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# Electrification of the Road Transport Sector in Europe and the Case of Italy

by Pier Paolo Raimondi

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# EXECUTIVE SUMMARY

The European Union (EU) has increasingly raised its climate ambition, especially since the launch of the European Green Deal in 2019, which set a target of climate neutrality by 2050. The bloc's achievement demands a contribution from all sectors: power, industry, buildings, and transport. The latter is sizable, accounting for almost a quarter of the total emissions of the twenty-seven EU members (EU-27) in 2021—with road transport responsible for more than 75 percent of the transport sector's total emissions given its reliance on fossil fuels. Additional policies and measures are required since the sector's emissions have substantially increased since 1990, unlike the other sectors.

Electrifying road transport is gaining relevance as a major force to cut emissions from the sector. Indeed, there is growing consensus in Europe that battery-powered electric vehicles (BEVs) are an important part for the solution for decarbonizing road transport. Besides technological reasons, both political commitment and market developments have pushed the rise of EVs. Politically, the EU has set higher renewables targets and tighter $CO_2$ performance standards for passenger vehicles. Economically, the pivotal role of EVs in decarbonization has become possible thanks to declining battery costs. The volume-weighted average price of a battery pack has dropped from $1,391/kilowatt hour (kWh) in 2010 to $139/kWh in 2023, a 90 percent reduction.

On the global level, Europe ranks second only to China as the largest EV market, with 25 percent of electric car sales and 30 percent of the global stock. Since 2019, the EV sales share in the EU has constantly increased from below 3 percent before 2019 to 22 percent in 2023. The EV fleet in Europe has consistently expanded from just 1.1 million in 2020 to 4.6 million EVs in 2023. However, EV deployment is heterogeneous. In 2023, BEVs accounted for around 25 percent of car sales in both Germany and France, while Spain, Italy and Poland accounted for 12 percent, 9.2 percent, and 6.6 percent, respectively. Germany, with 1.5 million BEVs in circulation, ranks as the largest market in Europe, followed by France (980,000), and Norway (690,000).

While EVs are gaining relevance and are set to become an increasingly important factor in decarbonization, policymakers will need to address critical issues, especially relating to enabling infrastructure (i.e., charging stations) to have a sustainable and smooth transition. In 2022, 2.7 million public charging points were installed worldwide, and Europe is home to 460,000 slow chargers and more than 70,000 fast chargers. According to a McKinsey & Company analysis, at least 3.4 million public charging points are needed in the EU by 2030.

Italy, one of the largest car markets in Europe, has much to do to decarbonize road transport. It has developed alternative fuels, but electricity still accounts for less than 0.3 percent of vehicle fuels. It has set ambitious EV targets to achieve by 2030: 6.6 million cars including 4.3 million BEVs. However, Italy is still lagging behind its European peers. In 2023, the share of EVs in Italy's car fleet was only 1.3 percent compared to 3.6 percent in the EU; the share of EVs in new registrations is 9.2 percent versus an EU average of 22 percent. To accelerate EV deployment, the country should revise its fiscal incentives and subsidies in compliance with new EU $CO_2$ performance standards for cars, directing them more decisively toward EVs.

To its credit, Italy has expanded its charging infrastructure, reaching 54,164 public charging stations at the end of March 2024. Italy has a high ratio of charging points to EVs, ranking behind only the Netherlands, Belgium, and Spain. But Italy will need to continue to develop an adequate and distributed charging infrastructure to ensure and support further and faster EV deployment. This should include focusing on the deployment of faster chargers (i.e., direct current) outside urban areas, especially along highways, and in light of investment opportunities through the National Recovery and Resilience Plan (NRRP), using NextGenerationEU funds. To do so, Italy needs to fully use and exploit such financing capacities. Additionally, Italy should develop a more holistic and shared vision of EVs by reducing permitting procedures and promoting better cooperation between national and subnational administrations. Measures and

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policies also are needed to address the charging experience, including streamlining existing rules, and ensure price transparency, standardized minimum payment options, and uniform customer information. All of these aspects are essential to improving the experience, while reducing consumer skepticism and removing soft barriers to electrifying the road transport sector.

This article explores Europe's rising ambition in electrifying this sector and the political and market drivers at work; presents the case of Italy, including its national objectives, trends, and challenges in the transition; and provides a summary of takeaways and policy recommendations to further support the decarbonization of the road transport sector, especially in Italy.

# EUROPE'S RISING CLIMATE AMBITION

Throughout the decades, the European Union (EU) has drastically changed its energy and climate policies. Throughout this evolution, the three aspects of the energy trilemma—security, affordability, and sustainability—have been at the top of the political agenda at different times. Although energy was a key factor in the first integration process (with the formation of the European Coal and Steel Community and EURATOM), energy remained a shared competence between Member States and European institutions, with national governments playing a prominent role, especially in the 1960s and 1970s. Throughout the 1970s, the focus was on energy security following the 1973 and 1979 oil shocks (and in the early 2000s due to two gas crises).[1] In the 1980s and 1990s, the primary focus turned to liberalization and price competitiveness—especially in the gas and electricity markets. In the past two decades, attention has focused on the transition to low-carbon energy and decarbonization, gaining substantial political relevance at the EU level.

These developments have not been immune to volatility, as EU climate policies have gone through different phases, especially in the 2000s and 2010s. In 2005, for example, the EU inaugurated the European Emission Trading System (EU ETS), which became a key pillar of the EU climate policy framework. The economic crisis of 2008-09 partially slowed climate policy developments. New momentum took hold in the past decade, as the EU has expanded and enhanced its climate targets. This progress has aligned with broader international climate commitments towards decarbonization since the 2015 Paris Agreement. Still, the world isn't on track to limit global warming to 1.5 degrees Celsius according to the Global Stocktake concluded at COP28 in Dubai in late 2023[2].

In 2019, the European Commission launched its flagship program, the European Green Deal (EGD), which set the target of climate neutrality by 2050.[3] The EGD represents the European strategy for sustainable economic growth as it aims to decouple emissions and economic growth. Furthermore, the EGD has steadily become an external strategy: the EU seeks to build its climate leadership in the international arena on the energy transition and its advanced climate policy framework. Since the launch of the EGD, multiple crises have hampered its work on that objective. Indeed, the current "polycrisis"[4] could undermine those climate ambitions.

In 2020, Europe was hit hard by the COVID-19 pandemic, undermining political support for the EGD. Despire the challenges, the EU managed to establish the €750 billion NextGenerationEU recovery fund to support members' national economies, aimed at offsetting and overcoming socioeconomic challenges triggered by the pandemic.[5] The main element of the NextGenerationEU fund, the Recovery and Resilience Facility (RRF), is meant to support reforms and investments with a strong emphasis on climate and digital progress.[6]

In July 2021, the EU further enhanced its climate ambitions. The European Climate Law entered into force, writing into law the 2050 climate neutrality target of the EGD and setting the intermediate target of at least 55 percent reduction of its greenhouse gas (GHG) emissions by 2030.[7] Moreover, the European Commission presented the Fit for 55 (FF55) package aimed at accelerating the transition in the 2020s.[8] The FF55 consists of several legislative proposals to facilitate the achievement of its 2030 GHG emissions target and prepare the way for the realization of the 2050 target in the longer term.[9] Among these thirteen proposals, the Commission includes both new measures such as the Carbon Border Adjustment Mechanism[10] (regulating carbon-intensive imports) and expansion of existing climate policies (e.g., enhanced renewables and energy efficiency targets).

Since mid-2021, energy prices have risen along with geopolitical risks. In 2022, Russia's second invasion of Ukraine exacerbated the situation, which became the "first global energy crisis," as highlighted by International Energy Agency Executive Director Fatih Birol[11]. Europe has been at the heart of this crisis, as Russia largely reduced its gas supplies to EU member states by 80 billion cubic meters in 2022.[12] Meanwhile, the EU presented its REPowerEU Plan,[13] which aims both to wean Europe off Russia's energy imports and accelerate decarbonization. Among other measures, the EU

enhanced its 2030 renewables target (from 42.5 percent of the EU energy mix, to now 45 percent) and its 2030 energy efficiency target (11.7 percent at the EU level).[14]

Since the launch of its Green Deal, the EU has faced enormous economic and geopolitical challenges. However, it has not cooled its climate ambitions and has kept developing a wide portfolio of climate policies, enabling Europe to successfully cut its GHG emissions by around 29 percent in 2021 compared to 1990 levels.[15] The current crisis has reinforced the European commitment to the green transition, which can bolster energy security, leading to an acceleration of Europe's decarbonization policy.[16]

As a result, the EU has increasingly expanded the scope of its climate policies to look at several sectors, such as transportation, thanks to market and technological developments such as electric vehicles (EVs).

The aim of this article on the electrification of passenger cars and related infrastructures is to identify the main barriers and drivers in Europe and in Italy, which lags behind its EU peers, and to set out priorities and make recommendations to fill as many gaps as possible. The next section presents the main reasons for electrifying road transport as well as recent EU policy developments, providing a general framework on that matter.

