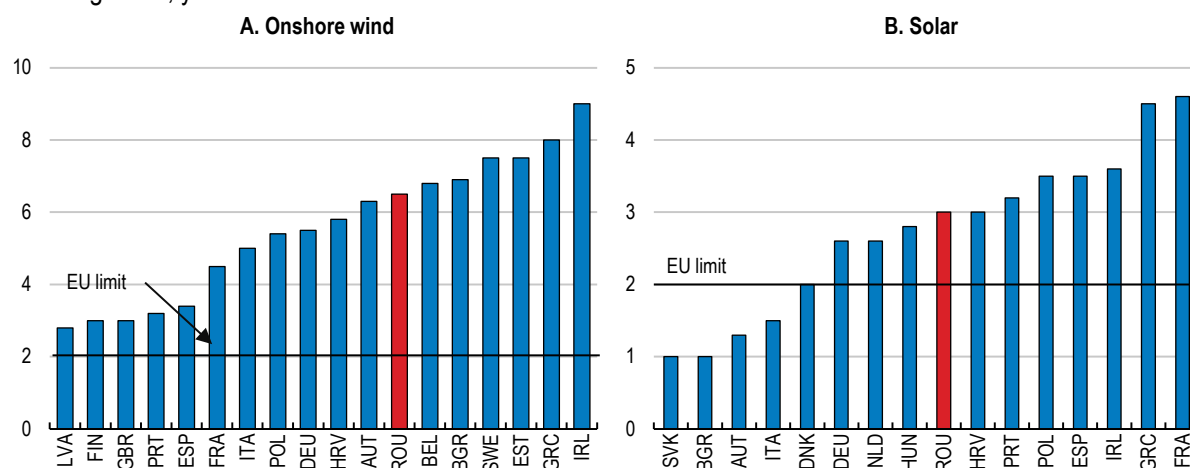
Streamlining permitting procedures

As in many other countries, long permitting procedures impede the deployment of renewables (Figure 14). The process in Romania requires applications for numerous permits. It also involves scattered and non-transparent procedures (Stancu Bîrsan, Cazacu and Porojan-Gheajă, 2023^[53]). The time needed to get a permit is three years for PV installations and 6.5 years for onshore wind, well above the two-year limit set by the EU Renewable Energy Directive. Frequent regulatory and procedural changes, as well as inconsistencies in the authorities' approach to permit granting have led to project delays and higher costs. In a welcome move, the government introduced a one-stop-shop system for gathering all licensing

procedures for industrial activities. However, the system is not yet fully operational and its implications for the energy sector remain unclear (Stavaru and Soltan, 2023^[52]).

Figure 14. Lengthy permitting processes are slowing deployment of renewables

Permitting times, years



Note: The EU limit of 2 years is stated in the Renewable Energy Directive (2018/2001) as amended by Directive 2023/2413. Data only available for the countries presented in the Figure.

Source: OECD calculations based on (EC, 2022^[55]).

Recent measures to streamline permitting procedures are welcome but have room for improvement. Romania recently introduced measures to simplify licensing procedures for self-consumption PV projects and relax land-use restrictions (see below). As a result, and thanks to the “Casa Verde” programme, there has been a recent boom in household PV. The government could go further and follow the example of other EU countries that changed their procedures in the wake of Russia’s invasion of Ukraine (IEA, 2023^[51]). These adjustments focused on simplifying procedures and compressing their duration, exempting small projects from certain authorisations, and identifying areas where renewable energy projects can be fast-tracked (Table 2). In the Recovery and Resilience Plan, the Romanian government committed to establishing the legal framework for accelerated permitting in selected areas, in line with the third EU Renewable Energy Directive (Box 6). Romania also needs to secure more resources for permitting authorities, which are often understaffed and lack necessary expertise, especially at local level (EC, 2022^[55]).

Romania is attempting to address difficulties related to land-use for renewable installations. Accelerating the deployment of PV and onshore wind will require more land to be opened up for these purposes (IEA, 2023^[45]). Recent legislative changes allow granting building permits for renewable energy projects even in the absence of urban land-use plans, which are often outdated or missing. The changes also authorised the installation of renewable energy and storage capacity on less than 50 hectares of poorly productive agricultural land, without conducting costly and time-consuming re-zoning procedures. However, uncertainty by permitting authorities about how to interpret this rule has reportedly resulted in many renewable projects being unduly blocked (Stavaru and Soltan, 2023^[52]). The government needs to clarify the intention behind the new rules, as well as the rules for using agricultural land for both farming and energy production. There is also an urgent need to complete the national land cadastre (OECD, 2024^[13]), which covers less than half the country’s properties and is particularly incomplete for rural areas. This discourages investments, including in renewables (EC, 2023^[14]).

Table 2. Examples of streamlined procedures for renewable electricity in Europe

Country	Description of regulatory measures taken between March 2022 and October 2023
Austria	Public interest status and accelerated environmental impact assessment (EIA) for PV; projects can go ahead unless complaints are received.
Finland	Temporary priority until end-2025 in permit processing by regional administrative agencies.
France	Local authorities can designate preferred “go-to” and “no-go” areas for renewable energy development.
Germany	Priority to offshore wind in maritime spatial planning and streamlined permitting procedures; relaxed air radio navigation rules to accelerate the permitting process for onshore wind; all renewable projects are legally established as a matter of overriding public interest, giving them priority in approval and permitting decisions when evaluated against competing interests.
Ireland	Exemption from planning permission for rooftop PV, including for new buildings.
Italy	Simplified permitting and introduction of a limit of 150 days for finalising the procedures.
Lithuania	Exemption from production permits for PV and wind for self-consumption.
Luxembourg	Limit the permitting time to less than three months for PV installations and co-located energy storages systems.
Portugal	Exemption from the operating licence if the network operator confirms conditions for grid connection; simplified EIA for projects outside sensitive areas; exemption from EIA for PV installations occupying less than 100 hectares and wind stations located more than 2 km apart.
Romania	Exemption from building permit for solar panels (rooftop or ground mounted); simplified procedure for grid connection in case of self-consumption; legislation on one-stop-shop for industrial authorisations; reduced land-use restrictions.
Spain	Until 2024, accelerated environmental approvals for wind power plants up to 75 Megawatts and solar parks up to 150 Megawatts; shortened response time from six to two months; requirement for distribution grid operators to earmark 10% of their investment budget for upgrades to facilitate connection for new small-scale renewable power plants; 10% transmission capacity reserved for large self-consumption projects.

Source: Adapted from (IEA, 2022^[37]), (IEA, 2023^[51]) and (Stavaru and Soltan, 2023^[52]).

Box 6. Renewable acceleration areas: The new EU approach to permitting

The third EU Renewable Energy Directive 2023/2413 introduces the concept of renewables acceleration areas, where renewable power projects benefit from simplified permitting processes. This approach aims to speed up permitting while preserving landscape and biodiversity, in line with some international experience. For example, in the US state of California, siting PV projects in pre-defined renewable power zones with low-biodiversity value tripled permitting speed and cut project costs by 7-14% (OECD, 2024^[56]).

Under the EU Directive, permitting time limits for projects in renewable acceleration areas are brought down from two to one year for most technology. In addition, these projects, including co-located energy storage facilities and connection to the grid, are exempt from environmental impact assessment. The selection of renewable acceleration areas should prioritise artificial and built surfaces, transport infrastructure and surrounding land, industrial sites and degraded land not usable for agriculture. High-value environmental and biodiversity rich areas such as Natura 2000 sites (the EU network of nature protection areas) must be excluded. The countries’ plans identifying these areas must undergo strategic environmental assessment, and the designation process should ensure public participation. EU Member States have 27 months from the entry into force of the directive to designate renewables acceleration areas.

Source: EU Renewable Energy Directive 2023/2413 of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources.

Accelerating grid development

Romania should continue to invest in expanding electricity grid capacity and cross-border connections. Investors point to grid bottlenecks as the primary hurdle to renewable expansion, as well as export of renewable power to neighbouring countries (EC, 2023^[14]). At present, renewable electricity production has often to be curtailed to ensure grid stability. Transelectrica, Romania’s state-owned transmission system

operator, has been extending and upgrading the grid, but progress has been slow. Most investment goes into maintenance of the ageing transmission and distribution grids, often following service interruption, as opposed to digitalisation and extension of the networks (ANRE, 2023^[57]). Closing the gap created by years of underinvestment will require significant time and resources. In the interim, developers of renewables projects compete for available connection capacity. While Transelectrica has a general obligation to grant access to the grid, developers can incur in delays and additional costs, for example for grid reinforcement works (Stancu Bîrsan, Cazacu and Porojan-Gheajă, 2023^[53]). Quickly designating “renewables acceleration areas” (Box 6) would help prioritise grid developments, as has already been done in Australia, South Africa and the United States (in Texas) (IEA, 2023^[58]).

More investment in electricity storage capacity and system flexibility is also needed. This would enable better integration of variable renewable sources, such as wind and PV, reduce the need for backup generation capacity and improve the reliability of the electricity grid. Romania’s Recovery and Resilience Plan pledges to add some 240 Megawatts of storage capacity by mid-2026. The government should consider introducing incentives to encourage renewables developers to install electricity storage alongside PV and wind projects. The country should also accelerate the grid digitalisation and the smart metre rollout to improve demand response. Smart meters enable the introduction of dynamic price contracts, which encourage customers to adapt their electricity consumption to market conditions, for example to reduce consumption at peak times when prices are higher. In turn, this allows to facilitate meeting expected future high demand of electricity resulting from the progressive diffusion of electric vehicles and heat pumps. Digitalisation of the grid would also help establishing more energy communities, which are in their infancy in the country (Box 7). However, as of end-2021, smart meters covered only 18% of Romania’s households, one of the lowest shares in the European Union. The country foresees to reach an 80% coverage after 2024 (the EU target year was 2020) (ACER/CEER, 2022^[59]).

The functioning of Romanian retail energy markets could be improved with a view to increasing competition, thereby reducing prices and improving energy affordability without direct price regulation. The country’s retail markets of natural gas and electricity for residential customers are highly concentrated, with the three largest suppliers serving more than 80% of the electricity market and 90% of the natural gas demand. Prior to the introduction of the price caps, the rate at which residential customers switched suppliers was among the lowest in the European Union (ACER/CEER, 2022^[59]). Romanian households seemed to have little awareness of opportunities to make savings on their energy bills by switching suppliers, despite the availability of an online tariff comparison tool that is certified by the energy market regulator. Removing the price cap is essential to allow customers to benefit from increased competition in retail energy markets.

Improving the targeting and cost-effectiveness of support mechanisms

Romania could better target support to emerging technologies. Most renewables support has taken the form of financial contributions to capital investment in wind, solar and hydropower facilities, mainly funded through EU funds. For small-scale renewables, support includes investment grants for residential PV (via Romania’s “Casa Verde” programme) and net metering. In March 2022, Romania launched its first auction for wind and solar projects (EC, 2023^[14]), as suggested by the previous *Economic Survey* (OECD, 2022^[16]). Auctions may help minimise the fiscal cost of deploying renewables, as developers compete for power capacity allocations based on the lowest price. While auctions improve cost-effectiveness of support to renewables, Romania should over time reroute support for utility-scale projects from cost-competitive technologies such as solar, wind and hydro, towards those where cost-competitiveness remains a challenge (IEA, 2022^[37]). These include electricity storage and hydrogen.

Box 7. The benefits of energy communities and some international experiences

Energy communities or community-based energy projects (where final consumers/renewables producers gather to share electricity locally produced by renewables plants) are a means to engage citizens in the clean energy transition, encourage energy efficiency, reduce energy bills and, ultimately, improve public acceptance of renewable energy projects. Experience also shows that such projects have generated employment opportunities. Energy communities can also improve the flexibility and resilience of energy systems. Digital tools are essential for the effective management of the energy system within the community, as well as to provide participants with access to their energy production and consumption data.

In Italy, energy communities and prosumers benefit from a scheme that provides guaranteed price (EUR 100-110 per Megawatt hour) for 20 years. The country's Recovery and Resilience Plan is providing EUR 2.2 billion to public administrations, households and micro-enterprises in small municipalities to build energy communities with a goal of installing 2 Gigawatts of renewable power capacity. The energy community of Magliano Alpi in the Italian Alps was able to cover 35% of their electricity needs through solar PV systems. Increased reliance on their own generation resources during peak demand periods alleviated grid stress and helped defer expensive infrastructure upgrades.

In Perth in Australia, a battery resource shared by 119 households resulted in collective savings of over USD 52 000 during a five-year period. The battery also helped ease pressure on the grid by cutting 85% of the participants' electricity offtake from the grid at peak times.

