

Battery electric vehicle access in Europe: A comparison of rural, intermediate, and urban regions

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Introduction

Sales shares of battery electric vehicles (BEVs) increased significantly in Europe from 2019 to 2020, rising from about 360,000 vehicles to over 700,000.¹ This represented a share increase from nearly 2% to 6.2%.² Norway had the highest BEV uptake in Europe in 2020, with a new registration share of 54%. The Netherlands held the second highest electric passenger car registration share at 21%, followed by Liechtenstein, Sweden, and Switzerland, with rates ranging from 8% to 10%. In 2021, BEV registration rates continued to rise in Europe, with BEVs making up 10% of the 10 million new passenger car registrations. Norway (65%) continued to lead new BEV registration shares, followed by Iceland (27%), the Netherlands (20%), Sweden (19%), and Austria (14%).³

This paper provides an update of a previous ICCT study on the progress of passenger car electrification in Europe in 2019, focusing on BEV uptake.⁴ The analysis differentiates uptake by urban, intermediate, and rural regions, with a focus on the latter.⁵ Uptake in rural regions is particularly important in the context of social equity. For example, commuting distances in rural regions can often be longer compared to their urban and intermediate counterparts, leading to higher fuel consumption and travel-related

1 This includes the 27 European Union (EU) member states, the United Kingdom, and the European Free Trade Association (Iceland, Norway, Liechtenstein, and Switzerland).

2 Sonsoles Díaz, Marie Rajon Bernard, Yoann Bernard, Georg Bieker, Kaylin Lee, Peter Mock, Eamonn Mulholland, Pierre-Louis Ragon, Felipe Rodriguez, Uwe Tietge, and Sandra Wappelhorst, *European Vehicle Market Statistics 2021/22* (ICCT: Washington DC, 2021), <https://theicct.org/publication/european-vehicle-market-statistics-2021-2022/>.

3 Peter Mock, Uwe Tietge, Sandra Wappelhorst, Georg Bieker, Jan Dornoff, and Marie Rajon Bernard, *Market Monitor: European Passenger Car and Light Commercial Vehicle Registrations, January – December 2021* (ICCT: Washington DC, 2022), <https://theicct.org/publication/market-monitor-eu-jan-to-dec-feb22/>.

4 Sandra Wappelhorst, *Beyond major cities: Analysis of electric passenger car uptake in European rural regions* (ICCT: Washington DC, 2021), <https://theicct.org/publication/beyond-major-cities-analysis-of-electric-passenger-car-uptake-in-european-rural-regions/>.

5 Based on Eurostat's urban-rural typology which differentiates by predominantly urban, intermediate, and predominantly rural regions. It is applied at NUTS 3 level regions (NUTS = Nomenclature of Territorial Units for Statistics). Predominantly urban regions, referred to here as urban regions, are regions where more than 80% of the population live in urban clusters, i.e. a cluster of contiguous grid cells of 1 km² with a population density of at least 300 inhabitants per km² and a minimum population of 5,000 inhabitants. Intermediate regions are regions where more than 50% and up to 80% of the population live in urban clusters. Predominantly rural regions, referred to as rural regions here, are regions where at least 50% of the population live in rural grid cells, or grid cells that are not identified as urban centers or as urban clusters.

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emissions.⁶ A previous ICCT study also suggests that savings on vehicle operational costs of BEVs can be higher in rural regions due to lower costs of electricity and charging.⁷ As residents of rural regions are more reliant on passenger cars to access jobs and other essential services, the reduction of operational costs can be beneficial, especially for low-income households.

While the previous study utilized BEV and plug-in hybrid vehicle (PHV) registration data, this paper examines only BEV new passenger car registrations for the year 2020. The aim is to further understand distributional equity by identifying regions with high battery electric passenger car uptake. It also provides information on changes to the policy landscape in 2020 for selected regions, with special attention paid to rural regions. The analysis covers 17 European countries, which includes 13 European Union (EU) Member States, Liechtenstein, Norway, Switzerland, and the United Kingdom.⁸ The EU Member States studied include Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Italy, Poland, Portugal, Spain, Sweden, and the Netherlands. The regional-level data analysis is based on the statistical regional typology classification using the Nomenclature of Territorial Units for Statistics third level (NUTS 3) of the 2016 NUTS classification by Eurostat.⁹

Development of the BEV market by regional typology in 2019 and 2020

Of the three regional typologies, urban regions showed the highest new registrations of BEVs by total numbers in 2020, followed by intermediate and rural regions (Figure 1). Compared to 2019, urban regions in the 17 European countries analyzed saw total new registrations of BEVs almost double from over 200,000 in 2019 to around 372,000 vehicles in 2020. Total new BEV registrations in intermediate regions grew more than twice the 2019 level of 116,000, rising to over 260,000 new registrations in 2020. In rural regions, new registrations of BEVs more than doubled between 2019 and 2020, from around 34,000 vehicles to 83,000.

6 Timo Ohnmacht, Jana Z'Rotz, and Lisa Dang, Relationships between coworking spaces and CO₂ emissions in work-related commuting: First empirical insights for the case of Switzerland with regard to urban-rural differences. *Environ. Res. Commun.*, 2 (2020) 125004, <https://iopscience.iop.org/article/10.1088/2515-7620/abd33e>.

7 Gordon Bauer, Chih-Wei Hsu, and Nic Lutsey. *When might lower-income drivers benefit from electric vehicles? Quantifying the economic equity implications of electric vehicle adoption?* (ICCT: Washington DC, 2021). <https://theicct.org/publication/when-might-lower-income-drivers-benefit-from-electric-vehicles-quantifying-the-economic-equity-implications-of-electric-vehicle-adoption/>.

8 Marie Rajon Bernard, Dale Hall, Nic Lutsey. *Update on electric vehicle uptake in European cities* (ICCT: Washington DC, 2021). <https://theicct.org/publication/update-on-electric-vehicle-uptake-in-european-cities/>.