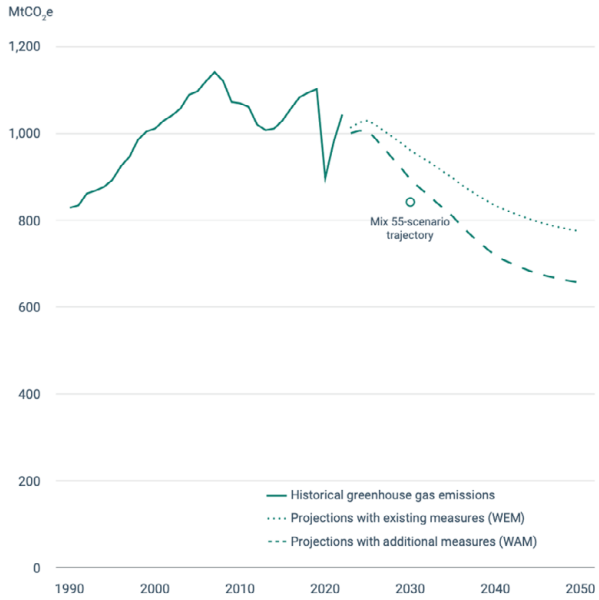
# ELECTRIFYING THE ROAD TRANSPORT SECTOR: POLITICAL AND MARKET DRIVERS

As the EU aims to reach climate neutrality, it needs to expand the scope and the ambition of its climate policies. Indeed, the achievement of the 2050 target demands a contribution from all sectors: power generation and distribution, industry, buildings, and transportation. In recent years, the transport sector has been under the spotlight. The sector is responsible for almost 25 percent of the total emissions of the EU-27, based on 2021 data.[17] Road transportation is responsible for more than 75 percent of those emissions, although international aviation and navigation are also significant contributors. Furthermore, road transport still relies heavily on fossil fuels, especially oil. The need to address transport sector emissions is urgent because emissions have substantially increased since 1990, unlike other sectors. Figure 1 shows the continuous increase in transport sector GHG emissions through 2007; since then, there has not been a significant, lasting decrease.

While the European Climate Law does not include corresponding and legally enshrined reduction targets by sector, the law envisages sectoral road maps toward the EGD target. Furthermore, according to the EGD, the transport sector is expected to reduce its GHG levels by 90 percent by 2050, compared to the 1990 level, to contribute to realizing climate neutrality.[18] In 2020, the EU's Sustainable and Smart Mobility Strategy outlined a road map to abate 90 percent of transport emissions by 2050 through eighty-two initiatives in ten key areas. The strategy proposed several specific targets over the period of 2030 to 2050, including at least thirty million zero-emission cars by 2030 and close to 100 percent zero-emission vehicles to be on the European roads by 2050.[19] The strategy envisions by 2050 "a fully operational, multimodal Trans-European Transport Network (TEN-T) for sustainable and smart transport with high-speed connectivity." Moreover, it imagines almost all road transport as fully decarbonized.

To abate $CO_2$ emissions from road transport, the EU can rely mainly on two key instruments: applying $CO_2$ performance standards to passenger vehicles; and defining the minimum use of renewables in the car sector (i.e., light-duty vehicles). Regarding the latter, in 2009, the Renewable Energy Directive (RED I, Directive 2009/28/EC) set the target for the renewable share of the transport sector in all member states. According to RED I, renewables should have supplied 10 percent of all energy used in transport by 2020. The EU reached that target in 2020, with renewables accounting for 10.3 percent also as a consequence of lockdowns. In 2018, the EU updated that directive with RED II (Directive 2018/2001/EU), raising the renewable target in the transport sector to 14 percent by 2030. The European Environment Agency estimates that

**Figure 1.** Transport Sector GHG Emission Trends and Projections, Including International Transport (1990-2050)




Source: European Environment Agency (EEA), Trends and Projections in Europe, Publications Office of the European Union, 2023, 40, https://www.eea.europa.eu/publications/trends-and-projections-in-europe-2023. The projections are based on the data submitted by member states in March 2023; the mix 55-scenario reference point refers to the 2030 emissions as included in the mix 55-scenario for the transport sector (including international transport), where the EEA has mapped the emissions of the PRIMES categories into categories linked to the CRF classification.

renewables accounted for an 8.7 percent share in 2022.[20] The Fit for 55 package aims at enhancing renewable targets, including in the transport sector, with the amendment to RED II. To reach the 2030 target, member states can either set a mandatory target of a 14.5 percent reduction of GHG intensity in transport thanks to the use of renewables, or achieve a mandatory share of at least 29 percent from renewables in the final energy consumption of the sector.

Traditionally, carmakers have approached $CO_2$ emission reduction through dieselization. As a result, the share of diesel cars in the EU grew from 36 percent in 2001 to a peak of 55 percent of sales in 2011.[21] The expansion of diesel cars was abruptly halted with the 2015 surfacing of the Volkswagen Group's Dieselgate scandal;[22] by 2017, the EU market share of diesel cars fell to around 45 percent and has continued to fall further.[23] Meanwhile, the EU has adopted additional measures and targets for $CO_2$ performance standards for vehicles to further reduce emissions. A 2009 EU regulation of passenger cars set the first $CO_2$ emission standards for new cars: 130 gram $CO_2$/kilometer by 2012 and 95 g $CO_2$/km by 2020.[24] Subsequently, Regulation 2019/631 set binding $CO_2$ reduction targets for 2025 (a 15 percent reduction in g $CO_2$/km) and 2030 (for a 37.5 percent reduction), both compared to a 2021 baseline.[25]

In March 2023, the EU agreed on a crucial aspect of its climate policies: the ban on new sales of internal combustion engine (ICE) cars as of 2035. Regulation 2023/851 sets more ambitious targets for new passenger cars for 2030 and requires zero-tailpipe $CO_2$ emission by 2035. The new regulation stiffened the 2030 emissions reduction target for new cars from -37.5 percent to -55 percent, while introducing a 100 percent reduction target in 2035. It did not, however, revise the 2025 reduction target (-15 percent) and did not introduce any annual or intermediate targets between 2025 and 2030. By 2035, the purchase of new ICE passenger cars and vans will be prohibited across the single market to satisfy the 100 percent reduction in $CO_2$ emissions.[26]

However, the final decision was reached after long negotiations. An important development occurred when Germany demanded an exemption for vehicles that run exclusively on e-fuels but rely on the internal combustion engine. Meanwhile, other countries, namely Italy, Poland, Bulgaria, and Romania, expressed opposition to the 2035 ban. Once Germany obtained the e-fuels exemption, however, the other European countries failed to form a unified block. While Poland decided to vote against the ban, the other three countries abstained.[27]

This regulation will be an additional driver for the expansion of EVs in the EU and Europe in general. Indeed, Norway, Switzerland, and Iceland have similar targets for the phaseout of ICE cars. From an international perspective, the EU and these three countries represented 13 percent of global car sales, or 9.7 million vehicles, in 2022.[28]

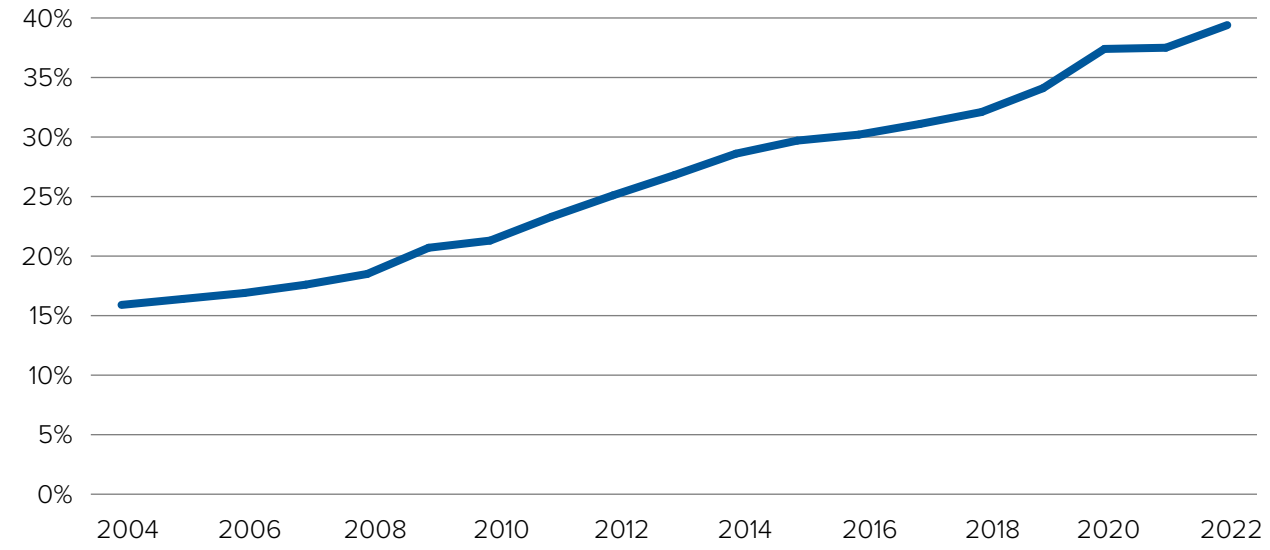
## Electrifying the Transport Sector Alongside the Evolution of Batteries

Electricity is not new in the transport sector, but over the past decade, electrifying road transport has become more relevant to both the market and policymaking as a major force to reduce the sector's emissions. Indeed, there is a general consensus on the fact that battery-powered electric vehicles (BEV) are the most effective solution for decarbonizing road transport (namely light-duty vehicles) due to their higher intrinsic power-train efficiency and ability to reduce life-cycle emissions,[29] and in the longer term, the potential to integrate them into smart electricity grids through digital technologies.[30]