In South Africa, the Lyndoch residential community microgrid project, which interconnected over 30 homes via a tiered grid system (from household to household, to the village, to the national grid) was the country's first smart embedded residential rooftop microgrid. The pilot project is co-owned and maintained by the utility (Eskom), but members of the community were taught and certified by industry to assume roles in the development, installation, maintenance, operation and ownership of the energy system.

Source: (IEA, 2023^[58]); (IEA, 2023^[60]).

The ongoing development of contracting arrangements to mitigate revenue volatility for renewables power producers is welcome. Electricity price volatility is set to increase with the expansion of renewables. As short-term electricity wholesale markets are based on marginal pricing (the most expensive power unit that is needed to meet demand sets the price) electricity prices can fall to zero when renewable power is abundant and rise steeply in the opposite scenario. This poses challenges for renewables producers reliant on stable long-term revenues for recovering high fixed costs (OECD, 2023^[61]). To address the issue of price volatility, a contract for difference scheme is slated for introduction in 2024, similar to schemes in several other European countries, including France, Greece, Hungary, Ireland, Italy, Poland, Spain and the United Kingdom. Contracts for difference reduce price (and therefore revenue) uncertainty for renewable generators by providing a guaranteed (strike) price for the electricity produced. The government provides subsidies if the wholesale market price falls below the strike price and requires payment if the price exceeds the strike price. The contracts for difference are expected to be funded (at least in part) through a levy applied to all final customers.

In a welcome move, in 2021, Romania reopened the possibility of long-term contracts between electricity users and producers (power purchase agreements), following a 10-year ban. These contracts are a market-based approach to mitigate buyers and sellers' exposure to price volatility. However, only a few agreements have been concluded so far due to heightened energy price uncertainty amid successive crises (COVID-19, Russia's war of aggression in Ukraine). The ceilings on wholesale and retail electricity prices – in place since January 2023 – will have also reduced the gains from striking such agreements (see above).

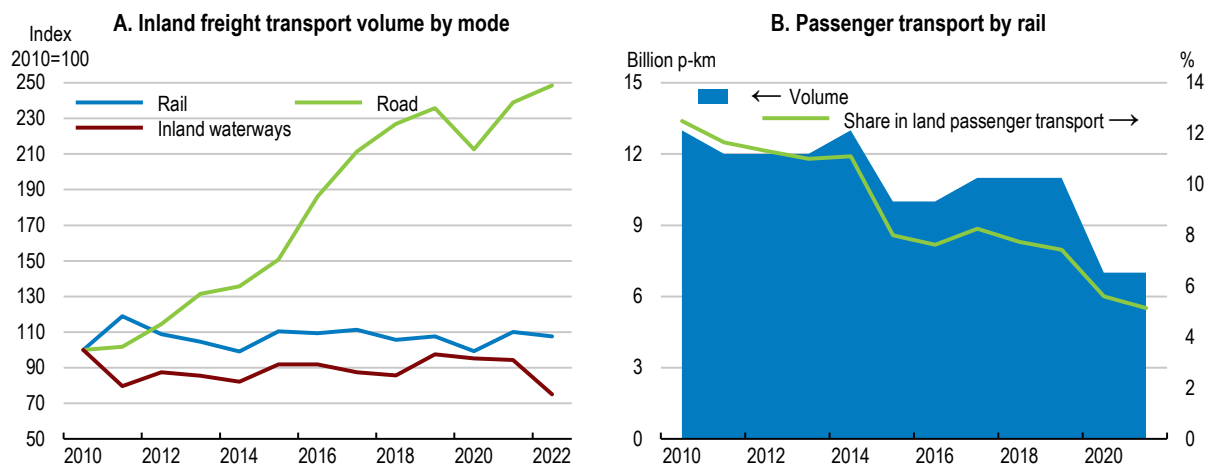
Setting the groundwork for low-emission transportation

Decarbonising Romania's transport system requires large investments and more cost-effective incentives. In its climate-neutral scenario, the Long-term Strategy calls for GHG emissions from transport to decline by 10% in 2021-30 to get on the net-zero pathway (Government of Romania, 2023^[2]). However, transport emissions are projected to rise by 20% in the same period (Ministry of Environment, Water and Forests, 2023^[3]), even with full implementation of ongoing and planned reforms and investments (Box 2). GHG emissions from transport rose in the last two decades, and by more than in any other sector of the economy (Figure 2), reflecting increasing economic activity, road freight and household income, as well as a growing and ageing vehicle fleet. Like everywhere, private cars and freight vehicles generate the bulk of transport emissions (UNFCCC, 2023^[62]).

Large infrastructure gaps hinder transport decarbonisation

As discussed in the previous *Economic Survey*, Romania's transport infrastructure still lags most OECD countries (OECD, 2022^[16]). Motorway density is low, with insufficient connections in rural regions. Nearly all roads are single-lane, resulting in extended transport times and heightened safety risks. Nonetheless, freight shipping by road remains faster than by rail and the preferred option by businesses. Indeed, freight transport by road has grown considerably (Figure 15, panel A), to account for 70% of freight movements in the country.

Figure 15. Rail transport is losing ground to driving



Note: Panel A: index of transport volume as measured in tonne-kilometres. Panel B: passenger transport volume measured in passenger-kilometres.

Source: Eurostat; and Odyssee-Mure.

The rail network is extensive, but train services are inefficient due to underinvestment and inadequate maintenance. Less than 40% of rail lines are electrified and most are single-track. Few passenger rail lines can compete with road travel, such as the route between Bucharest and Constanta (the largest city on the Black Sea coast). Travelling by rail between Bucharest and other major Romanian cities, such as Cluj-Napoca and Timisoara, typically takes nearly twice as long as driving. Rail passenger traffic has steadily declined both in volume and as share of total land transport (Figure 15, panel B).

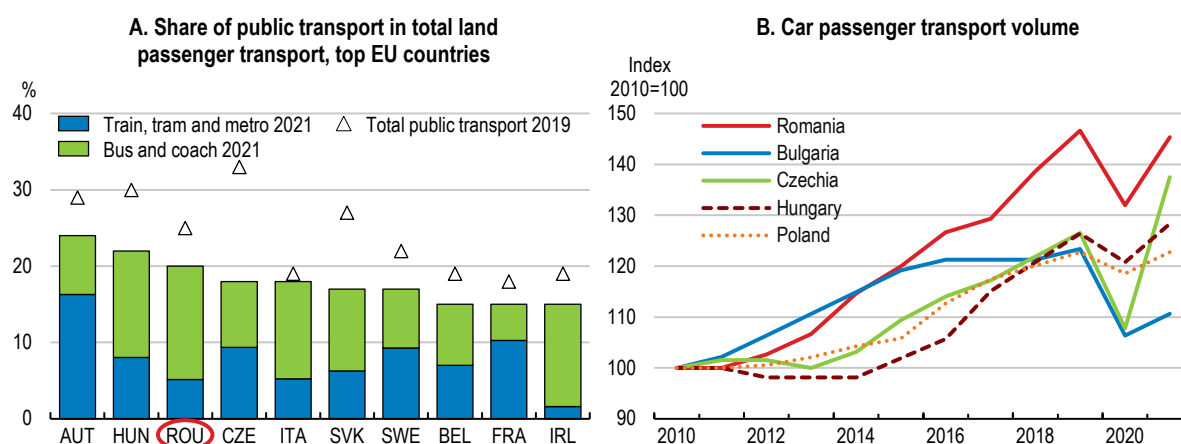
Addressing rail infrastructure shortcomings would support modal shift towards rail and help curb GHG emissions from transport. The Recovery and Resilience Plan allocates about EUR 3.5 billion to the modernisation and electrification of railway infrastructure and rolling stock. The government should ensure

that these funds are efficiently spent. As the previous *Economic Survey* highlighted, weak infrastructure planning and project design along with inefficient public procurement contribute to Romania's underinvestment in transport networks (OECD, 2022^[16]). The Ministry of Transport has consistently underspent relative to budget allocations (World Bank, 2023^[63]), although spending of EU funds for transport infrastructure has accelerated recently. Improving administrative capacity and reducing political interference in project selection (OECD, 2024^[13]) will be key to achieving higher-quality transport infrastructure.

Enhancing urban mobility systems is a top priority

As in many other countries, transport within and between Romania's urban areas must undergo large structural changes to reduce overreliance on personal cars and reverse the erosion of public transport usage (OECD, 2021^[40]). The country's public transport, mostly by bus, is more used than in other EU countries (Figure 16, panel A). However, development of and access to public transport vary considerably across cities and between urban and rural areas (EC, 2023^[14]). The share of public transport in total passenger trips declined in the last decade – particularly in the wake of the COVID-19 pandemic – while travel by cars rose more than in regional peers (Figure 16, panel B). In 2021, the use of public transport had not yet recovered to pre-pandemic levels (Figure 16, panel A). Road trips in single-occupancy cars make up for most passenger transport in Romanian cities. In addition to generating GHG emissions and air pollution, these mobility patterns have increased traffic congestion and accident risks. Romania has the highest number of road fatalities per capita in Europe, including for cyclists and pedestrians. This, in turn, discourages walking and cycling. Active mobility in Bucharest is estimated to make up 16% of urban trips, below levels in other European capital cities (Rudolph and Amon, 2019^[64]).

Figure 16. Public transport is widely used, but its role has declined to the benefits of private cars



Note: Panel B: index of car transport volume as measured in passenger-kilometres.

Source: Odyssee-Mure.

Investing in extended and electricity-based public transport systems would help reduce car dependence, ensure access to affordable mobility and avoid exacerbating inequality. Lower income households tend to rely on public transport and walking. In 2022, 19% of Romania's households declared they could not afford a personal car, the highest share in the European Union (Eurostat, 2023^[65]). Planned investments in metropolitan trains, urban public transport and cycling and walking infrastructure are welcome. The Recovery and Resilience Plan allocates EUR 1.8 billion to finance part of these investments.

Better integration of public transport systems could increase use. Public transport should evolve towards a Mobility-as-a-Service model that combines various transport modes (e.g. bus, metro, carsharing, biking, taxi) into a single, accessible and user-friendly system, including an integrated digital platform. This would

increase the attractiveness of public transport and active mobility as part of an interconnected network of mobility services (ITF, 2021^[66]). Several cities, including the capital Bucharest, have not yet fully integrated public transport services. Two companies operate Bucharest's extensive bus/tram and metro networks independently of each other, with a lack of transport interchanges. There has been some progress in integration. For instance, in 2021, the companies introduced a unique ticket for travel on both networks alongside their separate tickets. The Bucharest-Ilfov Public Transport Intercommunity Development Association, established in 2017 to oversee the country's largest public transport system (2.5 million passengers per day), has largely focused on the procurement of tram and bus services. The capital city and its surrounding county would benefit from developing the association into a fully-fledged metropolitan transport authority akin to those in Barcelona, London and Paris, for instance. Such authorities co-ordinate planning, investment and operation of transport infrastructure and services and have contributed to significantly improving public transport efficiency, attractiveness and usage (ITF, 2018^[67]).

The new Law on Sustainable Urban Mobility (2023) is a step in the right direction and should be implemented without delay. This legislation aims to fill a longstanding gap in integrated urban and transport planning, which has allowed urban sprawl and unsustainable mobility patterns to continue. Less than half of Romania's urban municipalities have developed the Sustainable Urban Mobility Plans, despite these being required by law since 2001. Information about these plans' implementation and effectiveness is scarce (Andrei and Luca, 2022). The new law creates a national commission to provide technical support to municipalities for the development and implementation of the Sustainable Urban Mobility Plans. There are concerns about how the new plans will be coordinated with municipalities' general urban plans, many of which are outdated. Bucharest has been lacking such plan since a judicial decision in May 2022.

More can be done to manage demand for car travel so as to reduce congestion and emissions. Parking fees are low in Romanian cities and should be raised to discourage car trips. The Law on Sustainable Urban Mobility also opens the possibility of establishing low-emission zones in large urban areas. By banning polluting cars in certain parts of a city and certain times of day, low-emission zones encourage a shift to other types of transport. They can also accelerate a transition to lower-emission vehicles (see below). Such zones exist in several European cities, such as Amsterdam, Berlin and Madrid. Local governments should consider associating congestion charges to low-emission zones, as done in London and Milan. Congestion charges raise the cost of driving, discouraging unnecessary trips, reducing traffic congestion and improving driving conditions for both paying drivers and public buses. A pilot charging system – as implemented in Milan, for example – should be considered to showcase the benefits of the system and gain citizens' support (OECD, 2024^[68]). Parking and congestion charges can also become a considerable revenue stream for local governments.