9 Eurostat. NUTS - Nomenclature of Territorial Units for Statistics. <https://ec.europa.eu/eurostat/web/nuts/nuts-maps>.

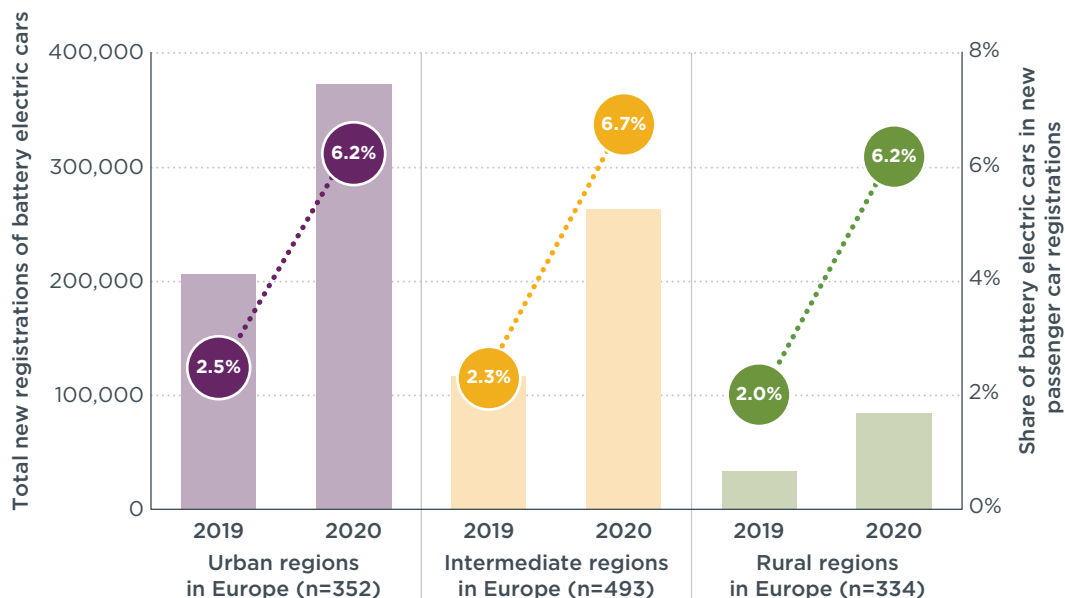


Figure 1. Total new registrations (left axis) and average market share (right axis) of battery electric passenger cars in Europe by regional typology in 2019 and 2020. Data is based on 13 EU Member States, Liechtenstein, Norway, Switzerland, and the United Kingdom. “n” denotes the number of NUTS 3 regions by regional typology.

By new BEV registration shares, the average market share within each of the three different regional typologies was quite balanced in 2020, similar to 2019. The BEV market shares were highest for intermediate regions in 2020 at almost 7%, with urban and rural regions seeing almost equal market shares of just over 6%. Slight variations were seen amongst the regional typologies and the largest BEV market share growth compared to 2019 occurred in intermediate regions by 4.4 percentage points.

It is important to note that urban regions, which had the highest number of new BEV passenger car registrations, also had the highest population compared to intermediate and rural regions. In the 17 selected European countries, around 48% of the inhabitants lived in urban regions, 36% in intermediate regions, and 16% in rural regions.¹⁰ When considering total BEV registrations per capita, urban regions still saw the highest number in 2020, with 17 new BEV registrations per 10,000 inhabitants. Intermediate regions had the second most BEV registrations per capita with 16 per 10,000 inhabitants, and rural region had 12 electric cars newly registered per 10,000 inhabitants.

To put this in perspective, the urban regions also saw the highest number of total new passenger car registrations in 2020 with nearly 6 million vehicles registered. Intermediate regions saw roughly 3.9 million vehicles registered, followed by rural regions with over 1.35 million. In 2019, numbers of total new vehicles registered were lower, however, urban regions still led with the highest registration numbers, followed by intermediate and rural regions.

Analysis of the BEV market by regional typologies and clusters in 2020

To better understand if access to electric vehicles is equitable among urban, intermediate, and rural regions for the selected countries in 2020, we differentiated regions based on BEV shares in new passenger car registrations in 2020. Regions in this paper are defined at the NUTS 3 level and are defined by Eurostat as small regions

¹⁰ Eurostat, Population change – Demographic balance and crude rates at regional level (NUTS 3), https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_r_gind3. Population data for the United Kingdom was unavailable for 2020. 2019 data has been utilized for all calculations in its place.

for specific diagnoses.¹¹ The regions are then clustered depending on if their new BEV registration shares are equal to/above or below the European average of 6.2% in 2020.¹²

Figure 2 displays the cluster separation for urban, intermediate, and rural regions based on new passenger car registrations in 2020. In the 352 urban regions, 38% saw BEV registration shares equal to/above the European average of 6.2% in 2020. In intermediate regions, 45% of new BEV registrations were equal to/above the European average, and rural regions saw 42% of new BEV registrations equal to/above the European average. Overall, areas with BEV registration shares equal to/above the European average in 2020 were the highest in intermediate regions with 45%, followed by rural regions with 42%, and urban regions with 38%.

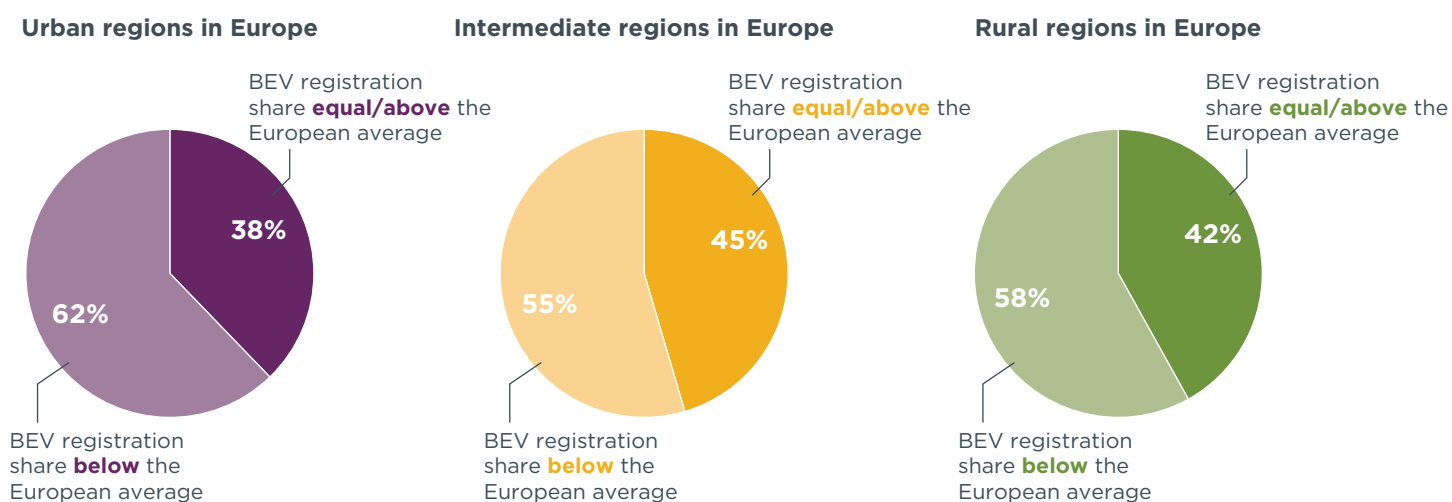


Figure 2. Urban, intermediate, and rural regions with BEV shares of new passenger car registrations below and equal to/above the European average in 2020.