Nonetheless, electrification does not automatically guarantee a reduction of emissions compared to traditional fuels. Alongside the support for transport electrification, governments need to sustain and enhance the decarbonization of the power generation mix.[31] For example, the EU has increasingly expanded the role of renewable energy to aid in the displacement of coal use in the power sector. In 2022, renewable sources accounted for 39 percent of EU power generation, up from 26.8 percent in 2013 (see figure 2). Following the Russian war to Ukraine, the EU has further accelerated the deployment of renewables by adjusting cumbersome permitting procedures. As a result, in May 2023, wind and solar exceeded total fossil fuels in electricity generation.[32]

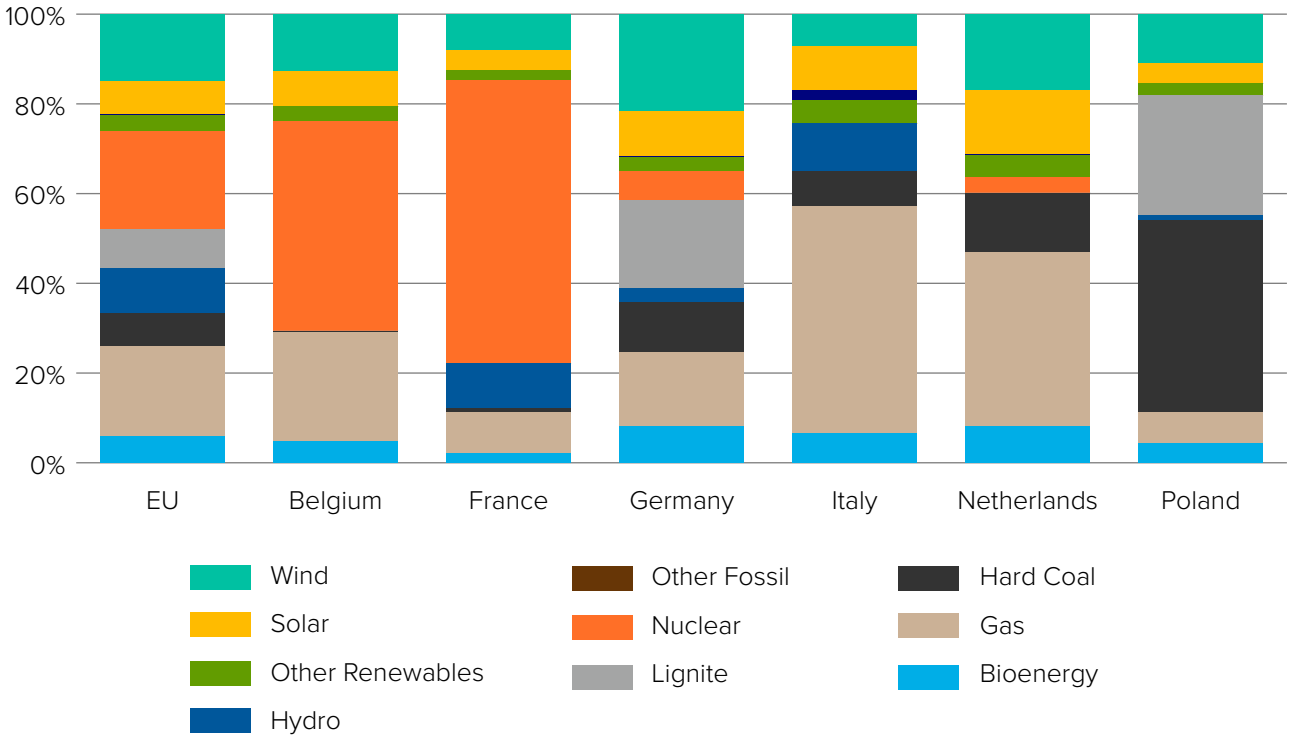
Meanwhile, the contribution of the different energy sources, and especially renewable energy, to power generation varies widely among EU countries (see figure 3). The heterogeneity of power generation means that each member state starts from a different point in terms of decarbonizing the power sector. Regardless, countries need to accelerate the deployment and development of renewables to cut their emissions as much as possible to reach EU targets.

**Figure 2:** Share of Renewable Energy in Electricity Generation in the EU (2004-2022)




Source: Author's elaboration of a European Council infographic in "How Is EU Electricity Produced and Sold?," n.d., https://www.consilium.europa.eu/en/infographics/how-is-eu-electricity-produced-and-sold/.

**Figure 3:** Power Generation by Source in the EU and Selected Member States (2022)




Source: Author's work using EMBER European Electricity Review 2023, supporting material, https://ember-climate.org/insights/research/european-electricity-review-2023/#supporting-material.

The pivotal role of EVs in decarbonization has been underpinned by tighter environmental regulations and climate ambition, as well as compelling market reasons: namely, the declining costs of batteries. Between 2010 and 2023, the volume-weighted average battery pack price dropped from $1,391/kilowatt-hour (kWh) to $139/kWh—a 90 percent reduction.[33] Between 2021 and 22, however, that trend halted and reversed (until 2023) because of rising prices of critical metals and minerals. This was part of a surge in global commodity prices amid supply chain disruptions caused by the COVID-19 pandemic, growing demand underpinned by economic recovery plans, and major geopolitical risks, especially Russia's war in Ukraine, among other factors. In early 2023, prices for lithium, a key material for EV batteries, rocketed six times higher than its historical average in the 2015-2020 period.

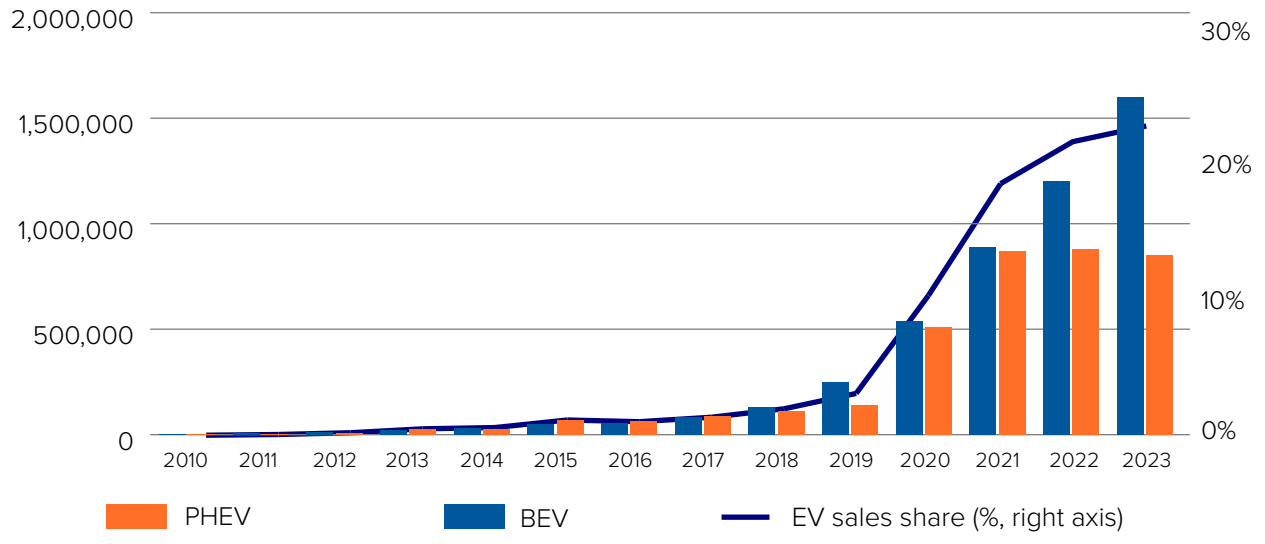
Overall, however, battery metals prices declined in 2023 amid higher supply and slower demand growth, especially in China.[34] Raw materials and component prices started decreasing and companies expanded manufacturing capacity. Ultimately, lithium-ion battery pack prices declined 14 percent in 2023.[35] These factors suggest that the downward trajectory could persist in the near term (e.g., $99 per kWh by 2025), leading to parity in the total cost of ownership of EVs and ICE vehicles, according to Goldman Sachs Research analysis.[36]

Two other key factors are expected to play a relevant role in the rise of EVs: faster charges and better mileage per charge.[37] Newly launched BEV models have demonstrated progress in recent years on both counts. In 2023, the global average range exceeded 470 km (292 miles).[38] However, average ranges vary by markets. For example, in 2023, the range of US models (at 517 km) exceeded the range of models in Europe (445 km), given geography, density and American preferences[39]. Nonetheless, faster charges and longer ranges should help in overcoming consumers' concerns, especially regarding range anxiety, which remains one of the main obstacles to EV adoption.

## EV Gains Globally and at the EU Level

Given the aforementioned political and market reasons, EVs are gaining momentum globally with a rising share of sales. The rise of EVs should be analyzed in conjunction with the opposite trend of ICE vehicle sales. Since their peak in 2017, ICE vehicles have experienced a long-term structural decline. In 2022, fewer than seventy-five million

**Figure 4:** EU-27 EV Sales (left) and EV Sales Share, Cars (right axis) (2010-2022)




Source: Author's elaboration using International Energy Agency (IEA) Global EV data, https://www.iea.org/data-and-statistics/data-tools/global-ev-data-explorer.

passenger cars were sold globally (11 percent below 2019 sales)—with ICE cars taking the biggest hit: -6 percent on average per year since 2019, with only fifty-nine million cars[40] sold in 2022, a 29 percent reduction compared to their 2017 peak. In contrast, EV sales are on the upswing: increasing by 68 percent in 2022 compared to 2021, and by 253 percent compared to 2019. Plug-in hybrid vehicle (PHEV) sales have experienced some growth globally, despite losing some ground to EVs in Europe.