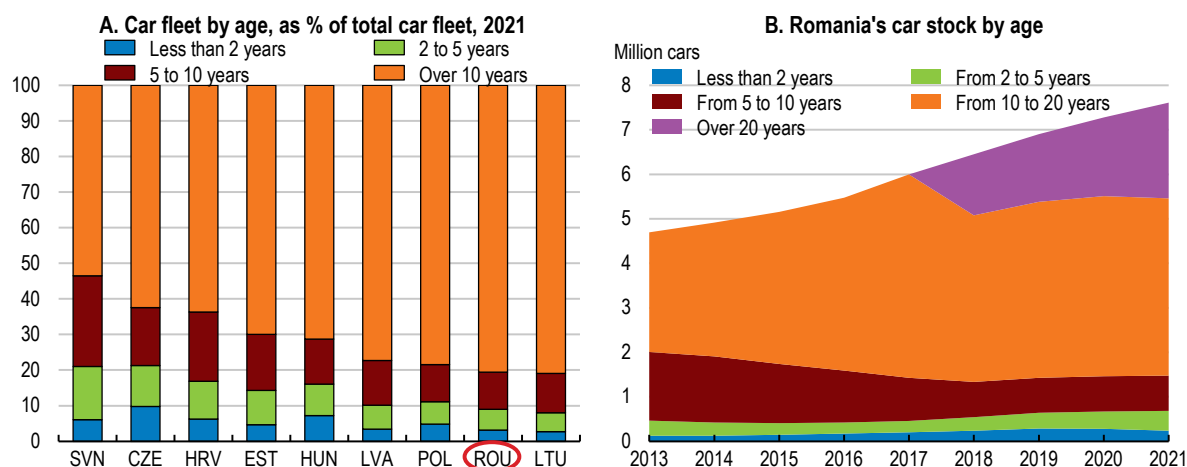
Outside urban centres, road tolls would help manage demand for driving on specific roadways or during particular times. Road tolls in Romania are fixed amounts paid per week, month or year of driving on non-urban roads, therefore providing little incentive to drive less and use alternative modes of transport. Starting from 2026, the vignette prices for passenger cars and light-duty vehicles are scheduled to vary based on the vehicle's emission category, while distance-based electronic tolls will apply to heavy-goods vehicles only. Looking ahead, Romania could benefit from a system of road tolls based on global navigation satellite system technology. Such systems apply different rates based on multiple factors including distance travelled, location and time, and the emission performance of both passenger and freight vehicles. This allows to reflect the various externalities of car use, including air pollution, road wear and tear, and accidents. Revenue from road tolls and congestion charges can in future help replace transport fuel tax revenues, which will decline with progressive electrification of the vehicle fleet (van Dender, 2019^[31]).

Better price signals and charging networks are needed to transition to electric vehicles

Car ownership is expected to continue growing as Romania's income levels rise further. The country's car fleet grew by 75% in 2010-21 (Figure 17, panel B). Still, at 400 cars per thousand inhabitants, Romania's

car ownership rate is the lowest in the European Union. Many vehicles are second hand, making the country's car fleet one of the oldest – and in turn most emission-intensive – among regional peers and in the European Union (Figure 17, panel A).

Figure 17. The car fleet is expanding and ageing



Note: Panel A: Centre and Eastern European countries. Panel B: data on cars older than 20 years are available from 2017; prior to 2017 the category of 10 to 20 years includes cars aged over 20 years.

Source: Eurostat.

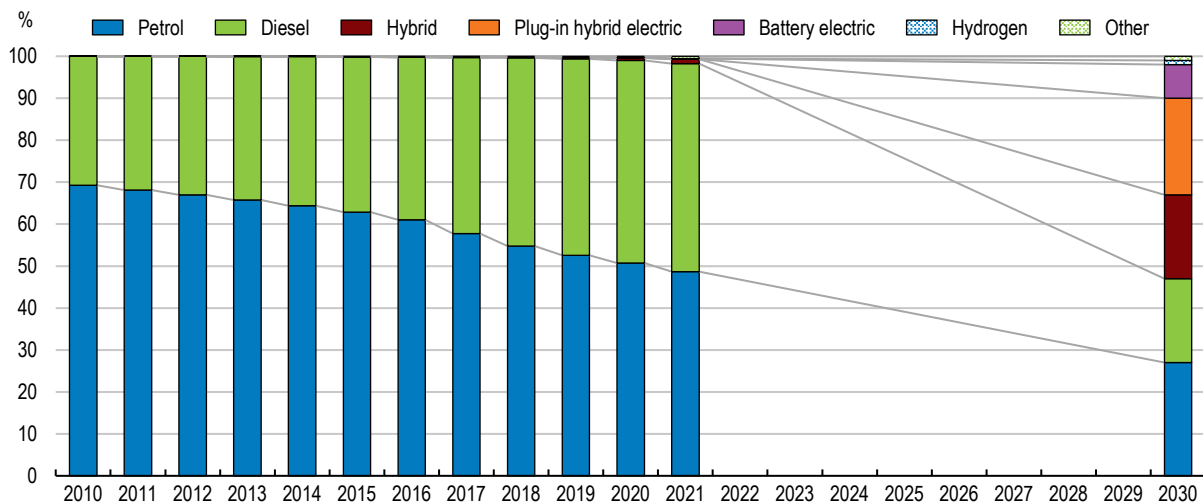
Romania's strategy to decarbonise transport depends on fast renewal of the vehicle fleet and a shift to electric mobility. According to the Long-term Strategy's carbon-neutral scenario, 31% of the car fleet will have to be electric by 2030 to abate GHG emissions from transport in line with a net-zero trajectory (Figure 18). The Strategy's modelling also envisages a renewal of bus and commercial vehicle fleets favouring hybrid, electric or hydrogen-fuelled vehicles. These vehicle categories would have to jointly reach 52% of the bus fleet and 42% of freight vehicles by 2030, from virtually zero today.

A steep acceleration in uptake of electric cars is needed. Electric cars make up less than 1% of Romania's vehicle stock, among the lowest shares in the European Union. Activity in the Romanian electric vehicle market has picked up recently. Sales of electric cars grew from virtually zero in 2015 to 9% of new car sales in 2022. This share is less than half the EU average (22%) but above that of other Central and Eastern European countries (Figure 19, panel A). Romania shares with other emerging economies some challenges to develop electromobility, including weak electricity grids (see previous section) and reliance on second-hand vehicles (IEA, 2022^[69]).

Higher and better designed fuel and vehicle taxes are needed. This will stimulate the renewal of the car fleet towards less carbon-intensive vehicles, including electric cars. As fuel taxes are relatively low and not based on a fuel's carbon content, they provide little incentive to purchase lower-emission vehicles. Low taxation of diesel has stimulated a shift to diesel-fuelled cars with negative impacts on CO₂ and local air pollutant emissions. As in many countries, electric vehicles are exempt from Romania's annual ownership tax. However, unlike practices in most EU countries, vehicle taxes are not directly tied to emissions of CO₂ or local air pollutants (the annual ownership tax is based only on engine capacity and the acquisition tax is a fixed fee). Partly because of these weak incentives, newly registered cars in Romania tend to be more carbon-intensive than in most EU countries (Figure 19, panel B). The Recovery and Resilience Plan announces the reform of taxes on vehicles in line with their environmental performance. This is welcome and should be pursued.

Figure 18. A massive shift to alternative fuel cars is needed to advance on the net-zero path

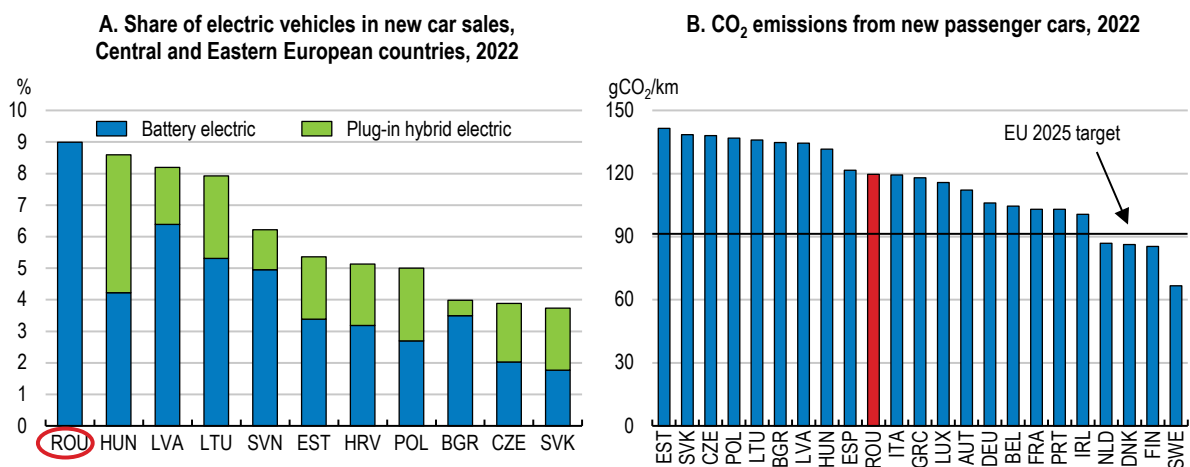
Composition of the passenger car fleet by fuel, historic trend and Long-term Strategy 2030 milestone



Note: Other includes cars fuelled by liquified petroleum gas, compressed natural gas and bi-fuel cars.

Source: (Government of Romania, 2023^[2]); and UNECE Transport Statistics database.

Figure 19. Despite high electric car sales, new cars are carbon-intensive in international comparison



Note: Panel B: emission levels based on the WLTP (Worldwide harmonized Light vehicles Test Procedure).

Source: European Environment Agency (2023), Monitoring of CO₂ emissions from passenger cars; European Automobile Manufacturers' Association.

The authorities should consider revising the long-standing car scrapping programme "Rabla", which subsidises the purchase of new vehicles in exchange for scrapping older ones (Box 8). The programme has been renewed over time to support progressively cleaner vehicles, including electric cars, but it has not succeeded in renewing the fleet. The average age of the car stock has continued to rise, with 28% of cars being over 20 years old (Figure 17, panel B). Nonetheless, with its generous subsidies for electric vehicles, the programme led to a boom in electric car sales to 12% of all new cars as of October 2023. Until December 2023, the Rabla programme provided among the highest subsidies for purchasing electric vehicles in the European Union (Box 8). The government cut the subsidies by 80% starting in 2024.

However, the Rabla programme still supports the purchase of internal combustion engine cars with emission levels that are above the average for new cars sold in every country in the European Union, which is inconsistent with climate mitigation objectives (Box 8) (Figure 19, panel B). Vehicle scrapping schemes are generally costly and inequitable ways to abate CO₂ and pollutant emissions, as they tend to benefit people who would buy a car and scrap their old one even without the subsidy, just a bit later in time (Buckle et al., 2020^[70]) (Linn, 2020^[71]). Only households who can afford to purchase a new vehicle and that already own cars can benefit from these subsidies. Scrapping programmes also tend to lock people into car-dependent transport systems and to increase the number of cars on the roads (OECD, 2021^[40]). To partially address these problems, the authorities could consider a scrapping programme that exchanges an old car for a subsidy for the purchase of an electric bike (as done in France) or a subscription to public transport and shared-mobility services (as done in Canada's British Columbia).

Box 8. Romania's long-standing car scrapping programme

The Rabla programme offers subsidies for the purchase of a new vehicle in exchange for scrapping one or two cars that have been registered in Romania for at least six years. The subsidy amount increases with the environmental performance of the new car, as well as with the number, age and pollutant emission levels of the scrapped old vehicles.

In 2023, the minimum level was RON 6 000 (EUR 1 200) for the purchase of a car emitting between 120g and 160g CO₂/km. This increased to RON 7 500 (EUR 1 500) for cars emitting up to 120g CO₂/km; RON 9 000 (EUR 1 800) for a hybrid vehicle; RON 26 000 (EUR 5 200) for a plug-in hybrid electric car; RON 51 000 (EUR 10 200) for a battery electric car. There were additional bonuses for scrapping vehicles older than 15 years complying with Euro 3 emission standards or lower; scrapping two vehicles; or purchasing a car running on liquefied petroleum gas or compressed natural gas. In 2023, in countries that are members of both the European Union and the OECD, subsidies for electric vehicles ranged between EUR 3 000 in Austria, Italy and Portugal to EUR 9 000 in Greece and Luxembourg.