The map in Figure 3 shows the distribution of the BEV registration shares in the urban, intermediate, and rural regions among the 17 countries of focus in 2020, with the BEV national averages labeled. In four of the 17 countries (Liechtenstein, Norway, Sweden, and the Netherlands), all urban, intermediate, and rural regions recorded average BEV registration shares equal to/above the European average in 2020.¹³ In Austria, Denmark, France, Germany, and Switzerland, more than 50% of regions recorded registration shares equal to/above the European average. In Finland, Italy, Portugal, and the United Kingdom, less than 50% of all regions recorded registrations shares equal to/above the European average. In Belgium, Hungary, Poland, and Spain, no regions had BEV registration shares equal to/above the European average in 2020.

¹¹ Eurostat, Background, (2022), <https://ec.europa.eu/eurostat/web/nuts/background>.

¹² The European BEV average of 6.2% includes BEV shares from the EU-27, the UK, and EFTA countries. Marie Rajon Bernard, Dale Hall, and Nic Lutsey. *Update on electric vehicle uptake in European cities*. (ICCT: Washington DC, 2021). <https://theicct.org/publication/update-on-electric-vehicle-uptake-in-european-cities/>.

¹³ Liechtenstein is made up of only one urban NUTS 3 region.

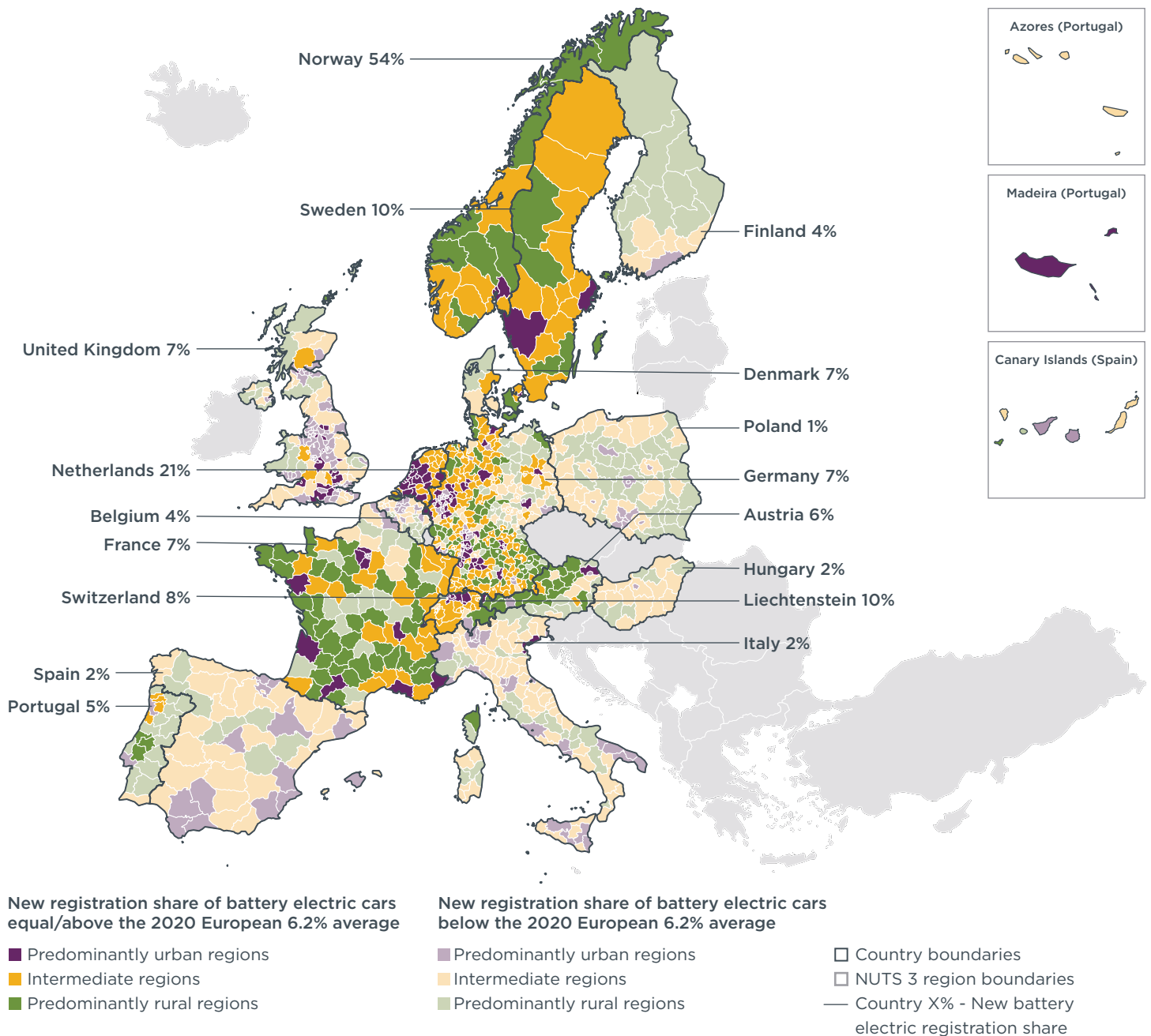


Figure 3. BEV share of new passenger car registrations in 2020 for selected countries by NUTS 3 regions. National averages of BEV shares in new passenger car registrations in 2020 are labeled.