As of today, the major markets for EVs are China, Europe, and the United States.[41] China is leading the way, having increased the national EV stock fivefold from 2020, reaching nearly twenty-two million EVs. Europe accounts for 25 percent of all electric car sales and 30 percent of the global stock.[42] Since 2019, the sales share of electric cars in the EU has constantly increased, from less than 3 percent before 2019 up to 21 percent in 2022 (see figure 4): nearly twelve million[43] EVs are on European roads, up from just 3.2 million in 2020.[44]

In EV sales share, European countries stand out. Using 2022 data, Nordic countries led the way in sales share of electric cars, with Norway reaching 88 percent and Sweden 54 percent. Next are the Netherlands (35 percent), Germany (31 percent), the United Kingdom (23 percent), and France (21 percent).[45] However, EV deployment is heterogeneous. In the first half of 2023, both in Germany and France, BEVs accounted for 16 percent of car sales, while in Spain, Italy, and Poland they accounted for 6 percent, 4 percent, and 4 percent, respectively.[46] In terms of volume, Germany is the largest EV market in Europe with 520,000 EVs sold in 2023. Thanks primarily to fiscal support, German EV sales have increased tenfold compared to the period before the COVID-19 pandemic; the expectation that subsidies would decline beginning in 2023 contributed to an acceleration in 2022 sales. In 2023, the growth continued and now Germany has 1.5 million BEVs, making it the largest market in Europe, followed by France (980,000) and Norway (690,000).

## The Need for Adequate Infrastructure

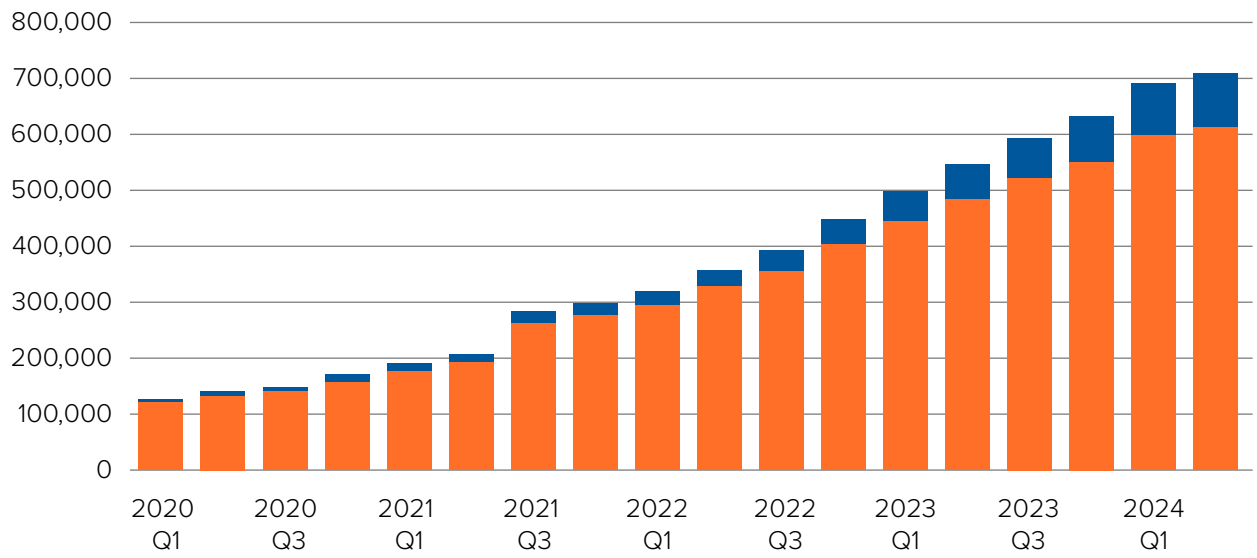
While EVs are gaining relevance and are set to become a major factor for decarbonization, policymakers will need to address critical issues, especially relating to enabling infrastructure (i.e., charging stations) to have a sustainable and smooth transition. Policymakers need to ensure publicly accessible chargers across the national territories to ensure the same level of convenience and availability that exists for refueling ICE cars. Indeed, access to chargers and driving range are key concerns for consumers, which can be alleviated by an accessible and fast-charging infrastructure. The distribution of charging stations is critical because pervasiveness ensures access to the charging infrastructure within the EC driving range, while also making EVs a valid and credible way of displacing ICE vehicles.[47] For example, according to an Ernst & Young survey (the 2021 EY Mobility Consumer Index), the absence or low distribution of charging stations is a key barrier to purchasing an EV, along with high up-front costs.[48]

As of today, home charging is the main option for most of the charging demand, thanks to lower electricity costs and the extensive time available for charging.[49] Notably, home charging is quite a bit more challenging in dense urban areas, where on-street parking is more common, further requiring a well-established public charging infrastructure to enable EV adoption. In 2023, 3.9 million public charging points were installed globally, with the EU becoming the home of 590,000 slow chargers and more than 110,000 fast chargers (see figure 5).[50] Yet more public charging stations in the EU are needed to reach an estimated target of at least 3.4 million public charging points by 2030, based on the most conservative scenario according to an analysis by McKinsey & Company for the European Automobile Manufacturers' Association, or ACEA.[51]

A public-private partnership is required for adequate investment to develop easily accessible public charging-station networks. Typically, governments must provide funding for public chargers in areas of low utilization, before a positive business case can be made, as low EV adoption discourages private investment.[52] Public funding at the early stage resolves the "chicken-or-egg" dilemma. So far, what's attracting private investment is fast direct-current (DC) charging stations, while public funding is flowing to slower alternating-current (AC) charging infrastructure due to its lower profitability.[53]

Given the relevance of these issues, the EU transport policy envisages support to increase the market penetration of EVs through several measures. The EU used the regulation of the TEN-T (the main transport corridors) to promote the evolution of low-carbon transport infrastructure, including EVs, while it provided the financial

**Figure 5:** EU-27 Total Number of Recharging Points, per the Alternative Fuel Infrastructure Regulation




Source: Author's interpretation using data from the European Commission's European Alternative Fuels Observatory, accessed October 10, 2023, https://alternative-fuels-observatory.ec.europa.eu/transport-mode/road/european-union-eu27/infrastructure.

framework to support such investment through the Connecting Europe Facility (CEF).[54] In 2014, the Directive on the Deployment of Alternative Fuels Infrastructure (AFID) (EU Directive 2014/94/UE) was presented by the Commission. The AFID set a regulatory scheme for the development of public low-carbon[55] recharging infrastructure. While it had merit in addressing the issue and promoting the advent of charging infrastructure, the AFID was not fit for the purpose, as the directive only required member states to have the "appropriate" number of recharging stations by 2020.[56] The Fit for 55 package included the proposal of the Alternative Fuel Infrastructure Regulation (AFIR). In March 2023, the European Parliament and the Council reached a provisional agreement on the regulation, which was adopted in July 2023.[57] The AFIR sets a binding deployment target for low-carbon (i.e., electricity and hydrogen) charging infrastructure, as detailed below.

Importantly, the AFIR also addresses the need to create efficient and user-friendly refueling experiences. It calls for a clear pricing scheme, easy and common payment options, and accessible charging-location information.[58] Furthermore, the regulation sets explicit and binding deployment targets by 2025. From then, there need to be fast charging points of at least 150 kW for light-duty vehicles every 60 km on the EU's main transport corridors. Furthermore, the specific targets relate to the annual member state target for EV charging networks to provide enough power output to meet demand. Specifically, for each BEV and PHEV registered within each member state's jurisdiction, at least 1.3 kW and 0.8 kW, respectively, must be provided through publicly accessible recharging stations each year.[59] At present, the AFIR targets would be satisfied in all EU countries, with the exception of Malta. As more EVs come onto European roadways, the challenge will be continuing to expand public chargers at a similar pace.

Additionally, governments will need to upgrade and expand utility grids to supply and allocate electricity to the charging infrastructure, alongside the expansion of installed renewable capacity. Strong and flexible electricity networks and electricity storage infrastructure are essential for managing the high-power demand of these stations—especially fast-charging stations.[60]

## Related Issues: Just Transition and Geopolitical Concerns

European policymakers need to take into account the social dimension of transforming transportation, not just the environmental and health benefits of decarbonization. The urgency of addressing the social aspects and the issue of affordable transportation surfaced in 2018 as the French "Yellow Vests" movement brought a year of protests to the nation's streets.[61] Indeed, many Europeans rely heavily on road transport for most of their daily activities including getting to work (especially in rural areas). The automotive sector is relevant for the labor market and the economy, and provides jobs for about thirteen million Europeans (equal to 7 percent of total employment in the EU), with 2.4 million Europeans directly involved in vehicle manufacturing.[62] To address this issue, the EU and member states must enhance their financial and social support: the Just Transition Fund, for instance, provides alternatives and compensation for those who are heavily affected by climate policies. Absent such support, the energy transition could fail. Furthermore, the just transition principle should also guide policymakers in the development and distribution of EV charging infrastructures. Without adequate policies and measures that promote a well-distributed network, there is a risk of fragmentation[63]—both among member states and within national borders along the dividing lines of high- and low-income countries and classes. In addition, the uneven deployment of charging infrastructure means travel across the EU and within national borders by EV is not easy, discouraging the shift from ICE vehicles to EVs.