A new version of the Rabla scheme was introduced in 2023. The system is co-financed by the Environment Fund Administration and the 500 participating municipalities (out of about 3 000 local governments), for a total national budget of RON 240 million (EUR 49 million). The programme offers a subsidy of RON 3 000 (EUR 600) in exchange for scrapping a vehicle older than 15 years, with no obligation of purchasing another car. The beneficiary commits to not purchasing a car complying with Euro 5 and/or lower emission standards within three years of receiving the scrapping incentive. It is not clear how this commitment will be enforced. As the Euro 5 standard entered into force in 2009, the system allows to purchase an old and high polluting car. For comparison, the stricter Euro 6 standard has been in place in the European Union since 2015, and the more demanding Euro 7 standard is scheduled to become effective in mid-2025.

Source: European Automobile Manufacturers' Association; Romanian Environmental Fund Administration.

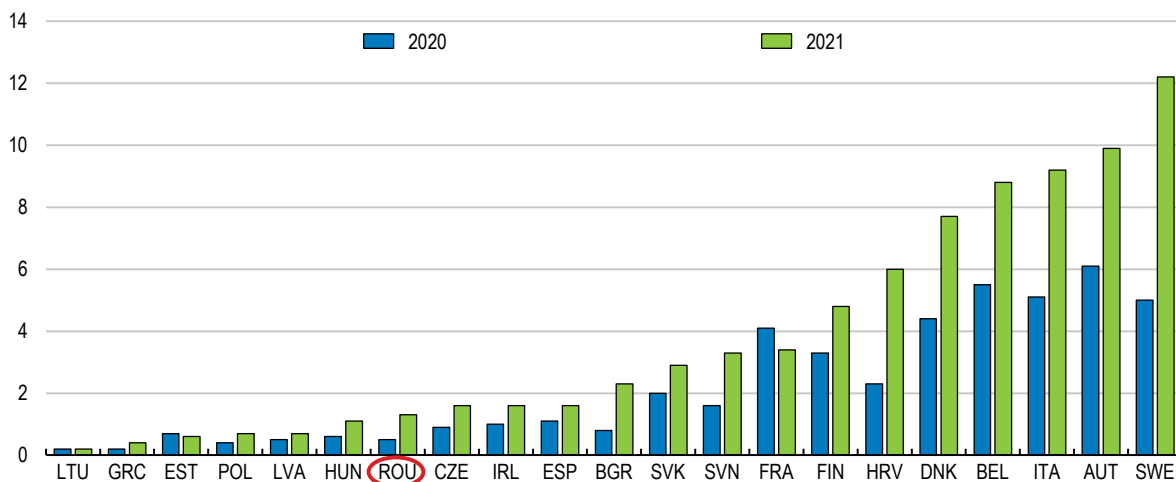
Nonetheless, subsidies to electric vehicles may still be necessary while there remains a cost gap with traditional cars. The authorities should limit eligibility for Rabla subsidies to electric vehicles and cars with CO₂ emissions lower than average emissions from new cars registered in Europe (108.2 gCO₂/km in 2022). To mitigate the regressive impact of electric vehicle subsidies, the subsidy amount could be higher for low-income purchasers, as done in France, or the government could fund concessional loans for low-income households, as in Scotland. As the country's electric vehicle market matures, purchase subsidies should be accompanied and progressively replaced by higher taxation of internal combustion engine vehicles (see above). This should aim to reduce the difference in purchase price or lifetime cost between electric and traditional cars. France, for example, applies a bonus-malus system combining a subsidy for the purchase of electric vehicles and a heavy tax for the registration of high-emitting cars. Reducing and better targeting

subsidies to vehicle purchase would free up resources that could be repurposed, for instance towards charging infrastructure and electric buses.

Development of Romania's charging-point network needs accelerate. The density of charging stations has increased but remains among the lowest in the European Union (Figure 20), with most pronounced gaps in rural areas. The government is taking steps to address this issue by providing funding for public charging infrastructure and for home charging, including via the Recovery and Resilience Plan. Subsidising charging stations with vehicles for short-term renting (carsharing) could improve access to electric vehicles for low-income households, who are less likely to own a car (Nicholas and Bernard, 2021^[72]).

Figure 20. Romania has expanded EV charging infrastructure but lags other EU countries

Number of electric vehicle charging stations per 100 km of roads



Note: For better readability, the chart excludes Netherlands, Luxembourg, Germany and Portugal, which all had more than 20 charging points per 100 km of roads. The 2021 value were respectively: 64, 58, 26 and 25 electric vehicle charging stations per 100 km of roads.

Source: European Automobile Manufacturers' Association.

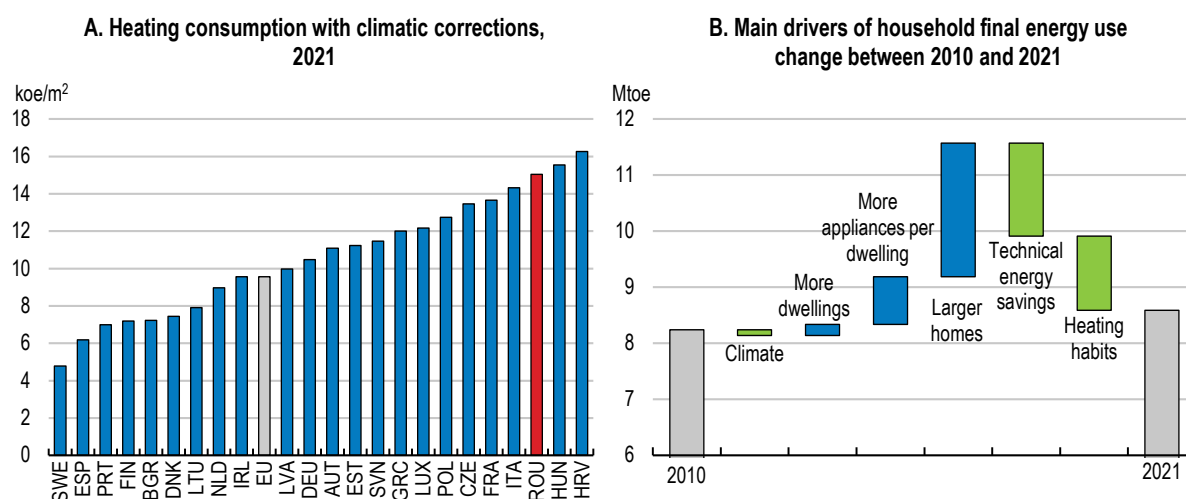
Making buildings less energy- and carbon-intensive

Decarbonising Romania's homes and other buildings is imperative yet challenging. Romania is one of the few EU countries where emissions from residential, commercial and public buildings increased over the period from 2005 to 2021 (EEA, 2023^[73]) (Figure 2, panel B). Higher living standards and increased household energy use were among the main drivers of this trend (Figure 21, panel B). People's homes are responsible for over 80% of GHG emissions and energy consumption from buildings. The full implementation of reforms and investments planned in the Recovery and Resilience Plan (Box 2) is expected to contribute to reducing these emissions. However, the projects in train are insufficient to meet the ambitious energy savings targets in the revised Energy Efficiency Directive (2023) or get Romania onto the net-zero pathway outlined in its Long-term Strategy. The Strategy calls for a 22% cut of emissions from buildings over 2021-30 to be on the net-zero path (Government of Romania, 2023^[2]).

Improving the energy efficiency of existing residential buildings and switching to low-carbon heating and cooling systems would generate large energy savings and GHG emission reductions. It would also help containing households' energy bills and make buildings more resistant to the rising temperature expected with climate change (see last section). While new buildings have had to meet near-zero-energy standards since 2021, most existing homes are highly energy-intensive. Many also need maintenance and improvement of sanitation conditions (EC, 2023^[14]) (OECD, 2022^[16]). Heating accounts for two-thirds of

energy use in Romania's dwellings. Energy use for home heating, per square meter, is among the highest in the European Union (Figure 21, panel A). This is mostly due to inadequate building insulation, inefficient heating systems and an old housing stock – built mostly before the introduction of strict thermal standards. The heating needs of larger homes and greater use of electrical appliances drove up households' energy use. Technical energy savings and changes in heating habits only partly offset the increase (Figure 21, panel B).

Figure 21. Heating consumption in residential spaces is high and increasing



Note: Panel A: The graph shows unit consumption of energy for space heating in buildings, adjusted for climate variations across countries and years. Panel B: technical energy savings refer to improved specific energy performance of equipment and buildings.

Source: Odysee-Mure.

Removing impediments to renovations is crucial

Romania needs to accelerate the pace of building renovation. Its National Long-term Renovation Strategy aims to retrofit 77% of the building stock by 2050. Low-interest loans and grants have been available for several years to encourage thermal rehabilitation of the housing stock. However, the co-existence of multiple programmes, complex procedures and weak administrative capacity have hampered investments (OECD, 2022^[16]). Only 0.5% of the building stock was retrofitted each year in the last decade. The annual renovation rate needs to increase to 3.4% this decade and rise further after that. The total investment needs are massive – estimated at EUR 12.8 billion (or 4.5% of 2022 GDP) in 2020-30 alone.

As in other countries, high upfront costs and long payback periods deter homeowners from initiating energy-saving renovation projects in Romania. Over 95% of the country's dwellings are occupied by their owners (OECD, 2024^[13]). In theory, this makes the problem of split incentives to energy-efficient renovation less relevant for Romania and facilitates home improvement decisions, as the owner-occupier bears the investment costs and reaps benefits from reduced energy bills and higher property value (Hoeller et al., 2023^[74]). However, the prevalence of informal rental agreements intensifies the split incentive problem in Romania's small rental market, while many low-income homeowners likely have limited borrowing capacity (OECD, 2024^[13]). Renovating multi-apartment blocks presents the additional complexity of balancing diverse preferences and financial contributions of multiple homeowners. As in other countries, at least two-thirds of owners need to agree for renovations to be undertaken in multi-apartment buildings, which is often an unachievable threshold. Lowering voting requirements to a simple majority, as done in Austria and Lithuania, could expedite decision making (Hoeller et al., 2023^[74]). In Lithuania, social benefits, such as heating aid to low-income households, are made conditional on a household's agreement to multi-

apartment building renovation. Mechanisms to facilitate agreement on renovation works should be coupled with easier access to financial assistance for low-income owners (see below).

To address the financial and collective decision-making challenges of renovating multi-apartment buildings, the Recovery and Resilience Plan establishes a Renovation Wave Fund worth EUR 2.2 billion to finance the energy and seismic renovation of about 5 million square metres of multi-household buildings and public buildings (EC, 2023^[18]). The fund deviates from the legislative requirement for owner associations to cover at least 10% of renovation costs. It provides non-refundable grants that cover the full cost of the works. This approach is very costly. Since homeowners do not directly incur the expense of the interventions, demand is likely to be high. Given capacity constraints in the construction industry, there is a risk of subpar interventions and inflated pricing by builders.

In most countries, government support for building renovations is generally capped as a level or percentage of costs (Hoeller et al., 2023^[74]). The Romanian authorities should consider following this approach in a more consistent manner across programmes, so that owners have a stronger financial stake in projects. Ideally, part of the support should be provided via concessional or guaranteed loans, while grants should prioritise lower-income households. These are more likely to occupy poor quality homes and are less likely to undertake renovations without significant assistance. Income-based eligibility criteria could help target support. This is done in France (Box 9). The current subsidy programme for multi-apartment blocks ultimately favours urban dwellers, who mostly live in flats (Figure 22, panel B). In 2024, a new grant programme for renovating single-family houses is set to be introduced, with priority given to vulnerable energy consumers. This is a step in the right direction, as two-thirds of Romania's population and 90% of lower-income households live in single-family houses (Figure 22).

There is a need to improve data on buildings and energy use, as well as the administrations' capacity to monitor implementation of subsidised energy efficiency projects and realised efficiency gains. This would help design better policies, including financial support mechanisms. It would also support ex post assessment of a program's cost-effectiveness, permitting adjustments as necessary. The Long-term Renovation Strategy envisages establishing a database of energy performance certificates tied to the national digital register of buildings, currently under development. Energy performance certificates are mandatory for renting or selling a dwelling but have been considered a formality rather than a helpful guide in real estate transactions. This reflects inconsistent measuring approaches and low data credibility (Buildings Performance Institute Europe, 2018^[75]). A 2023 regulation aims to improve the certificates, by upgrading the methodology for energy intensity calculation and including different pollution classes for buildings. Local authorities will have the possibility of reducing property taxes based on a building's energy efficiency rating. However, for the new certificates to work effectively, the digital cadastre will have to be completed. This will provide greater certainty in real estate transactions and, in turn, help attract investment in energy efficiency. In addition, the prevalence of informality in the rental market undermines the effectiveness of energy performance certificates, while bounding tenants to homes with higher energy consumption. Promoting formalisation of rentals (OECD, 2024^[13]) could enhance the effectiveness of energy efficiency regulations, benefiting both landlords and tenants (higher rentals for landlords and lower bills and better comfort for tenants).