The regions with the lowest and highest new BEV registration shares, along with the national and European average in 2020, are displayed in Figure 4. Of the top regions for new BEV registrations in 2020, six were classified as urban, six as intermediate, and four as rural. Conversely, nine of the regions with the lowest registration shares were rural regions, while four were intermediate regions and three were urban regions. In Finland, the regions with the lowest and highest BEV registration shares were rural, while in the United Kingdom both were urban. Variations between the regions with the lowest and highest share of BEV registrations were the highest in Norway (44 percentage points), Finland (36 percentage points), and the Netherlands (31 percentage points). In Poland, Belgium, Hungary, and Spain, the differences in the lowest and highest average regional BEV registrations were the least pronounced, ranging between 2 and 4 percentage points. In Norway, the Netherlands, and Liechtenstein, the regions with the lowest and highest shares were above the European BEV registration average of 6.2%.

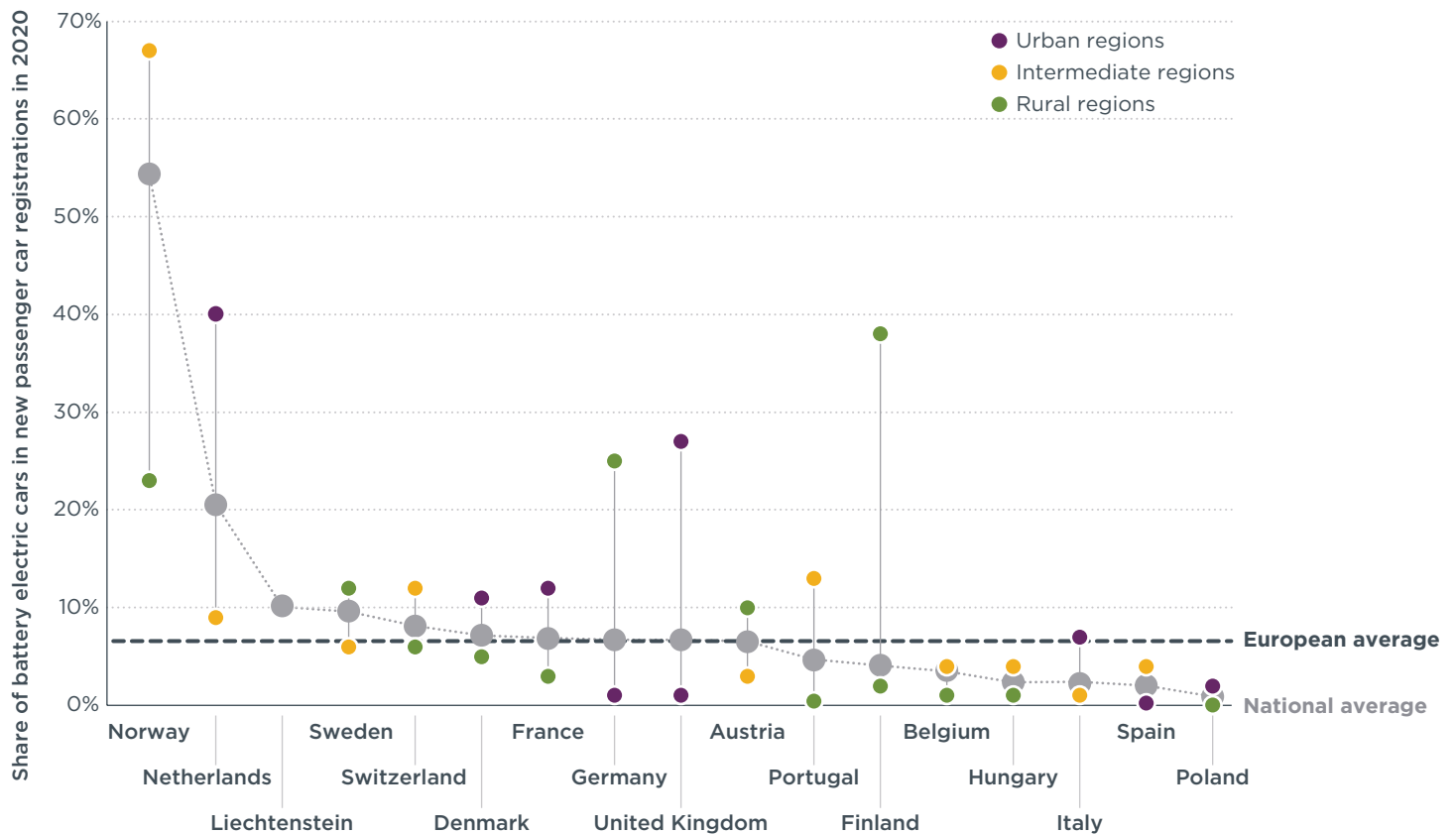


Figure 4. Highest and lowest BEV shares of new passenger car registrations at the national and regional level in 2020 compared to the European average, differentiated by urban, intermediate, and rural regions. The order displayed is based on national averages.

Overall, the results show wide variations between regions with the lowest and highest uptake of BEVs. There is no general pattern and it's noteworthy that, in some countries, rural regions are also seeing high uptakes of BEVs in terms of new registration shares.

Analysis of rural regions

Rural regions provide a compelling case for the electrification of passenger cars due to the residents' higher dependency on private cars and a lack of alternative modes of transportation compared to urban regions.¹⁴ In addition, the potential to access home charging is greater due to higher proportions of one- and two-family homes with garages or off-street parking.¹⁵

In order to understand why some rural regions have been successful in driving BEV registrations, we assess those which experienced a country's highest BEV share in new passenger car registrations in 2020 that were also equal to or above the European 6.2% average. We also examine public charging infrastructure deployment and policies which might have helped to spur BEV registrations shares in these rural regions.

Nine rural regions, shown in Figure 5, meet the criteria described above: Außerfern (Austria), Aust-Agder (Norway), Graubünden (Switzerland), Jämtlands (Sweden), Lezíria do Tejo (Portugal), Manche (France), Rhön-Grabfeld (Germany), the Orkney Islands (United Kingdom), and Zeeuwsch-Vlaanderen (Netherlands). Five of these regions also met the above criteria in 2019 and thus were also assessed in the 2019 study: Aust-Agder, Graubünden, Jämtlands, Rhön-Grabfeld, and Zeeuwsch-Vlaanderen.