Lastly, the expansion of EVs in the EU market has serious geopolitical and geoeconomic consequences. Indeed, European countries have increasingly expressed concerns about developing an overdependence on China in the field of clean technologies—particularly batteries and EVs. As of today, China dominates the EV battery supply chains and has also become an EV powerhouse both regarding production and consumption. China has managed to rapidly gain relevance in the EV sector thanks to a combination of factors: namely, large subsidies, an open-door policy for foreign leaders in the industry, and subsidies for consumers. China also has become a leading exporter of both EVs and their batteries (lithium-ion batteries), sold primarily to Europe, while the United States is largely self-sufficient in both, although there has been a recent growth of EV imports from the EU.[64] As it set tighter climate targets for the transport sector, the EU—traditionally a leading car producer and exporter—has increasingly imported EVs, especially between 2017 and 2022. In 2022, 42 percent of the total number of cars imported were electric or hybrid.[65] In the same year, Germany was overtaken by China as the world's second-largest car exporter. This development profoundly altered the industry.[66] China's car-export status has been built on two main factors: the critical role of foreign companies in China's car exports; and EVs driving the growth in exports.

In response to the rising Chinese role in the automotive industry, European Commission President Ursula von der Leyen announced in September 2023 the launch of an anti-subsidy investigation into EVs coming from China. In June 2024, the Commission proposed new tariffs on EVs made in China up to 38.1 percent depending on the level of subsidization by China. However, this probe could bring collateral damage to international companies, including US carmaker Tesla and others that manufacture in China. Such an initiative cannot be considered the silver bullet for Europe's industrial challenges. Indeed, the EU needs to develop and design its industrial policy to seize opportunities in clean energy technologies, including EVs and batteries, respecting its own peculiarities.[67] Besides some issues and risks, the decarbonization of road transport can entail major industrial opportunities both in manufacturing and the service sector.

The following section delves into Italy's policies and strategies for the expansion of EVs and related infrastructure, and how this fits into the decarbonization picture, with the aim of outlining the main barriers and challenges.

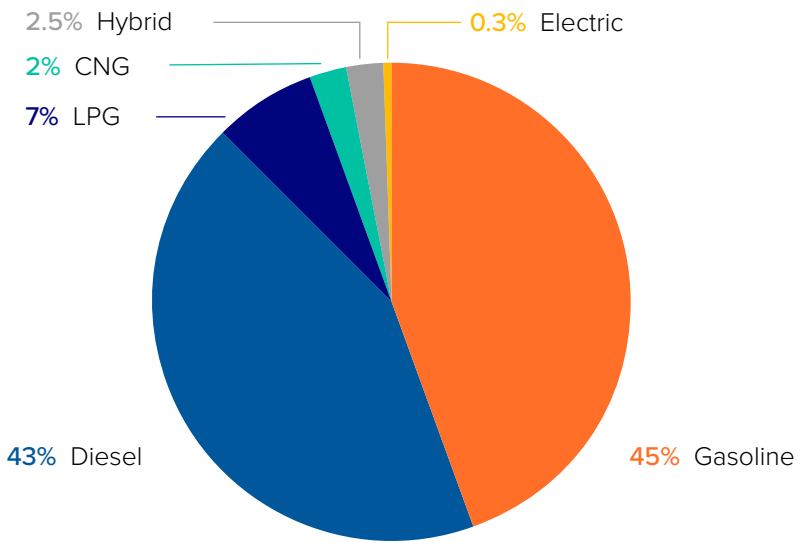
# THE CASE OF ITALY: OBJECTIVES, TRENDS, AND CHALLENGES

Italy is among the largest EU car markets. The existing national car fleet exceeded thirty-nine million vehicles in 2021, or 670 vehicles per 1,000 citizens.[68] The current average age of the national car fleet is 11.8 years, in line with the EU average. As of today, the national car fleet is dominated by cars using gasoline (i.e., at about 45 percent) and diesel (about 43 percent), while EV (0.3 percent) and hybrid vehicles jointly account for less than 3 percent (see figure 6). The limited relevance of EVs is due to a combination factors, notably lower political commitment, translated into inconsistent policies and subsidies as well as regulatory complexity (see following section).

Against this backdrop, road transport is a key area for GHG emission reduction in Italy. In 2021, the sector was responsible for 24.7 percent of total national GHG emissions and 31.0 percent of energy-sector GHG emissions.[69] Furthermore, transport-sector emissions have increased by 3.2 percent between 1990 and 2019, while the country's total emissions have declined by 19 percent over the same period.[70] Road transport comprises the lion's share of the sector's emissions because of the heavy dependence on oil products. The sector accounts for 70 percent of Italy's total petroleum products demand.

Furthermore, the carbon intensity[71] of newly purchased cars and light commercial vehicles in Italy amounted to 108.6 g/km in 2020, which is slightly above the EU average (107.8 g/km). However, it is well above the EU fleet-wide 2020 target for new passenger cars of 95 g/km. Thus, it will become even more challenging for Italy to reach new $CO_2$ performance targets set by EU Regulation 2023/851 without a significant ramp up of EV deployment.

**Figure 6:** Italian Car Fleet by Energy Type (2021)




Source: Italian Association of the Automotive Industry, Car Fleet by Type, https://www.anfia.it/it/automobile-in-cifre/statistiche-italia/parco-circolante. LPG: liquefied petrol gas; CNG: compressed natural gas.

Photo by Oxana Melis on Unsplash.

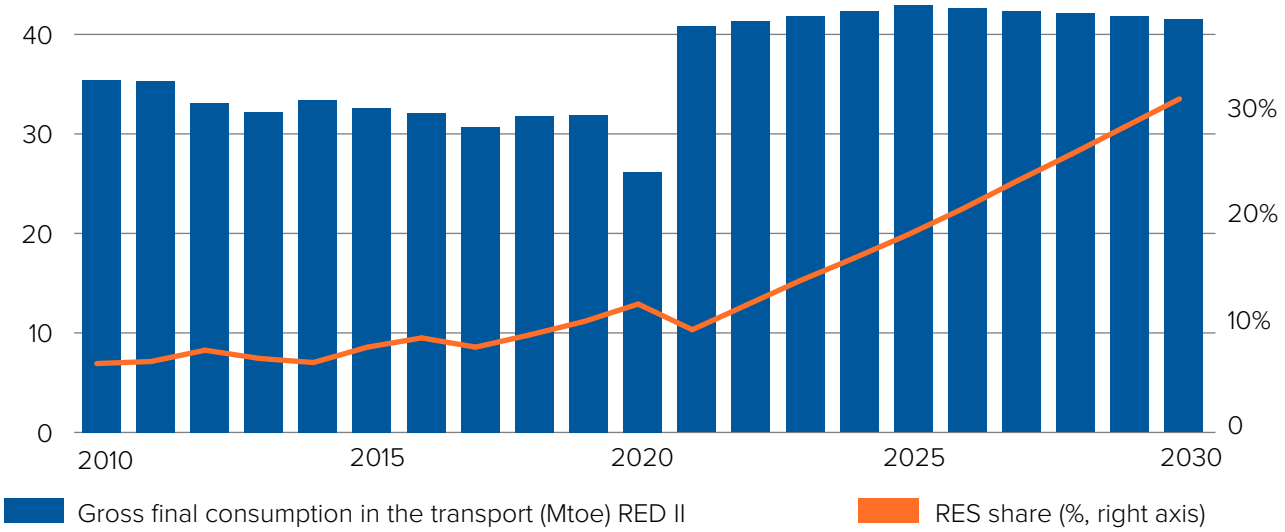
Electrification of road transport can be a main contributor to the emission-reduction strategy, as outlined by a report prepared for Italy's Ministry of Infrastructure and Sustainable Mobility (MIMS) in April 2022.[72] The report, produced by experts involved in the MIMS-created Structure for a Green Transition for Mobility and Infrastructure (STEMI), pointed out that electrification of vehicles entails relevant emissions reduction with limited development of new renewable energy capacities. The report found that replacing ICE vehicles with EVs would result in a 50 percent reduction of light heavy-duty transport emissions even with Italy's current energy mix.[73]

Italy recently outlined its climate and energy goals and related policies to reach its 2030 targets in its National Energy and Climate Plan (NECP). The new draft, submitted to the Commission in July 2023, foresees renewables comprising 40 percent of total energy consumption in 2030 and 65 percent of electricity consumption. Concerning the transport sector, the new NECP envisages an increase in the use of renewables to 30.7 percent, compared to a Renewable Energy Direction (RED) III target of 29 percent (see figure 7).[74]

The updated NECP, which is expected to be finalized by June 2024, outlines new ambitions and measures to reach climate targets, given enhanced EU climate ambition following the Fit for 55 package as well as the new international context (e.g., the REPowerEU Plan). While the new NECP has increased the projected share of renewables, it also included what some would call a more balanced approach regarding the energy transition, in line with the current government's preferences and based on the concept of technological neutrality, which calls for using a flexible approach to available technologies, which can be used depending on their efficiency and effectiveness in abating emissions, rather than choosing a single technology to reach a goal. Compared to the previous government of Mario Draghi, the current Italian government headed by Giorgia Meloni has expressed less enthusiastic support for the energy transition in general, prioritizing energy security and affordability and expressing concerns over the social risks entailed in an energy transition, such as job losses[75].