Other non-financial barriers must be addressed to accelerate energy-efficient building renovations. These include insufficient awareness and information about energy-efficient solutions and benefits and a shortage of workers with expertise in renovations. Romania could disseminate information through awareness raising campaigns and regional or local one-stop-shops for energy renovation, as envisaged by the Long-term Renovation Strategy. One-stop-shops exist in Austria, France, Germany and the Netherlands, among other countries, and provide a range of services to homeowners, including energy audits, financing advice, project management and monitoring. The target of approving the legislation for one-stop-shops by March 2024 is welcome, but practical implementation should follow suit. The energy market regulator provides online information for consumers on how to reduce energy consumption. However, many households lack

information and control over their own energy use and expenses, which discourages energy-efficiency investments. For instance, in multi-apartment buildings, heating bills are often for the entire building rather than for each individual housing unit.

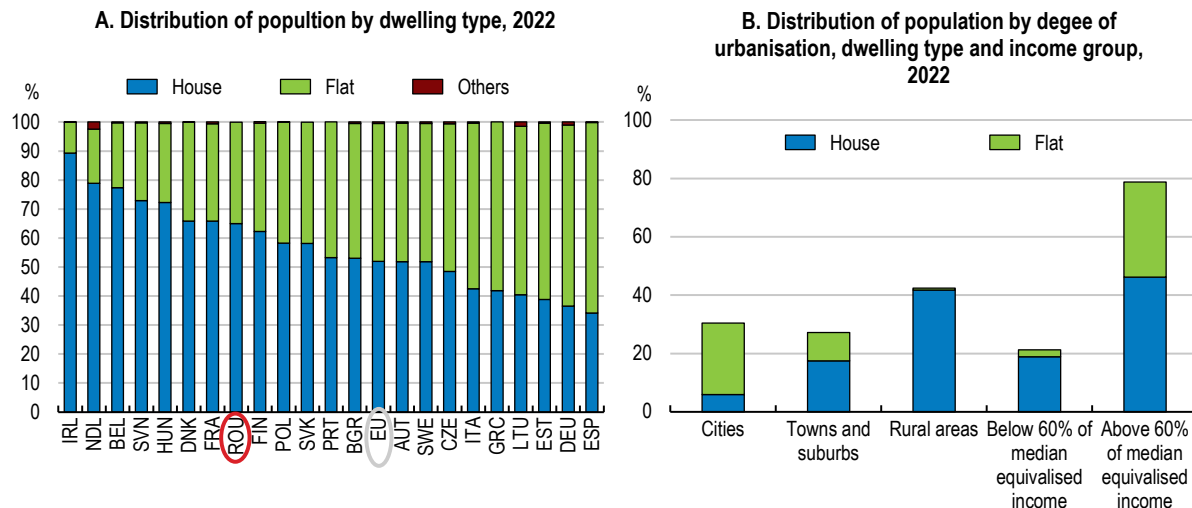
Box 9. Targeting renovation subsidies to low-income households

If poorly targeted, subsidies for energy renovation can disproportionately support housing upgrades for higher-income homeowners. This is unfair and inefficient, as higher-income households are better able to afford investments without support and stand to benefit from it already. In contrast, lower-income households are less likely to undertake renovation projects without assistance. Distortions are more likely when subsidies are provided as non-refundable tax credits (i.e. the maximum value of the credit cannot exceed the recipient's tax liability, which is generally lower for low-income earners).

Introducing income-based eligibility criteria or providing refundable tax credits can better target support for energy renovation. This would be more effective in countries like Romania, where most low-income households own their own home. France's programme "MaPrimeRénov" offers higher grants for retrofitting projects carried out by lower-income households (up to EUR 10 000 per project) and an advance payment for the lowest income households. As a result, lower-income households accounted for two-thirds of the applications for funding received between April 2020 and June 2021. Nearly 300 000 applications were accepted in the same period, for a total of EUR 862 million.

Source: (Hoeller et al., 2023^[74]) and (OECD, 2022^[76]).

Figure 22. Most of Romania's population live in single-family houses, except in cities



Source: Eurostat.

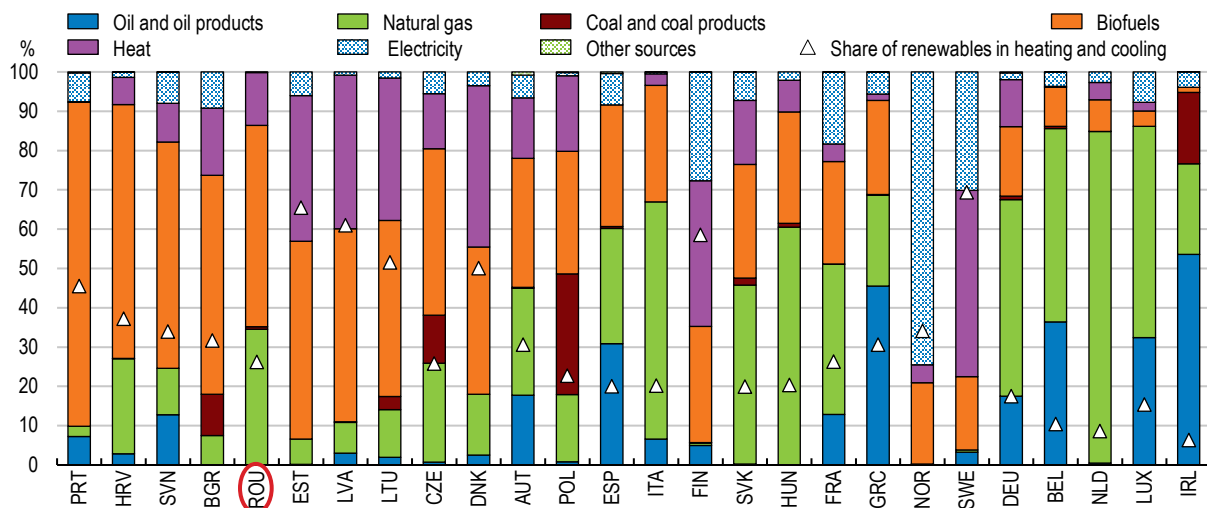
Accelerating the rollout of smart meters for heat, as well as electricity, would provide accurate data about energy consumption. More generally, by improving price and consumption awareness, smart meters are known to encourage energy-saving, including through regulation of indoor temperatures. Hence, they also help address potential "rebound effects" - the tendency to increase energy use, offsetting energy bill savings achieved through efficiency improvements. As mentioned above, regulated retail energy prices for households hinder the effectiveness of smart metres, as well as of energy efficiency regulations and subsidies more generally.

Moving away from firewood- and gas-based heating would provide multiple benefits

Romania needs to move away from wood-based fuel and natural gas for heating to renewables and electricity. Such fuel switch would complement the impact of thermal building retrofitting on reducing energy needs for heating and cooling. The 2023 draft National Energy and Climate Plan aims for renewable energy to meet 36% of energy consumption needs for heating and cooling by 2030. Renewables account for a quarter of thermal energy use (Figure 23), a share that has changed little in the last decade. Nearly all of this renewable energy is in the form of traditional woody biomass, mainly firewood. Firewood is the country's main source of energy for residential heating, covering over half of home heating needs (Figure 23). About half of households use firewood for heating or cooking, a share that reaches 90% in rural and remote areas, where natural gas networks are absent (OECD, 2022^[16]). This is common to other Central and Eastern European countries (Figure 23).

Figure 23. Woody biomass is the dominant renewable energy source used for residential heating

Residential heating by energy source and share of renewables in final energy consumption for heating and cooling, 2021 or latest available year



Source: Eurostat; IEA Energy end-uses and Efficiency Indicators database.

Widespread burning of woody biomass generates several problems in Romania, as the 2023 draft National Energy and Climate Plan acknowledges. A large proportion of firewood is sourced informally and burned in inefficient domestic wood stoves – a major source of indoor air pollution with significant health impacts in Romania (EPG, 2023^[43]) (OECD, 2022^[16]). As trees and other vegetation absorb CO₂ from the atmosphere, harvesting wood means reducing carbon sink capacity, in addition to affecting the integrity of ecosystems. Burning wood immediately releases CO₂ in the atmosphere, while reforestation takes time. Hence, depending on the time needed for reforestation and the type of wood, emissions may increase for decades before they are reabsorbed (OECD, 2023^[61]). Like other countries, Romania needs to carefully balance trade-offs between using biomass for heating and the need to increase land carbon sinks and protect biodiversity (EEA, 2023^[77]) (see above).

More should be done to promote solar and heat-pump heating systems. The 2023 draft National Energy and Climate Plan foresees heat pumps to provide a quarter of thermal energy needs in Romania by 2030, from virtually zero today. Heat pumps and solar thermal technology offer more sustainable alternatives for decarbonising residential heating and cooling than combustion of biomass and gas boilers (EEA, 2023^[77]). Heat pumps are a particularly viable heating solution for single-family houses, the dominant dwelling type

in Romania (Figure 22). Solutions are needed to get past high upfront cost of heat pumps. The government should consider a programme of investment subsidies or loans to support the installation of solar collectors and heat pumps, as support for these investments has so far been limited (EC, 2023^[14]). Financial support would complement reforms to remove favourable tax treatment of heating fuels, including firewood. The availability of low-priced, unregulated firewood discourages energy-efficient renovations and fuel switches in rural areas.

Enhancing the use of district heating (centralised heating systems serving multiple buildings) could also facilitate the integration of renewables into the heating energy mix. Countries with a higher share of renewables in heating and cooling (in industry, services and residential) often use a mix of biofuels and renewable waste to produce heat that is distributed to buildings (Figure 23). The use of district heating dramatically declined in the last two decades in Romania. As in other Central and Eastern European countries, in Romania many urban district heating systems and distribution networks are old, poorly maintained and marred by heat losses (Miu, Nazare and Diaconu, 2022^[78]). They need urgent upgrades to become more efficient, flexible and integrate increasing share of renewables and waste as required by the recast Energy Efficiency Directive (2023). However, modernising these systems is complex and costly (Miu, Nazare and Diaconu, 2022^[78]). The Recovery and Resilience Plan envisages a reform of district heating by developing flexible and highly efficient gas-fired electricity and heat cogeneration, with at least 300-Megawatt electricity production capacity.

Policy also needs to look toward eventual phase out of natural gas heating. In addition to high costs in rural areas, plans to develop the country's gas heating network risk locking households into fossil-fuel-based heating systems. A phase out of gas-fired heating should be considered (IEA, 2022^[37]). Initially, the ban on gas boilers could apply to new homes and then gradually extend to all buildings, as done in Denmark, Germany, Ireland and the Netherlands. For existing buildings, a targeted boiler scrappage scheme could accelerate retrofits.

Policy options for abating emissions from industrial processes, agriculture and waste

More efforts are also needed to reduce emissions beyond energy use. Just above one-third of Romania's GHG emissions arise from industrial processes, agriculture and waste (Figure 3, Panel B). Emissions from chemical reactions in industrial processes, for example when producing cement or steel, are mostly covered by the EU Emissions Trading System (ETS). Gradually rising carbon prices under the EU ETS are expected to encourage emission reductions in these sectors. Low-carbon hydrogen (Box 5) and carbon capture utilisation and storage (CCUS) technology provide ways to decarbonise some heavy industries (IEA, 2023^[45]). The Long-term Strategy envisages using CCUS to capture half the emissions from cement manufacturing. Romania's large estimated CO₂ storage potential, extensive national network of oil and gas pipelines and expertise in fossil fuel extraction put the country in a favourable position to deploy CCUS technology (EPG, 2021^[54]). However, progress on CCUS has been slow in Romania, as in most of the world (IEA, 2023^[45]). No projects have emerged since 2012, when Romania's only proposal for a CCUS demonstrator was halted. Romania has done less than other countries to provide financial support for capital-intensive CCUS projects or to establish a robust regulatory framework to manage their potential liabilities associated with the long-term risk of leakage or release of captured CO₂ (EPG, 2021^[54]).