14 Eurostat, "Transport statistics at regional level," (2020), <https://ec.europa.eu/eurostat/statistics-explained/pdfscache/14273.pdf>.

15 Eurostat, "Population on 1 January by five year age group, sex and other typologies," (2020), https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=urt_pjangr3&lang=en.

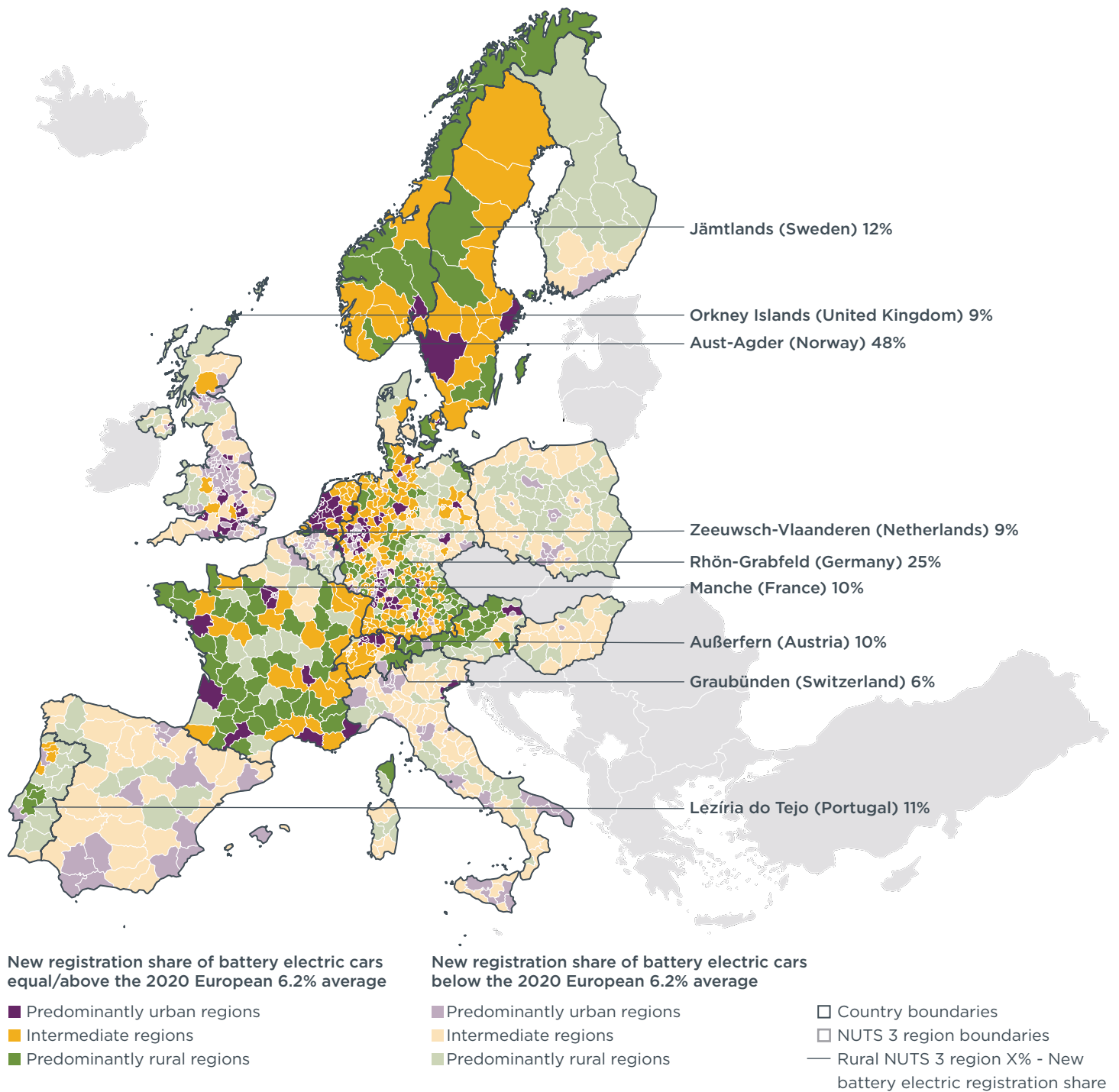


Figure 5. BEV share in new passenger car registrations in 2020 for selected countries by NUTS 3 regions. Rural regions with a country's highest BEV share in new passenger car registrations in 2020 and equal to/above the European average are labeled.

The nine rural regions selected for this analysis were diverse in terms of area, population size, and population density, and understanding this diversity can give a better perspective on the new BEV registration shares and totals (Table 1). In terms of area, the smallest region was Zeeuwsch-Vlaanderen, with a size of about 750 km², and the largest was Jämtlands with over 53,700 km², over 70 times larger.¹⁶ Population size ranged from

¹⁶ Eurostat, Area by NUTS 3 region, (February 8, 2021). https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_r_d3area&lang=en.

22,000 inhabitants in the Orkney Islands to 492,000 in Manche.¹⁷ Population density also differed greatly, ranging between 2 people per km² in Jämtlands and 140 people per km² in Zeeuwsch-Vlaanderen. The biggest towns in the rural regions are also shown, as key policies to spur the electric vehicle market are often found in these areas. The largest towns in each of the rural regions ranged from under 7,000 inhabitants (Reutte in the rural region of Außerfern, Austria)¹⁸ to about 79,000 inhabitants (Cherbourg-en-Cotentin in the rural region of Manche, France).¹⁹

Table 1. Conditions in the selected nine rural regions.

	Außerfern (Austria)	Aust- Agder (Norway)	Graubünden (Switzerland)	Jämtlands (Sweden)	Lezíria do Tejo (Portugal)	Manche (France)	Rhön- Grabfeld (Germany)	Orkney Islands (United Kingdom)	Zeeuwsch- Vlaanderen (Netherlands)
Area (km²)	1,237	9,147	7,107	53,752	4,275	6,007	1,022	1,013	749
Population	32,838	118,273	199,021	130,810	237,868	492,896	79,635	22,055	105,192
Population density (people/km²)	27	13	28	2	56	82	78	22	140
Largest towns	Reutte (7,000)	Arendal (37,000)	Chur (38,000)	Österund (54,000)	Almeirim (23,000)	Cherbourg- en-Cotentin (79,000)	Bad Neustadt an der Saale (15,000)	Kirkwall (9,000)	Terneuzen (55,000)

BEV registrations

In the rural regions analyzed, BEV registrations showed a large range in terms of total vehicles and uptake share. The total BEVs registered in these regions ranged from 21 in the Orkney Islands to 1,460 in Aust-Agder. The total number of new BEV registrations is influenced by the total population of a region. For example, the Orkney Islands had the lowest population of 22,055 people and also had the lowest total number of new BEVs registered. However, a high population will not always equate to a high level of new BEV registrations, as many factors influence BEV purchases. The BEV uptake in these regions also ranged in terms of new registration shares (Figure 6). Of the selected rural regions, all saw higher new BEV registration shares than the national averages, with the exceptions of Aust-Agder, Zeeuwsch-Vlaanderen, and Graubünden. Rhön-Grabfeld held a share over three and a half times larger than the German average.