Electrifying transport is one part of the decarbonization equation. The NECP promotes a combination of tools to reduce transport-sector

**Figure 7:** Renewable Energy Share (RES) in Gross Final Energy Consumption in the Transport Sector and Projections through 2030




Source: Author's elaboration of Italy's 2023 Draft NECP; Mtoe stands for megatonne of oil equivalent.

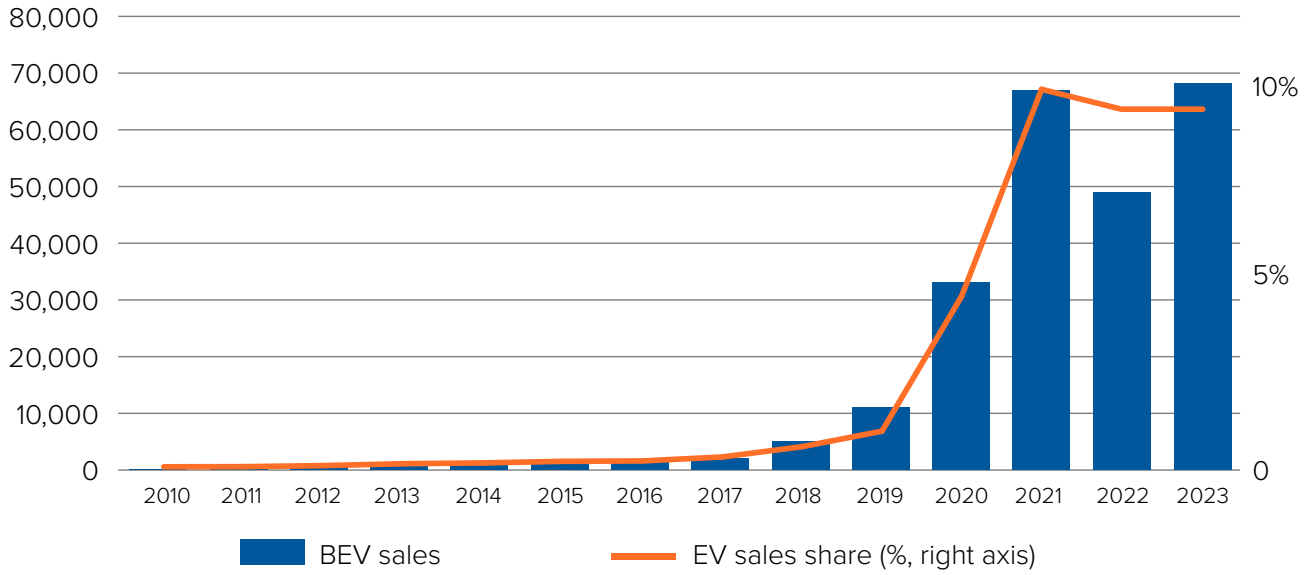
emissions, including clean electricity, renewable gases (biomethane and hydrogen), and other biofuels. Italy, in particular, has promoted the role of biomethane in transport decarbonization. This approach is motivated by a key characteristic of Italy's transport sector: the relatively high diffusion of methane-powered vehicles and related refueling infrastructure. This focus also is a driver for Italy's initial opposition to Regulation 2023/851, the ban of new ICE car sales by 2035.[76] Indeed, Italy requested that vehicles using biofuel be exempted from the ban, and joined other countries including Germany to reopen negotiations before the regulation's final approval. Italy did not succeed in securing its exemption, unlike Germany.

## EV Targets and the Slow Expansion

Notwithstanding this evolution in political commitment, Italy has outlined several targets for EVs in its key official documents. The previous version of Italy's NECP[77] envisaged a reduction of the national car fleet to about thirty-six million by 2030 as a result of behavioral changes and a shift in transport modes toward walking, cycling, public transport, carpooling, and car sharing; in addition, it foresaw a rise to six million EVs (i.e., around four million BEVs and two million PHEVs) in 2030—equal to about 17 percent of the expected future fleet. After the Commission launched the Fit for 55 package two years later, Italy slightly raised the target. The new NECP version foresees a total EV fleet of around 6.6 million vehicles in 2030, including about 4.3 million BEVs.[78] Regarding the 2050 target, the Long-Term Strategy on the Reduction of Greenhouse Gas Emissions envisages complete decarbonization of the transport sector through a drastic reduction of the national car fleet, which is currently thirty-nine million cars, to about twenty-four million and its electrification.[79]

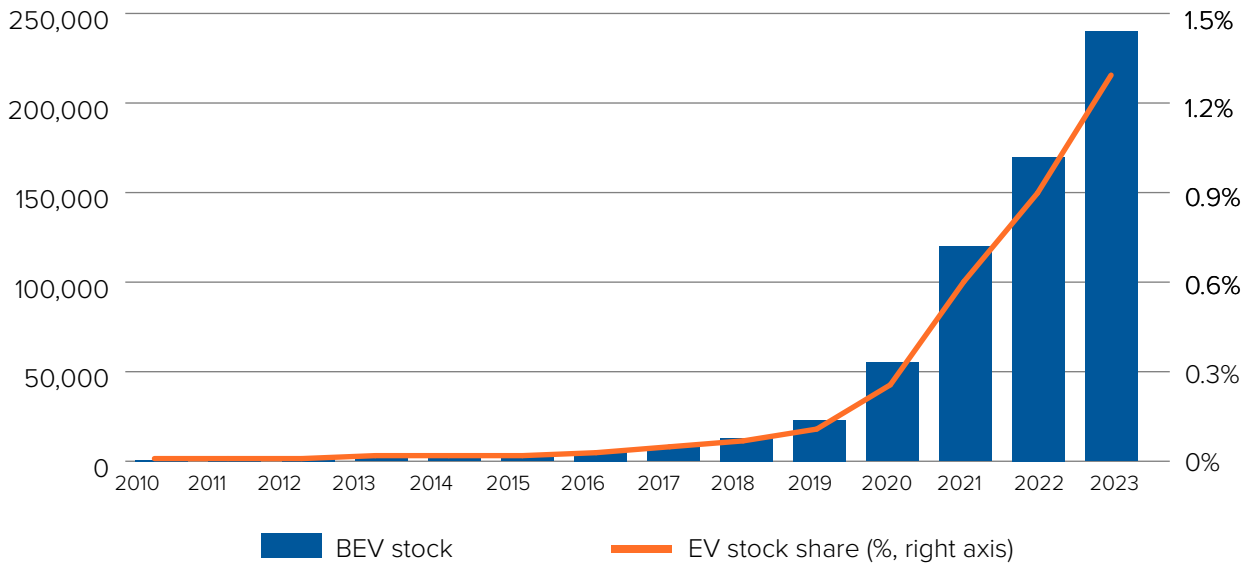
EV deployment has risen rapidly in Italy over the past decade and especially since 2019, thanks to purchasing subsidies. The number of registered EVs increased from just 650 in 2010 to more than 170,000 in 2022. In line with the global trend, steep growth occurred between 2020 and 2021, with EVs more than doubling thanks to very generous subsidies. In 2021, the subsidy scheme envisaged a lump-sum subsidy of up to €10,000 to buy a car within the $CO_2$ emission range of zero to 20 g $CO_2$/km with the condition of scrapping a more polluting car (Euro class 0-5). The subsidy was in place for the acquisition of a vehicle with a value of up to €50,000.

**Figure 8:** Italy's BEV Sales and EV Sales Share (2010-2022)




Source: Author's elaboration of IEA Global EV Data.

**Figure 9:** Italy's BEV Stock and EV Stock Share (2010-2022)




Source: Author's elaboration using IEA Global EV Data.

Nonetheless, the country has not kept the same pace of EV sales or market share as other EU countries. In 2021, EVs accounted for only 0.6 percent of national car fleet compared to 2.3 percent in the EU; the share of EVs in new registrations is 9.5 percent versus an EU average of 16.6 percent.[80] Furthermore, electric car sales in Italy suffered a setback in 2022, declining to 49,000 from 67,000 in 2021 (see figure 8).[81] In 2022, there were 170,000 BEVs in Italy (see figure 9). In 2023, EV stoke increased up to 240,000 as sales bounced back to 66,000. In terms of geographical distribution of the total EV fleet, northwestern and northeastern areas account for 30 percent and 37 percent, respectively; the central area accounts for 22 percent; and the southern area and islands for 11 percent.[82]

The limited expansion of EVs in Italy is the result of a combination of factors. The main barrier is the high upfront cost to purchase an electric vehicle. To partially overcome this barrier, Italy has deployed some subsidies (e.g., the Ecobonus) to purchase cleaner and less polluting vehicles, as regulated by the ministerial decree of April 6, 2022.[83] The subsidies have been allocated for three years (2022, 2023, and 2024). In 2024, the government ensures subsidies totaling €610 million, of which €570 million are for new car sales through lump-sum subsidy linked directly to the $CO_2$ emissions of the new car (see table 1). As currently structured, there are several issues with these subsidies. First, the government allocated only €205 million euros for BEVs, or less than half of the total amount dedicated for cars, highlighting a modest political commitment toward transport decarbonization. In addition, the subsidy is available for ICE cars with a $CO_2$ emission range that exceeds the limit (95 g $CO_2$/km) set by EU Regulation 2023/851.