With 17% of GHG emissions arising from agriculture (Figure 3, Panel B), Romania has one of the highest shares of agricultural emissions in the European Union (EU average is 11%) (OECD, 2023^[79]). Agricultural emissions are projected to increase by 2030, even with the implementation of new measures (Ministry of Environment, Water and Forests, 2023^[3]). In 2021, they were almost equally split between methane from enteric fermentation (i.e. cattle) and nitrous oxide from the application of fertilisers on agricultural soils. Policies to mitigate emissions include financial and technical support to adopt more climate-friendly farming

practices – such as improved soil and manure management, changing animal feed or using less fertilisers, as well as awareness raising initiatives to encourage the uptake of less GHG-intensive diets (Errendal, Ellis and Jeudy-Hugo, 2023^[80]). Romania should remove subsidies linked to the unconstrained use of variable inputs, such as discounted excise rates on fuels used in agriculture and forestry (see sections on energy taxation and support to fossil fuels), and reduced VAT rates on fertilisers, pesticides and water for irrigation. By stimulating the use of fuels, fertilisers and water, this kind of agricultural support has the greatest potential to increase GHG emissions (OECD, 2022^[81]).

Maintaining the carbon storage capacity of Romania's large old-growth forests will be essential to offset emissions from hard-to-abate sectors, including agriculture. Under current land management practices, removals from the land use, land-use change and forestry sector (LULUCF) are expected to decline in the period to 2030, while agricultural emissions are projected to rise (Ministry of Environment, Water and Forests, 2023^[3]). In line with its commitment in the Recovery and Resilience Plan, Romania should step up monitoring and enforcement efforts to curb longstanding, widespread illegal logging (OECD, 2022^[16]). Investment in upgrading the SUMAL Forest Inspector platform and wood traceability system and the establishment of a compensation scheme for forest owners are welcome. The scheme – in place between 2023 and 2027 – allocates EUR 200 million to compensate forest owners for unharvested wood due to mandatory ecological requirements. Similar programmes have been effective in reducing deforestation in other countries, such as Costa Rica (OECD, 2023^[82]). The authorities should assess the scheme's effectiveness and additionality as it nears conclusion and consider extending its duration if the assessment yields positive results. Promoting the afforestation of degraded agricultural land would further help expand carbon sinks. Romania should also more effectively promote the uptake of solar and heat-pump heating systems, especially in rural areas, to encourage a shift away from firewood burning (see section on buildings).

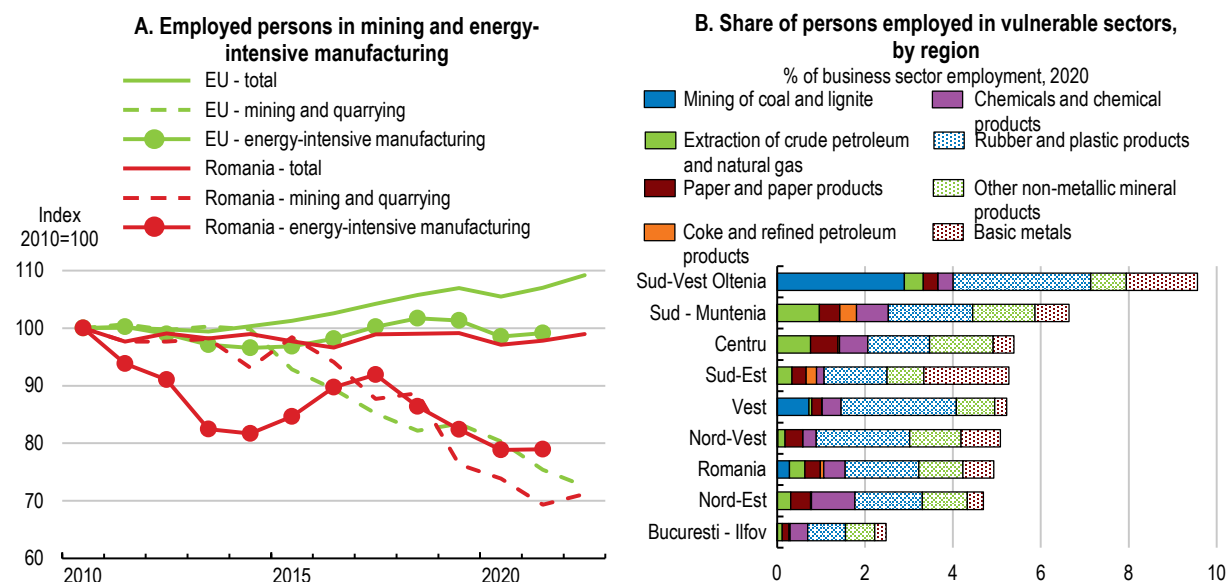
The circular economy transition can help achieve climate mitigation objectives and deliver broader health and environmental benefits. The government has introduced regulations and launched awareness raising campaigns to address Romania's low recycling rates and reliance on landfills for waste disposal. Municipal waste generation per capita has increased since the mid-2010s with rising income levels. In 2021, Romania landfilled three-quarters of its municipal waste, a rate over three times the EU average. Landfilled waste generates 6% of the country's GHG emissions (Figure 3, Panel B). Recycling rates have deteriorated since the mid-2010s and remain well below the EU average, as does the rate of composting (EC, 2023^[14]). To stimulate recovery and recycling, Romania should improve separate collection and treatment of waste, invest in treatment infrastructure and curb illegal dumping. The Recovery and Resilience Plan allocates EUR 1.2 billion to this effect and to implement the national circular economy strategy (Figure 5; Box 2). A ban on landfilling of biodegradable waste and pay-as-you-throw waste fees would help divert waste and materials from landfills towards recycling and reuse. The country could also boost its capacity to produce biomethane from residues of its large agricultural and forestry sectors.

Supporting workers in the transition to net zero

The shift to a low-carbon economy will have employment implications. It will change skill needs and contribute to reallocations of workers across sectors and regions in Romania, as in Europe. According to OECD modelling, the implementation of the EU "Fit for 55 package" (aimed at achieving at least 55% emission reductions by 2030 relative to 1990) will reduce total employment growth in the European Union from 3% to 1.3% in the period to 2030. This will involve an employment reallocation from blue collar and farm workers to other jobs and sectors (Borgonovi et al., 2023^[83]). Romania has already experienced reallocation of workers from mining and energy-intensive manufacturing to other sectors. While total employment remained broadly constant in the last decade, employment in mining and quarrying (mostly coal mining and gas extraction), decreased considerably, in line with a trend observed in the European

Union (Figure 24, panel A). Employment in Romania's energy-intensive manufacturing (including oil refinery, chemicals, steel and cement) also dropped (Figure 24, panel A).

Figure 24. Jobs in mining and energy-intensive industries are clustered and already declined



Note: Panel A: Energy-intensive manufacturing includes the NACE activities: paper and paper products (C17), coke and refined petroleum products (C19), chemicals and chemical products (C20), rubber and plastic products (C22), other non-metallic mineral products (C23), basic metals (C24). Panel B: the sectoral employment shares are based on business employment only from the Eurostat Structural Business Statistics. Source: Eurostat; and OECD calculations.

Job losses relating to decarbonisation will be highly localised. As mining and energy-intensive industries are regionally clustered, the social and employment impact of phasing out coal and decarbonising manufacturing will also be geographically concentrated. Sud-Vest Oltenia and Sud Muntenia have the largest shares of regional employment in the sectors most vulnerable to the net-zero transition as defined by (OECD, 2023^[84]), primarily coal mining, gas extraction, plastics, metals and non-metallic minerals (Figure 24, panel B). These are also regions lagging on economic and social development (EC, 2023^[14]), exacerbating their vulnerability to activity and job losses from the low-carbon transition. Over 32 000 jobs are expected to be lost in Romania's regions with the most carbon-intensive industries (EC, 2023^[14]). In addition, the shift to electric vehicles will have uncertain implications for employment and skills in Romania's automotive industry (OECD, 2023^[84]), which saw a 75% employment growth in 2010-20 and is dominant in the Vest region.

The most immediate impact will be felt in the coal sector, with the progressive closure of mines and power plants until a complete phase out by 2032 (see section on decarbonising electricity generation). Coal mining takes place in two regions – Sud-Vest Oltenia and Vest – where also most of Romania's coal-fired power plants are located. While coal mining accounts for less than 0.5% of total employment at national level, it makes up nearly 3% of direct employment in Sud-Vest Oltenia (Figure 24, panel B). The 2022 "Decarbonisation Law" foresees that workers laid off by the closure of coal mines and power plants will have priority in enrolling in vocational retraining, which is welcome.

The government should ensure adequate support to workers and communities hard-hit by the phase-out of coal power and the net-zero transition more generally. Experiences in other countries suggest this requires an effective mix of active labour market policies, local investments and measures to remove obstacles to geographical labour mobility (OECD, 2023^[85]). In late 2022, the government approved the Territorial Just Transition Plans for the regions most at risk of job losses from the low-carbon transition,

which was a condition to access the EU Just Transition Fund (Box 10). However, these plans do not lay out the specific actions to be implemented. They also neglect the need to increase local technical and administrative capacity to implement the plans (Bankwatch, 2023^[86]). This is a bottleneck to the implementation of these plans as it is for the absorption of EU funds more generally (OECD, 2022^[16]).

Box 10. Romania's Just Transition Plans for coal regions

In late 2022, the government approved Territorial Just Transition Plans for three coal counties and three carbon-intensive counties. The Just Transition Fund will provide over EUR 200 million in 2021-27 for reskilling and active labour market support for about 30 000 workers (EC, 2023^[14]). The plans for the three coal counties (Gorj and Dolj in Sud-Vest Oltenia and Hunedoara in the Vest region) aim to promote economic diversification. They envisage supporting entrepreneurship, including initiatives led by women and youth; reskilling and upskilling; supporting small and medium-sized enterprises operating in construction and renewable energy production, installation and maintenance, among other activities. Some measures have a gender dimension, such as childcare services to facilitate women's access to vocational training and reintegration into the workforce after having children (OECD, 2024^[13]). The Territorial Just Transition Plans identify ethnic minorities as a target group for labour market programmes.

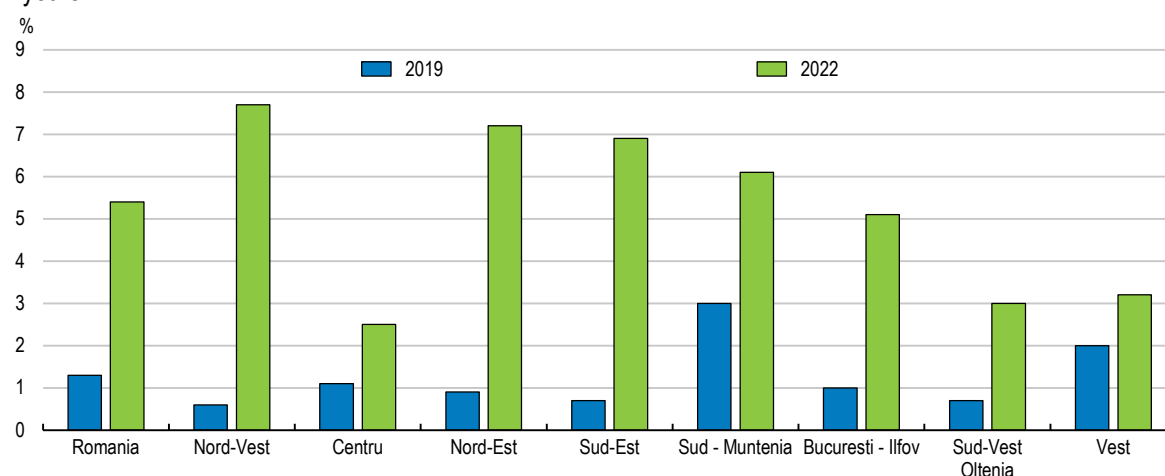
Source: (Bankwatch, 2023^[86]); (Bankwatch, 2023^[87])

Reskilling should be directed towards job categories in short supply, including those relating to the green transition. Romania's Long-term Strategy estimates 53 000 new jobs to be created by 2050, 40% of which by 2030, in manufacturing, construction, installation, operation and maintenance of renewable energy technologies. However, high skill shortages can hamper job creation (OECD, 2024^[13]). Improving reskilling and matching would help alleviate such shortages as well as limit negative socio-economic impacts from large-scale job losses. In 2022, labour shortages were reported in Romania for 27 occupations that required specific skills or knowledge for the green transition, including insulation workers, civil engineers and construction managers (EC, 2023^[14]). The government should further develop training activities related to energy building renovation and renewable energy integration into buildings, to support the decarbonisation of the building sectors. The accelerated deployment of heat pumps calls for a fast-growing number of skilled professionals throughout the entire value chain, including expert installers and energy advisers to guide homeowners in the choice of the best fitting heating system (Toleikyte et al., 2023^[88]). As in other countries, the lack of skilled professionals is a barrier to the growth of heat pump market in Romania. It can also lead to lock-in effects due to the improper execution of building renovation works.