¹⁷ Eurostat, Population change – Demographic balance and crude rates at regional level (NUTS 3), (June 3, 2021), https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_r_gind3.

¹⁸ Tirol, Reutte, (February, 2022), <https://www.tyrol.com/places/a-reutte>.

¹⁹ Eurostat, Population on 1 January by age groups and sex – functional urban areas, (February 16, 2022). https://ec.europa.eu/eurostat/databrowser/view/urb_lpop1/default/table?lang=en.

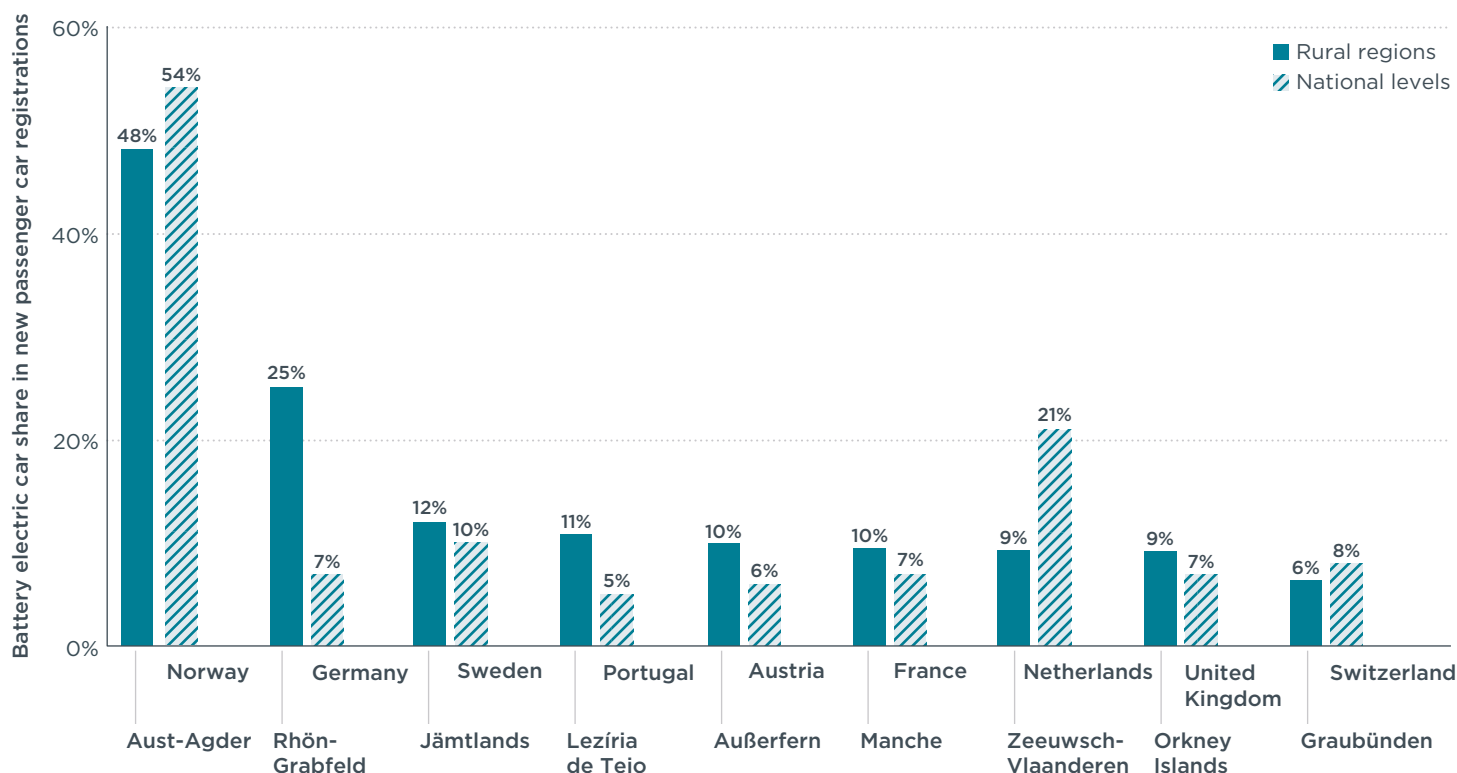


Figure 6. Comparison of BEV shares in new passenger car registrations in rural regions to national averages in 2020. Rural regions with a country’s highest BEV share in new passenger car registrations in 2020 equal to/above the European average are displayed.

Public charging infrastructure deployment

Evaluating public charging infrastructure deployment is important as it provides charging opportunities for inhabitants without private charging options. This is also important in rural regions due to commonly long commuting distances, even if charging at home or at the workplace is possible. In this section, we analyze public charging availability in the selected rural regions. It’s important to note that charging requirements vary in different regions and charging needs are largely dependent on the distances travelled, number of electric vehicles per population, and home charging options, among other factors.²⁰

Figure 7 shows the public charging infrastructure in the nine rural regions in 2020 based on the total normal and fast public charging points, public charging points per 100,000 inhabitants, and public charging points per 100 km².²¹ Jämtlands had the highest number of total charging points with over 460 total public chargers, and the highest total per population with over 350 chargers per 100,000 inhabitants. Zeeuwsch-Vlaanderen saw the most public chargers per 100 km², with nearly 40 chargers per 100 km². Aust-Agder had the highest total number of fast chargers with over 140 fast charging points available. The variation in charging availability coupled with varying populations and sizes show that different charging bottlenecks may occur depending on local conditions and need to be addressed on a case-by-case basis.