Another issue is the establishment of clear, stable and consistent funds aimed at the promoting EV expansion and helping lower-income individuals purchase EVs, which generally cost 20 percent to 30 percent more than traditional cars. However, although the government announced a new financial scheme for 2024 in February 2024, the new scheme has entered into force only in June 2024. This substantially undermined EV sales in the first quarter of 2024 (dropping by around 20 percent). In line with the new scheme, consumers can benefit from a bonus of €11,000 if they scrap an older car (Euro 0, 1 and 2), which can increase up to €13,750 if the family income is below €30,000. The funds dedicated for EVs (around €200 million)

**Table 1:** Features of Italy's Lump-sum Subsidy Earmarked for 2024

| **$CO_2$ emission range for M1 passenger vehicles (g $CO_2$/km)** | | 0-20 (BEV) | 21-60 (PHEV) | 61-135 |
|---|---|---|---|---|
| **Lump-sum subsidy (in euros)** | **If a car is scrapped** | 0-11,000* | 0-8,000*** | 0-3,000***** |
| | **If no car is scrapped** | 6,000 | 4,000 | - |
| **Lump-sum subsidy (in euros)** | **If a car is scrapped** | 8,000-13,750** | 5,000-10,000**** | - |
| | **If no car is scrapped** | 7,500 | 5,000 | - |
| **Car value cap (including VAT)** | | 42,700 | 54,900 | 42,700 |
| **Allocated funds** | | 240 million | 140 | 402 |

Note:
*Euro 0,1,2: €11,000; Euro 3: €10,000; Euro 4: €9,000; Euro 5: €0.
** Euro 0,1,2: €13,750; Euro 3: €12,500; Euro 4: €11,250; Euro 5: €8,000.
***Euro 0,1,2: €8,000; Euro 3: €6,000; Euro 4: €5,500; Euro 5: €0.
**** Euro 0,1,2: €10,000; Euro 3: €7,500; Euro 4: €6,875; Euro 5: €5,000.
***** Euro 0,1,2: €3,000; Euro 3: €2,000; Euro 4: €1,500; Euro 5: €0.

Source: author's elaboration on https://www.qualenergia.it/articoli/ecobonus-auto-2024-pubblicato-decreto-domande-3-giugno/.


Photo by Bob Osias on Unsplash.

were entirely used up in less than nine hours, underlining the urgent need to provide secure and stable funds to support consumers. In an attempt to address these challenges, the government decided to include an additional lump-sum subsidy for those who have an income below €30,000. Furthermore, in May 2024 the government finally presented the new scheme allocating a billion euros, of which €402 million for cars between 61-135 g CO2/km, 240 for EVs (a €35 million increase compared to the previous scheme) and 140 for PHEV. In addition to the national subsidies, some regional governments (especially in the North) envisage EV purchase subsidies, causing an additional geographical disparity in EV penetration. For example, the Lombardy region set a regional subsidy up to €4,000 in addition to the national subsidies.[84] The EV revolution has also put under pressure the automotive sector, demanding a new industrial strategy and funds. Therefore, in 2022 the government created the Automotive Fund: €8.7 billion available up to 2030 to support the redevelopment and transformation of the automotive sector. Nonetheless, a more holistic approach would be needed regarding national industrial policy.

Against this backdrop, Italy should quicken the pace of EV expansion if it is still committed to reaching the NECP target of 6.6 million EVs in 2030. The target indeed seems unreachable by 2030 if the country does not change the pace. A first, essential step would be revising the fiscal incentives in the automotive sector to favor EV sales. Subsidies and fiscal incentives need to target electric vehicles, in line with EU targets (Regulation 2023/851). The 2024 Ecobonus is not aligned with the EU's new $CO_2$ performance standards. Thought should be given to a measure that would encourage the purchase of EVs for company fleets by increasing deductible discounts.[85]

## Infrastructure: Good Developments Despite the Challenges

EV deployment in Italy also has been slowed by charging infrastructure concerns and range anxiety. Italy's regulatory framework follows EU initiatives concerning charging infrastructure. It adopted the 2014 EU AFID with Legislative Decree 257 of December 16, 2016, which outlines the standard power of the charging infrastructure (between 3.7 kW and 22 kW) and high-power charging points

(greater than 22 kW). The decree envisaged growth in the number of recharging stations (both public and private) to at least 6,500 in 2020. Furthermore, the Ministry of Transport prepared the National Infrastructure Plan for the Recharging of Vehicles powered by Electricity (Piano Nazionale Infrastrutturale per la Ricarica dei Veicoli alimentati a Energia Elettrica, PNire), which foresaw up to 13,000 slow/accelerated charging points, 6,000 fast charging points, with a ratio of a public charging point for every eight private charging points, and 130,000 electric vehicles in 2020.[86]

Italy has been steadily building out its charging infrastructure both in absolute and relative terms, achieving PNire's 2020 target. At the end of 2022, there were 36,772 charging points;[87] at the end of 2023, there were more than 50,000 charging points; in the first three months of 2024 that number rose to 54,164 points. This represents a remarkable growth as in March 2022, there were 27.857 and in 2023 there were 41,173.[88] Most of these charging stations are still located in northern Italy (58 percent); the southern area and islands (22 percent) surpassed the central area (20 percent). While the north-south gap reflects the map of EV registration rates (caused by socioeconomic disparities among on average richer Northern regions and poorer Southern regions), Italian EV drivers would benefit from adequate charging opportunities while traveling throughout the country.[89]

A positive trend is the expansion of installed charging stations in private areas (e.g., supermarkets and malls) because it contributes to the equal distribution of charging stations. This solution exploits the existing power infrastructure to those businesses, which can speed up the authorization process and minimize costs, which in turn lowers final user prices. Coordinating with distribution system operators and faster authorization procedures are essential to keep up the pace of installing charging points. Historically, around 11 percent of installed charging points are not available to consumers because of delayed connection with the grid or bureaucratic reasons.[90] Reducing permitting procedures for both operators and investors is therefore essential to accelerating the deployment of charging stations and their connection with the grid.

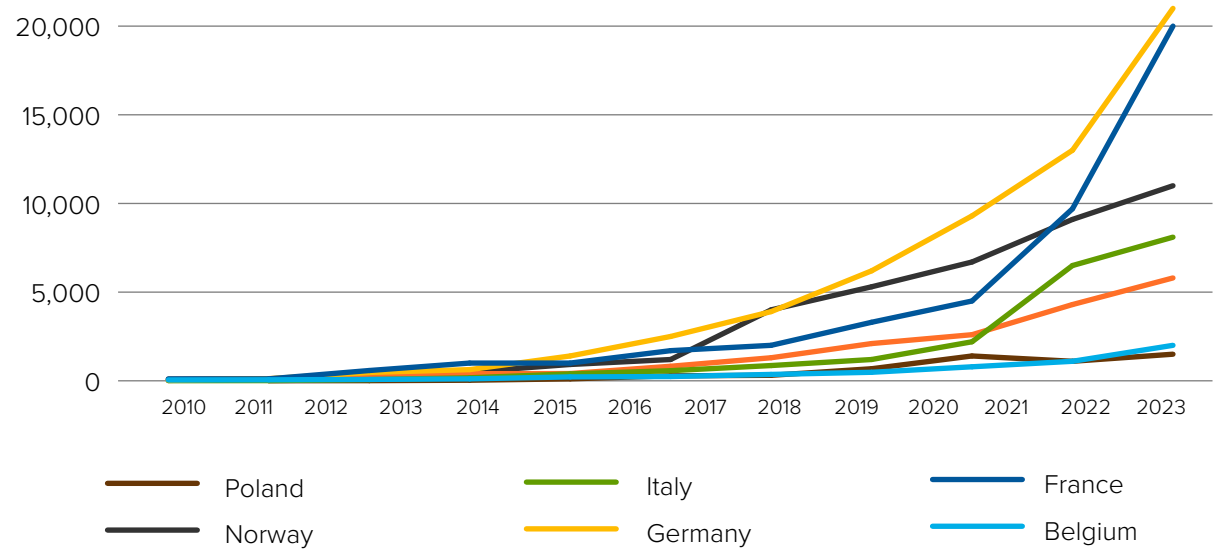
Regarding charging speeds, the good news is that the share of DC charging points has doubled between 2021 and 2022 and reaching 15 percent of total charging points in 2023.[91] As of September 2023, there are 2,375 with speeds between 44 kW and 99 kW, and 3,396 with speeds exceeding 100 kW. Nonetheless, most of the installed points (41,144 points) are slow AC chargers, providing less than or the equivalent of 43 kW.[92]

Notwithstanding the recent acceleration, Italy's charging network has experienced a different evolution compared to other large EU passenger car markets (i.e., Germany and France), as shown in figures 10 and 11. In these two countries, deployment of public charging stations started in 2014-15, while Italy begins deploying them in 2018. At the national level, the pace of EV deployment also differs.

Furthermore, these countries have made significant investments to support and cover larger shares of the necessary upfront capital. According to a STEMI report, Italy needs to invest about €2 billion in the charging network by 2030. Italy's NRRP represents a precious opportunity to partially close the investment gap and accelerate charging infrastructure development. Indeed, it provides €731 million for the establishment of 21,000 public charging stations between urban areas (13,755 fast charging stations) and nonurban areas[93] (7,500 superfast charging stations) by 2026.[94] While the first round of financing was positive for the urban areas (4,718 charging points approved), the round for nonurban areas failed to secure funds for any project.