Government support for workers needs to be multi-faceted. Labour market programmes should support job search, particularly for displaced low skilled and older workers, and focus on training, especially for youth. Spending on training programmes for the unemployed markedly increased in Romania in the second half of the 2010s (EC, 2023^[89]). Participation of working-age Romanians in upskilling and reskilling programmes, partly EU-funded, increased in all regions. Programmes included training for construction workers and specialists of energy performance of buildings (EC, 2023^[14]). The Recovery and Resilience Plan will also finance training in the renewable energy sector. However, participation in regions most exposed to job losses and restructuring risks remains lower than in other regions (Figure 25). This raises concerns that workers in regions vulnerable to green-transition may be less open to retraining. One paper reports that participation in training appears to be especially low among blue collar workers in the "mining of coal and lignite" sector in Romania (Borgonovi et al., 2023^[83]).

Figure 25. Participation in training grew but remains low, especially in vulnerable regions

Participation rate in education and training (during the last 4 weeks) of the population aged between 25 and 64 years



Source: Eurostat.

Broad policy efforts to improve the efficiency of the labour market can help adjustment to localised shocks, such as mine closures. As in other EU countries, there is scope to encourage greater labour mobility geographically and across sectors and skills. In Romania there is an abundance of professional licensing and certification requirements – which make it harder to change jobs. Regulatory restrictions for professions such as lawyers and civil engineers are stricter than the EU average (EC, 2023^[14]). Beyond broader payoffs to the business environment, reducing licensing and certification requirements could support employment reallocation in the green transition. Removing obstacles to regional mobility (OECD, 2024^[13]) would aid labour market adjustments arising from the net-zero transition.

Coping with mounting climate change risks

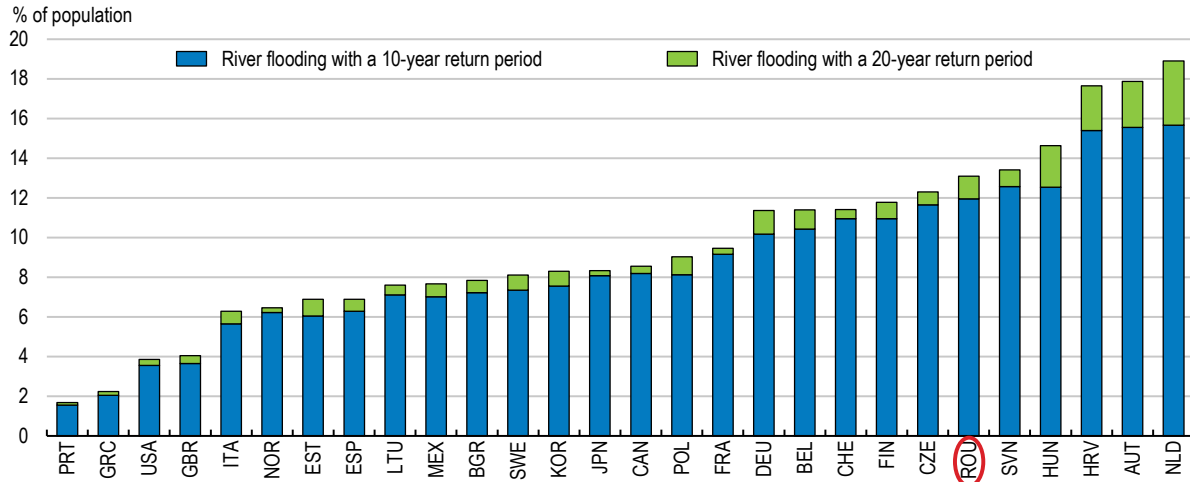
More extreme and variable climatic conditions will exacerbate Romania's vulnerability to natural disasters such as floods and droughts (in addition to the country's high seismic risk). In the last four decades, climate-related extreme weather events caused over 1 400 fatalities and losses and damages worth EUR 17.5 billion (6% of 2022 GDP) (EEA, 2023^[90]). Population exposed to the risk of river flooding is higher than in most OECD countries (Figure 26), while some Romanian regions face water scarcity. A drought in 2022 was the most severe ever recorded in the country, affecting water supplies, hydropower generation, agricultural production and waterway navigation (World Bank, 2023^[12]). The annual average temperature in Romania is already 1.5 degrees Celsius higher than in the period 1981-2010 and is set to rise further (World Bank, 2023^[91]). In addition to impacts on farming, hotter temperatures will expose more people to periods of extreme heat. Currently, about 60% of the country's population is exposed to hot summer days with temperature above 35°C, on par with some of the highest levels of exposure in the OECD (OECD, 2023^[92]).

Climate change will affect people's well-being and natural ecosystems, although with regional variations. Communities living in large urban centres, floodplains and drought-prone areas will likely bear the most intense impacts. Poverty, age and poor health aggravate vulnerability to climate risks (Climate-ADAPT, 2023^[93]). The housing market and gentrification have tended to drive lower-income groups, including Roma communities, into areas at higher environmental and climate-related risk (Alexandrescu et al., 2021^[94]). Roma communities – which suffer from poverty, material deprivation, poor housing and lack of access to basic services (OECD, 2024^[13]) – appear to be also disproportionately exposed to flood hazards. These communities are less able to move to safer locations (EEA, 2023^[95]). Insufficient incomes and coverage of

social protection likely hinder the ability of vulnerable and marginalised groups, including Roma communities, to prepare for and adapt to natural disasters (OECD, 2023^[96]) (World Bank, 2023^[12]).

Figure 26. Romania's population is highly exposed to river flooding

Share of the population exposed to river flooding, latest available year



Note: This indicator presents the annual percentage of the population exposed to river flooding with a 10- and 20-year return period. A return period is the average or estimated time that a flood event is likely to recur.

Source: (Maes et al., 2022^[97]).

Better governance and insurance markets would enhance resilience to climate impacts

Romania has strengthened its capacity for climate modelling and the organisational framework for disaster risk management, but further progress is needed. The government should swiftly adopt and implement its new draft strategy for disaster risk reduction and related action plans. A revised national adaptation plan is set to be adopted by 2024. Co-ordination between these strategies and plans will be crucial to ensure effective adaptation action. Investment in building climate resilience and risk prevention remains limited (Climate-ADAPT, 2023^[93]). The country needs to address remaining weaknesses in infrastructure, technology, and financial and institutional capacity. These weaknesses hinder the country's ability to adapt to climate change, especially in the eastern regions (EC, 2023^[98]). Providing dedicated training programmes and guidance would help improve capacity of local authorities to prepare for and respond to extreme weather events.

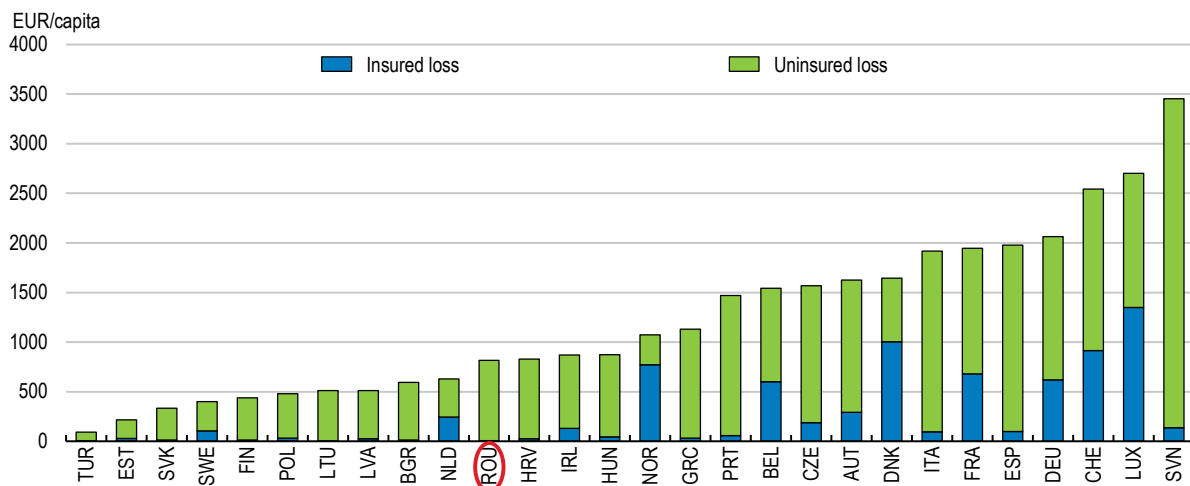
Stricter enforcement of land-use and building regulations is necessary to prevent construction in high-risk areas. Romania's legislation requires that risk maps be integrated in urban and land-use plans. Local planning and building regulations forbid building in high-risk areas. However, many urban and land-use plans are outdated or outright missing, and risk maps are insufficiently detailed to enable proper local spatial planning (EC, 2023^[98]). Instances of unauthorised building or corruption in issuing building permits undermine the integrity of urban development and may amplify exposure to climate-related risks.

Greater private insurance coverage for climate-related disasters would encourage households and businesses at risk to adopt risk-mitigating measures and reduce burdens on the public budget for disaster relief and financial support for rebuilding. Between 1980 and 2022, only around 1% of climate-related disaster losses were insured in Romania, lower than in many OECD countries (Figure 27). Average annual government liability for disaster losses is estimated between 0.25% and 0.4% of GDP, linked to the vulnerability of Romania's ageing housing stock and infrastructure (Cook et al., 2021^[99]). Disaster risk financing is mostly reactive and relies on contingency loans, reserves and credits (EC, 2023^[98]). The Pool of Insurance Against Disasters (PAID), a mandatory housing insurance against disaster risks, is the main proactive financing instrument. It offers simple and affordable policies, while sanctioning non-compliance

(Box 11). However, insurance uptake is low, with only about 20% of residential buildings covered. This threatens the financial viability of the system (Climate-ADAPT, 2023^[93]). Low coverage, especially in rural areas, appears due to a lack of risk awareness and financial literacy, low incomes, weak enforcement and moral hazard, given the expectation the government will subsidise emergency response and rebuilding (Box 11). Incomplete registration of land ownership, especially in rural areas (OECD, 2024^[13]), may be another barrier to insurance. Romania could learn from the national catastrophe insurance programmes implemented in countries such as Denmark, France and Switzerland, which have achieved relatively high levels of insurance coverage (OECD, 2021^[100]) (Figure 27). Improved dissemination of information on climate-related risks and impacts would help raise people's awareness and encourage uptake of insurance; this should form part of the national financial education strategy (OECD, 2024^[13]).

Figure 27. Insurance is rarely used in Romania to cover the risks of economic losses due to climate-related extreme weather events

Per capita economic losses from climate-related extreme weather events, selected European countries, 1980-22



Source: European Environment Agency (2023), Economic losses from climate-related extremes in Europe.

Box 11. Romania's natural catastrophe home insurance programme

The Pool of Insurance Against Disasters (PAID), operational since 2010, is a programme of mandatory housing insurance against risks of earthquakes, floods and landslides. It is a common insurance-reinsurance fund owned by several private insurance companies, backed with a state guarantee. The fund offers two policies depending on the construction materials of the insured buildings. The annual premium is a low EUR 10 for less resistant houses, for a maximum compensation of EUR 10 000; for more resistant buildings, the annual premium is EUR 20 and the insured value is EUR 20 000. Premiums and insured values have not changed since the inception of the programme. Non-compliance with the mandatory insurance notionally carries fines of up to EUR 100 and non-eligibility for compensation from the central or local government budgets in the case of damages due to earthquakes, floods and landslides. Local authorities are required to inform the population about the insurance obligation, verify compliance and sanction non-compliance. However, no sanctions have ever been applied and, in practice, also non-eligible households have received state compensation in the past (EC, 2023^[98]). As of November 2023, there were a little less than 2 million active PAID policies covering one fifth of homes. Voluntary insurance policies covering other risks and damages above the PAID programme threshold can be added after having purchased the mandatory policy.

Source: PAID Romania, <https://www.paidromania.ro/>.