²⁰ Dale Hall and Nic Lutsey, *Charging infrastructure in cities: Metrics for evaluating future needs*, (ICCT: Washington DC, 2020). <https://theicct.org/publication/charging-infrastructure-in-cities-metrics-for-evaluating-future-needs/>.

²¹ Normal chargers are defined as charging points that give less than or equal to 22 kilowatts (kW) with fast chargers providing greater than 22 kW. European Alternative Fuels Observatory (EAFO), “On the electrification path: Europe’s progress towards clean transportation,” (2021), <https://www.eafo.eu/sites/default/files/2021-03/EAFO%20Europe%20on%20the%20electrification%20path%20March%202021.pdf>.

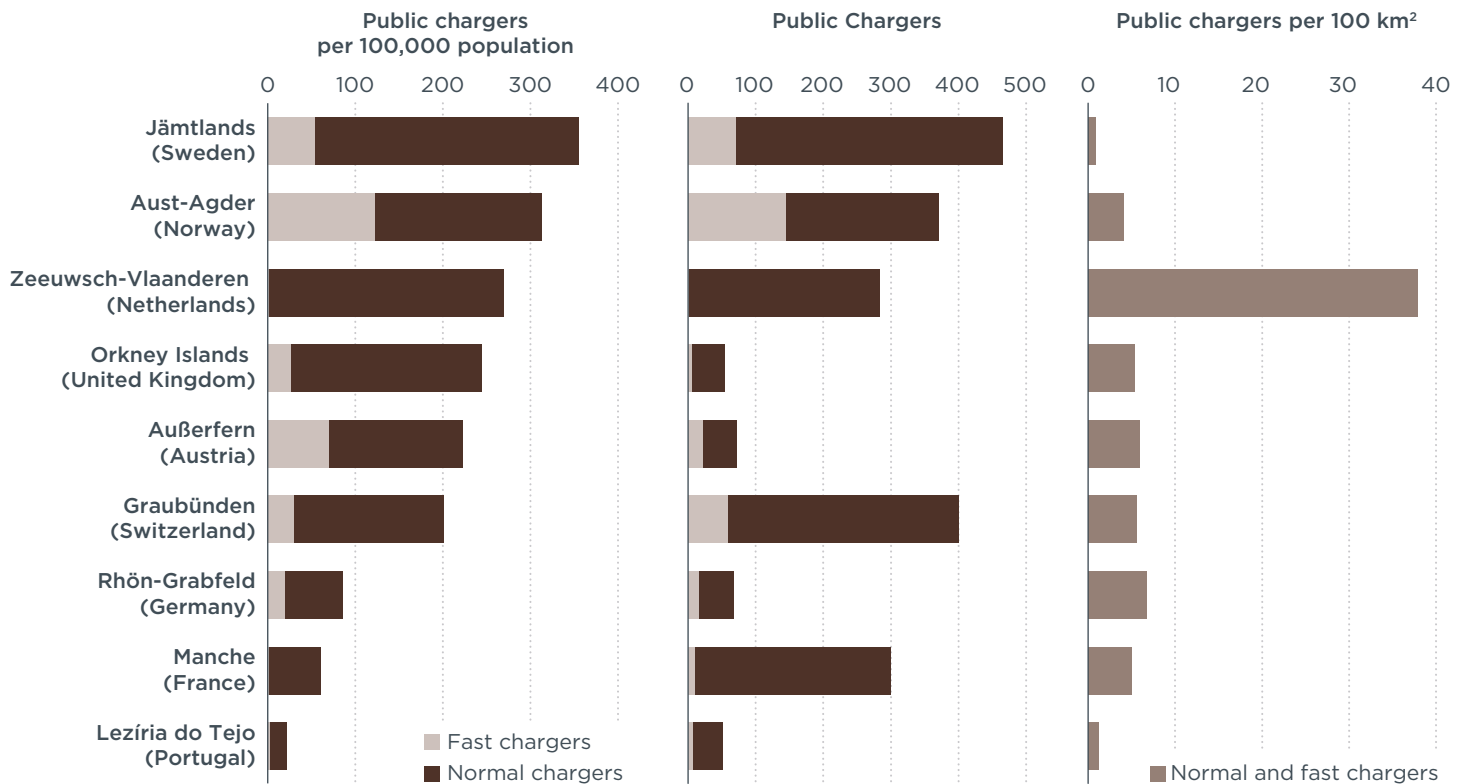


Figure 7. Public chargers by total, per 100,000 population, and per 100 km². Rural regions with a country's highest BEV share in new passenger car registrations in 2020 and equal to/above the European average are displayed.

The public charging availability per population did not follow the trend of total chargers, as the Orkney Islands and Außerfern were among the highest for chargers per population at nearly 250 and 220 total charge points per 100,000 inhabitants. Despite Manche having the 4th highest total chargers, the chargers per population were the second lowest at around 50 per 100,000 inhabitants. When considering how many chargers are available in a given area, Zeeuwsch-Vlaanderen held the most of all 9 rural regions with nearly 40 public chargers per 100 km², while Jämtlands held the lowest with under 1 public charger per 100 km².

To understand how the rural regions of focus are progressing in terms of charging infrastructure, it is helpful to compare these regions to their respective national levels to evaluate if there are potential trends or discrepancies. Figure 8 displays the number of public chargers per 100,000 inhabitants of the rural regions of focus and at the national level in 2020. All rural regions of focus, apart from Lezíria do Tejo and Zeeuwsch-Vlaanderen, had a higher number of public chargers per inhabitants compared to the country at large. This shows that, in many of the rural regions of focus, the high number of chargers available per population may influence BEV uptake.