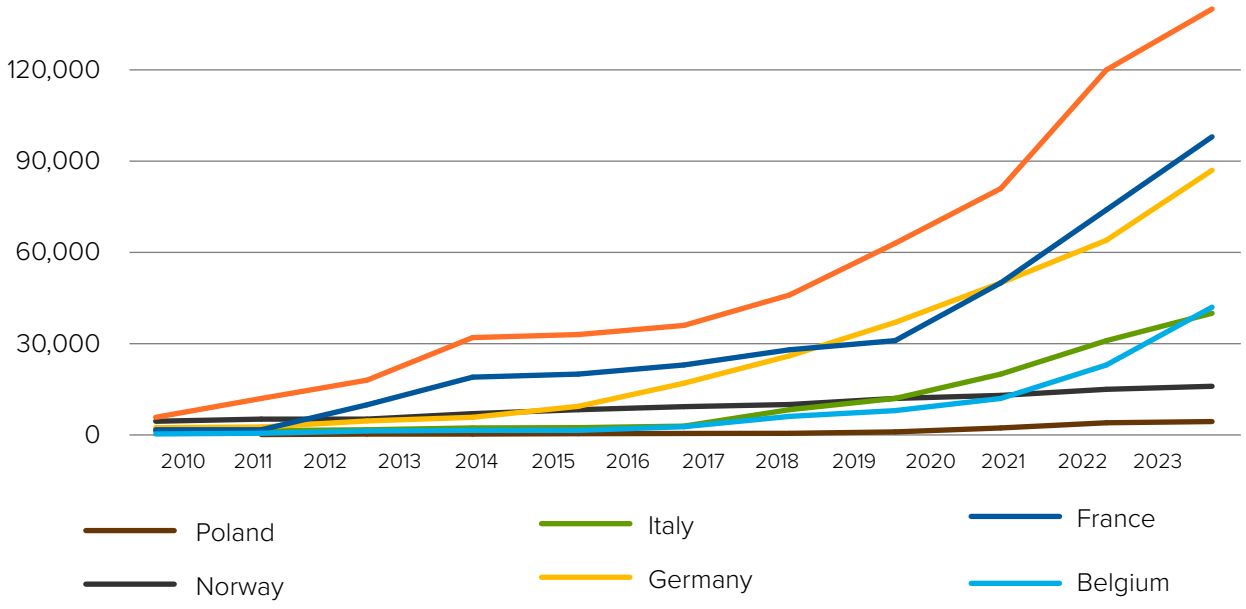
Notwithstanding such challenges, Italy has managed to develop an adequate infrastructure network for the existing EV fleet. Indeed, Italy ranks only second to the Netherlands and Belgium regarding the ratio of charging stations to EVs.[95] Moreover, Italy has experienced an even faster growth of private chargers—surpassing 400,000 points, more than tripling, in 2023.[96] However, most of this growth is driven by fiscal support for building renovations, the so-called Superbonus, rather than a sustainable expansion of EVs.[97] To further incentivize the expansion of the charging station network and support businesses and professionals, the Italian government announced a subsidy (bonus colonnine), which will cover 40 percent of the expenditure, with €87.5 million in funding allocated.[98] Since the revision of the Superbonus, Italy should stabilize other subsidies and funds (including the bonus for the "columns" of the infrastructure) to maintain momentum and avoid setbacks.

**Figure 10:** Development of Publicly Available Fast Chargers in Selected European Countries




Source: Authors' elaboration using IEA Global EV Data.

**Figure 11:** Development of Publicly Available Slow Chargers in Selected European Countries




Source: Authors' elaboration using IEA Global EV Data.

Conversely, the development of charging stations on the motorway is a major area where Italy needs to step up its efforts. This is particularly problematic, despite recent improvements. As of the end of March 2024, there were 942 charging points compared to 851 at the end of September 2023, of which 85 percent are DC chargers and 61% above 150 kW.[99] These charging points cover almost one-third of the national service areas. Still, several issues undermine a fully developed system. For example, several highway authorities have delayed publishing calls for bids to allow other operators to install charging stations along the highways, hindering the pace of deployment.

An enhanced effort also is required given the adoption of the EU AFIR and its consequent targets (a recharging station every 60 km). However, the AFIR only covers the EU's main roads (TEN-T). In this regard, Italy will need to work on the two EU corridors that cross its territory: Scandinavian-Mediterranean and the Mediterranean corridor. The former consists of 2,447 km, meaning that Italy will need to install around forty fast charging stations along the north-south axis.[100] The latter will require the deployment of about eight charging stations to comply with the AFIR targets. However, the main challenges are the permitting and authorization processes, which could delay the launch of these new charging stations beyond the 2025 deadline.

Notwithstanding these trends, Italy needs to reach its targets. For example, according to the scenario of the Italian energy services operator Ricerca sul Sistema Energetico (RSE), about 45 percent of the electric vehicles in use in 2030 will need to be charged at public stations, assuming there will be 3.6 million private charging points at homes and companies (in line with the FF55 scenario).[101] In addition, it foresees the need for more than 200,000 public charging points. By contrast, if EVs comprise 68 percent of vehicle sales by 2030, around 380,000 normal speed chargers (public and workplace) and 16,000 fast chargers will be needed, according to another forecast.[102]

In conclusion, Italy has expanded its charging infrastructure in line with other European peers. However, the country is struggling to ramp up EV deployment, with only 240,000 BEVs in 2023, well below other large car markets in the EU. Furthermore, it needs to address several administrative, financial, and market challenges to ensure an adequate network to meet the demand of a growing electric passenger-car stock. This will also be key to reducing consumers' main concerns regarding the distribution of charging stations.

The next section provides recommendations to further support the decarbonization of the road transport sector.

# KEY TAKEAWAYS AND POLICY RECOMMENDATIONS

To reach climate neutrality, the EU and member states will need to strongly address transport-sector emissions, especially road transport. There are several avenues through which to pursue this. Electrification and EV deployment, the focuses of this paper, are expected to play an ever-growing role in European mitigation strategies for the transport sector and the effort to achieve climate neutrality by 2050. As a result, the EU has increasingly enhanced $CO_2$ performance standards for cars and increased renewable targets for the transport sector. Nonetheless, some challenges and issues remain in place and they need to be address properly. In the case of Italy, the government should focus particularly on the expansion of the national EV fleet and the development of an adequate and distributed charging infrastructure. This approach demands a high level of consistency: in other words, the capacity to maintain the commitment to decarbonization and to produce reforms and policies to that end.

Over the past several years, EVs have gained relevance in the both the global car market and the EU market. However, Italy has not been able to keep pace with EV deployment in other major EU markets such as Germany and France. Not only its EV sales are affected by the lack of consistent and stable funds and policies causing fluctuations in EV sales. In absolute terms, Italy had 240,000 BEVs in 2023, well below Germany's 1.5 million vehicles.

Italy's NECP sets ambitious EV targets: 6.6 million EVs in 2030. Without any change in the pace of EV deployment, it is unlikely Italy will reach its target. This could limit incentives to further develop infrastructure. To achieve the 2030 target, Italy should revise its fiscal and incentives schemes for the automotive sector. As of today, the government still offers subsidies and incentives (i.e., the Ecobonus and Automotive Fund) for cars that do not comply with EU $CO_2$ performance standards (i.e., cars with 95 g $CO_2$/km). Purchase subsidies for EVs should also aim to enhance EV affordability, especially for lower-income individuals and counterbalance regressive effects given EVs higher cost relative to ICE cars. To further incentivize EVs, Italy should ultimately streamline the regulatory framework, which currently is too complex and fragmented.

> "Italy should focus particularly on the expansion of the national EV fleet and the development of an adequate and distributed charging infrastructure."

Furthermore, it would be particularly helpful to sustain the industrial transformation and the development of industrial capabilities related to the electrification of transport (both EV and charging stations), in order to seize economic benefits, provide a just transition and ensure support from local communities.

Italy expanded its charging infrastructure to 54,000 public charging stations, as of the end of March 2024. Italy has a higher charging point to EV fleet ratio than many peers, ranking behind only the Netherlands, Belgium and Spain. However, this rank is due to its modest EV fleet. Therefore, Italy will need to continue to develop an adequate and distributed charging infrastructure to ensure and support further and faster EV deployment. To that end, Italy should:

- Deploy faster chargers (DC) and expand charging points outside urban areas, especially on highways.
- Invest in public charging infrastructure in southern and central Italy, where EVs are generally less common also due to socioeconomic disparity compared to northern regions. To do so, it's essential to fully use and exploit financing capacities such as the NRRP.

- Develop a more holistic and shared vision of EVs by reducing permitting procedures and promoting better cooperation between national and subnational administrations.
- Ensure stability and certainty regarding investments and subsidies to send a signal to both the private sector (i.e., charging station providers and investors) and consumers; strive to avoid the boom and bust, and limited success, sometimes associated with generous subsidies in the deployment of clean energy technologies. The experience of the Ecobonus 2024 perfectly embodies this issue.
- Design a clear regulatory framework to facilitate private investments in the charging infrastructure, given limited national fiscal capacities; create measures and policies, and rationalize existing rules, to improve the overall charging experience including a clear pricing scheme, easy and common payment options, and accessible charging-location information—all of which will help reduce consumer skepticism and remove soft barriers to EV adoption.

These policy recommendations are relevant also for emerging markets, such as Turkey, which has set ambitious EV targets (1 million EVs on the road by 2030). But they need to build and complete their regulatory frameworks and incentives to allow the EV wave to fully manifest its contribution to their national decarbonization strategies.

# ENDNOTES

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