Climate change wide-ranging impacts require tailored policy responses

With heating and transport expected to rely on electricity in the future, building a climate-resilient power sector is key to avoid major disruption (IEA, 2021^[101]). Extreme weather events test the resilience of electricity grids and are a major cause of large-scale power outages. Changing temperatures will alter energy demand patterns for cooling and heating, putting pressure on the electricity system. Lower water availability could impair hydropower and nuclear generation, which are key to decarbonise power generation. Diversifying the renewable power mix, strengthening incentives for energy conservation and upgrading grids are, therefore, important to reach both mitigation and adaptation goals. The authorities should ensure that energy sector investment plans, such as the ten-year electricity network development plans, systematically consider adaptation needs. The energy regulator could link part of the recoverable electricity charges to indicators of resilience, such as the time to restore service after an outage (performance-based rate making). This would provide incentives for utilities to invest in reinforcing their assets against extreme weather events (IEA, 2021^[101]).

High temperatures, landslides and floods could strain Romania's already inadequate road and railway networks. On average, annual flooding is expected to raise the costs of road transport by almost 6% and that of passenger railway transport by nearly 25% in Romania (World Bank, 2023^[12]). Reduced water depths on major waterways have increasingly led to prolonged navigation restrictions (Climate-ADAPT, 2023^[93]). Floods and other climate-related hazards should be routinely considered when planning and managing transport infrastructure, especially in project appraisal, procurement processes and maintenance operations (OECD, 2018^[102]). Integrating multiple modes of transport would contribute to curb GHG emissions while reducing the impact of climate-related disruptions on passenger and freight movement (World Bank, 2023^[12]). Sustainable urban mobility plans, being developed for most municipalities, should incorporate adaptation considerations.

Romania needs to modernise and reinforce its water infrastructure to withstand the pressures of climate change (World Bank, 2023^[12]). Higher temperatures and lower precipitation threaten water security and will intensify competition among different water uses (Climate-ADAPT, 2023^[93]). The Recovery and Resilience Plan allocates nearly EUR 1.5 billion until 2026 to investments in water systems, including flood defence. Planned investments in upgrading and expanding ageing irrigation infrastructure can help improve the resilience of small farms to droughts. These investments need to be complemented by agricultural practices that conserve soil moisture to reduce water requirements (World Bank, 2023^[12]).

Nature-based solutions to building climate resilience can complement infrastructure investment such as flood barriers. Such measures include urban green spaces and restoration of forests and wetlands, which can reduce vulnerability to weather-related risks. Nature-based solutions are often less costly than infrastructure and provide additional climate mitigation benefits by increasing carbon storage capacity (OECD, 2021^[103]). The recently developed flood risk management plans for the country's 11 river basins and the Danube River lay out a more integrated approach to flood prevention, with higher emphasis on nature-based solutions such as setting back dikes and providing more room for rivers (Fischer, 2023^[104]). Protecting forests from climate change impacts (such as pests, degradation and wildfires) is key for both mitigation and adaptation objectives. Degraded or burnt forests release GHG emissions. Afforestation and reforestation investment planned in the Recovery and Resilience Plan are a step in the right direction, although they will cover less than 1% of the country's forest area.

Romanian urban areas are particularly vulnerable to extreme heat and floods (World Bank, 2023^[12]). Near-zero-energy standards for new buildings and ongoing investments in retrofitting buildings to improve their energy efficiency and earthquake resistance can simultaneously bolster their capacity to withstand extreme heat. These efforts should be part of urban neighbourhood regeneration plans that include green spaces, renewables-powered community cool spaces and improved access to sustainable transport modes (World Bank, 2023^[12]). Urban green space expansions, including parks and green roofs, lower the urban heat island effect (i.e. higher temperature due to human activities and heat-absorbing built environment). This

helps reduce energy demand for cooling and related GHG emissions. Furthermore, urban green spaces contribute to carbon sequestration and increase water absorption capacity, thereby mitigating the risk of urban flooding (OECD, 2021^[103]) (Box 12). As part of the Recovery and Resilience Plan, the government aims to plant over 3 million square metres of urban forests (equivalent to 600 football pitches) – a positive initiative.

Box 12. Green roofs against heat waves and urban floods: The case of Germany

About two-thirds of German cities have made green roofs mandatory in local land-use plans. Seven out of ten cities with more than 50 000 inhabitants require roof greening in their development plans. About a quarter of Germany's larger cities provide financial subsidies for green roofs. The proposed funding can cover up to half of investment costs and represents on average 10-100 EUR/m² and 500-100 000 EUR per project. The total amount of greened roof areas was estimated at 120 million m² in 2019, more than double the area at the start of the last decade. The cities of Munich, Stuttgart and Berlin have the largest green roof areas.

Source: (OECD, 2023^[105]).

Table 3. Recommendations on decarbonising the economy

MAIN FINDINGS	RECOMMENDATIONS (key recommendations in bold)
Strengthening the policy framework and governance capacity	
Romania does not have a climate framework law with a binding net-zero goal. It has not yet defined all the policy measures it needs to reach its 2030 climate and energy targets.	Look towards adopting a climate framework law that enshrines the long-term net-zero goal, sets procedures for defining and reviewing interim targets, allocates responsibilities, defines accountability mechanisms and establishes an independent advisory body.
Institutional capacity for climate policy making and implementation is weak. Monitoring of progress in climate policy action and outcomes is insufficient. Romania is often late in providing information required under EU and international commitments. Absorption of EU funds for low-carbon investment has been poor.	Build administrative capacity for designing, implementing and monitoring climate policy measures and investments.
Making carbon pricing more efficient	
Excise duties generate low implied carbon prices which differ across fuels, providing uneven abatement incentives. Various tax exemptions and other subsidies reduce the cost of fossil fuels, with high estimated fiscal costs. Coal and natural gas are taxed at near-zero rates. Increasing energy taxes and reforming fossil fuel subsidies are necessary but would heavily impact the large share of the population at risk of energy poverty.	Improve carbon pricing by increasing energy tax rates in sectors outside the EU Emissions Trading System and by gradually removing fossil fuel subsidies. Channel part of the proceeds to vulnerable households and affected businesses.
The cap on retail prices of electricity and natural gas, introduced in response to the energy crisis, has been extended to March 2025. This is untargeted and weakens incentives to save energy or switch to cleaner fuels.	Bring forward the phase out of current energy price caps.
Moving to a low-carbon electricity mix	
The government committed to phase out coal mining and power plants by 2032 at the latest. However, it postponed the first closures amid the energy crisis in 2022.	Ensure timely decommissioning of coal-fired power plants.
Romania does not have a comprehensive policy to address methane emissions. Production of fossil fuels generates one third of methane emissions in Romania. Abandoned coal mines continue to emit methane.	Develop methane-reduction plans for operating and decommissioned coal mines, as well as for oil and gas production and handling.
Renewables account for more than 40% of Romania's power generation. The country's renewable potential is high. However, progress in expanding and upgrading electricity grids has not been sufficient to support a substantial increase in renewable generation. Electricity storage capacity is also insufficient.	Accelerate expansion, upgrading and digitalisation of electricity grids and investment in electricity storage.
The government has simplified some licensing procedures and committed to further streamlining permitting in line with the third EU Renewable Energy Directive. However, rules for using agricultural land for renewables installations remain ambiguous. Frequent law changes and inconsistent application of regulations generate uncertainty and hinder investments.	Clarify agricultural land-use rules for renewable energy production.
Most of Romania's support to utility-scale renewables goes to mature technologies. The ongoing development of a contract for difference scheme to mitigate revenue volatility for renewables power producers is welcome. Power purchase agreements are allowed again, after a long ban, but are rarely used.	Gradually redirect financial support from cost-competitive technologies such as PV, wind and hydro towards emerging technologies.
Decarbonising transport	
Public transport use in cities has declined, while car driving has grown, increasing emissions. Cities lack integrated public transport systems.	Invest in integrated, smart urban mobility systems centred on public transport and incorporating walking, cycling and shared mobility.
The Law on Sustainable Urban Mobility (2023) is a step in the right direction to support municipalities in developing Sustainable Urban Mobility Plans. The absence of up-to-date general urban plans in many cities is of concern.	Ensure rapid development of Sustainable Urban Mobility Plans, as well as coherence between these plans and cities' general urban plans; support municipalities in implementing sustainable urban mobility plans.
Romania's large cities make little or no use of traffic demand-management tools such as parking fees and congestion charges. Tolls on the national road network do not vary with distance driven.	Raise parking pricing in high-demand locations in cities. Establish low-emission zones in large urban areas and consider linking them with congestion charges.

MAIN FINDINGS	RECOMMENDATIONS (key recommendations in bold)
Decarbonising transport	
The efficiency of train services is low due to underinvestment and poor maintenance. Most rail lines are single track and not electrified. Infrastructure weaknesses make rail less competitive than road haulage and impede modal shifts towards rail that would help curb GHG emissions.	Accelerate investment in the upgrade and electrification of rail lines; expand and improve train connections, both internationally and nationally.
The government cut overly generous and regressive subsidies for electric vehicle purchases as of 2024. However, the scrapping programme still supports purchases of high-emission cars and risks increasing the number of cars on the roads. The share of electric cars in new car sales has grown recently, but the uptake of electric cars is still limited.	Limit the subsidies of the <i>Rabla</i> car scrapping programme to purchases of zero- and low-emission vehicles and alternative transport modes. Target the subsidy at lower-income applicants.
The networks of charging stations for electric vehicles are undersized.	Ramp up the roll out of electric charging stations, including through investment planned in the Recovery and Resilience Plan.
Taxes on car acquisition and ownership are not based on fuel efficiency, CO ₂ emissions and air pollutant emissions. Most cars are old and highly polluting.	Revise vehicle taxes so that they increase with the vehicle's emissions of CO ₂ and air pollutants.
Promoting energy-efficient and low-carbon buildings	
Homes are energy-intensive due to their age, bad insulation, and inefficient heating. Current retrofitting support for multi-flat buildings is fiscally costly. A grant programme for renovating single-family houses is set to be introduced in 2024, with priority given to vulnerable energy consumers.	Ensure support for renovations is adequately targeted. Continue to provide sufficient support to single-family house renovations, especially in rural areas and for the energy poor.
Information about energy-efficient solutions and related financing is insufficient to encourage building renovations or changing heating systems. The intention to establish one-stop-shops for energy renovations is welcome.	Run more information and awareness campaigns for energy efficiency renovation.
Less than a fifth of Romania's households are equipped with a smart meter, which allows consumers to control their energy use.	Roll out smart meters faster and promote greater competition in retail electricity and natural gas markets.
Renewables account for a quarter of thermal energy use in Romania, a share that has changed little in the last decade. Woody biomass and natural gas are the main heating fuels. Solar thermal and heat pump systems are little used.	Support household purchases of solar thermal systems and heat pumps through means-tested subsidies or loans. Phase out gas boilers, banning them in new buildings as a first step.
Widespread burning of firewood in inefficient stoves, especially in rural areas, increases indoor air pollution and contributes to depleting forest carbon sinks. Increased investment in monitoring and the new compensation scheme for forest owners are welcome steps to tackle persistent illegal logging.	Step up efforts to tackle illegal logging through improved monitoring and enforcement.
Supporting vulnerable workers and communities during the transition to net zero	
The 2021 law on social protection for vulnerable energy consumers marks progress in tackling widespread energy poverty. However, aid remains tied to energy use and may distort heating behaviour.	Ensure that support to the energy poor is means-tested and untied from energy consumption.
The net-zero transition will change skill needs and lead to reallocation of workers. The employment impact of phasing out coal and decarbonising manufacturing will be geographically concentrated. Spending on, and participation in, training programmes has markedly increased, but is not yet sufficient.	Increase access to quality active labour market programmes and worker training, in particular in coal-dependent communities and across other sectors and regions potentially hard-hit by the net-zero transition.
Strengthening resilience to climate change impacts	
Climate change will intensify Romania's vulnerability to natural disasters such as floods and droughts. Planned investments will contribute to strengthening resilience, but policy coherence needs to be improved. Capacity disaster risk management has improved, but climate risks and preventive measures are not yet fully mainstreamed in land-use and sectoral planning.	Incorporate climate-related risks and adaptation considerations into spatial planning and sectoral investment strategies. Better enforce building regulations to prevent building in risk-prone areas. Leverage nature-based solutions to mitigate climate-change impacts in both urban and rural areas.
The mandatory catastrophe insurance programme covers only a fifth of homes, with many households unaware of climate-related risks. This potentially exposes the government to high liabilities for losses when disasters hit.	Promote higher insurance coverage for climate-related disasters, including through awareness and financial education campaigns and stricter enforcement of the mandatory home insurance programme.

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