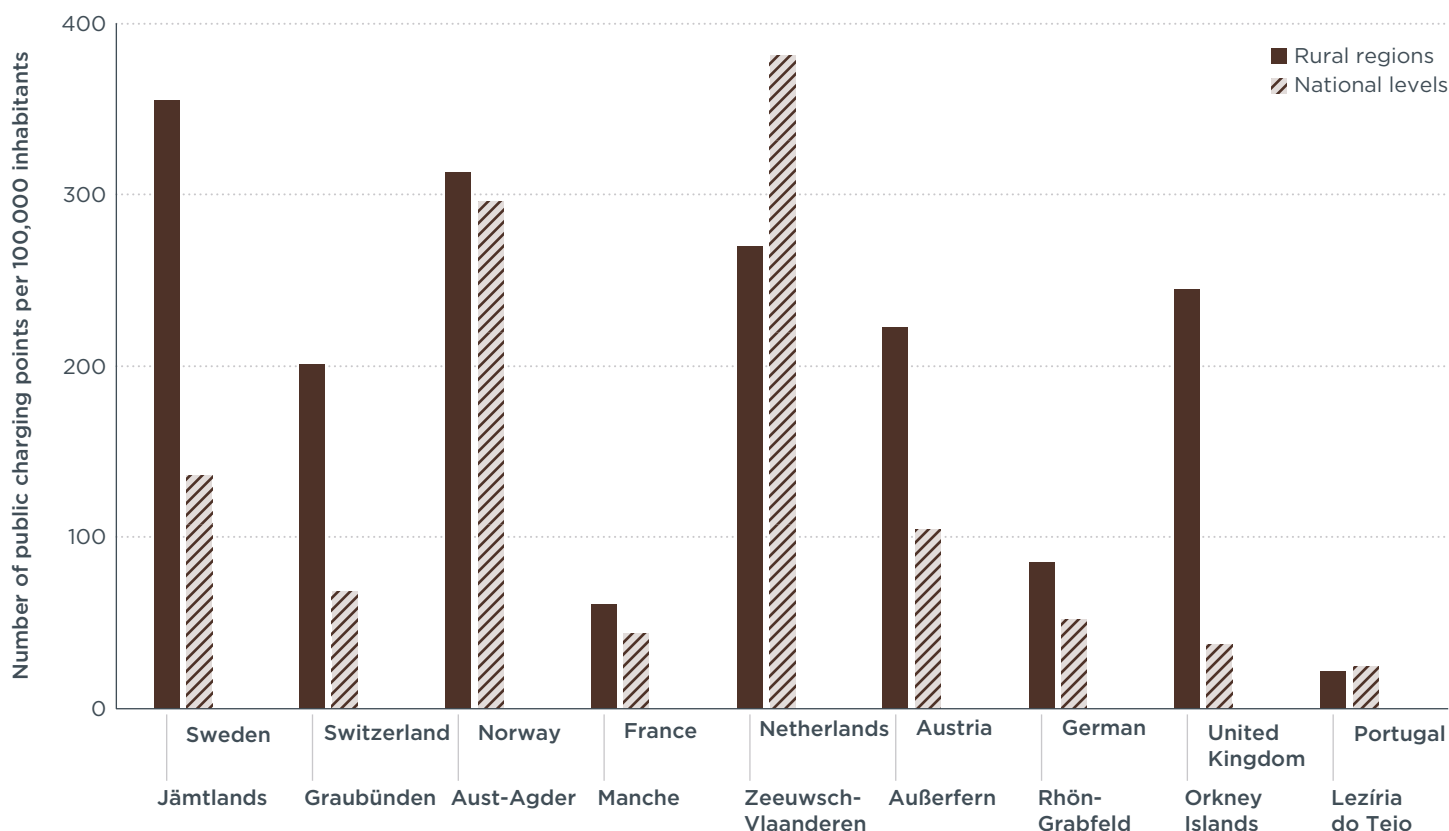


Figure 8. Comparison of public chargers per 100,000 population in rural regions to national averages in 2020. Rural regions with a country's highest BEV share in new passenger car registrations in 2020 and equal to/above the European average are displayed.

At-home charging options also play an important role in charging infrastructure deployment, as home charging availability impacts total public charging needs. For this analysis, the portion of the population living in single or double-family homes acts as a proxy for potential private charging access. Some regions saw high levels of potential private charging availability. For example, 90% of inhabitants of Rhön-Grabfeld lived in residential buildings with one- or two- apartments, and nearly 80% of dwellings in Manche and 85% of dwellings in Zeeuwsch-Vlaanderen were single-family homes.²² The Orkney Islands followed this same trend with 82% of all dwellings being detached- or semi-detached homes.²³ Some regions saw relatively lower rates of at home-charging potential, such as Außerfern where 49% of inhabitants lived in buildings with one apartment.²⁴ Lower at-home charging potential suggests a need for increased public charging deployment.

Fast charging availability is also important to foster electric vehicle uptake in rural regions, as driving distances can be longer compared to urban and intermediate regions. In Figure 9, the percentage of public chargers that are fast in the rural regions of focus are compared to the national level in 2020. Außerfern, Aust-Agder, Graubünden,

22 Bayerisches Landesamt für Statistik, "Statistik Kommunal 2020: Landkreis Rhön-Grabfeld [District Rhön-Grabfeld]," (2021), https://www.statistik.bayern.de/mam/produkte/statistik_kommunal/2020/09673.pdf; Institut national de la statistique et des études économiques, Dossier complet: Département de la Manche [National Institute of Statistics and Economic Studies, Complete file: Department of Manche], (2021), <https://www.insee.fr/fr/statistiques/2011101?geo=DEP-50#chiffre-cle-3>; "Stec Groep. Woningkwaliteit- en woningmarktonderzoek Zeeland 2019 (KWOZ) [Housing quality and housing market research Zeeland 2019]," (2020), https://www.zeeland.nl/sites/default/files/docs/woningkwaliteit_en_woningmarktonderzoek_zeeland_2019_kwoz.pdf.

23 National Records of Scotland, Orkney Islands Council Area Profile, (2021), <https://www.nrscotland.gov.uk/files/statistics/council-area-data-sheets/orkney-islands-council-profile.html#dwellings>.

24 Land Tirol, "Außerfern Regionsprofil [Außerfern Region Profile]," (2022). https://www.tirol.gv.at/fileadmin/themen/statistik-budget/statistik/downloads/Regionsprofil/Stat_profile/nuts3/Ausserfern.pdf.

Jämtlands, and Rhön-Grabfeld had a higher percent of fast public chargers compared to the national levels. Außerfern had a fast-charging percentage that was almost three times as high as the national level. Portugal and Lezíria do Tejo have similar levels of fast public chargers available at around 16%. Graubünden, with a share of 15%, saw similar levels to the Swiss national level of 14%. The percentage of fast chargers in the United Kingdom was higher than the Orkney Islands by almost 1.5 times. The percentage of fast chargers in France was almost three times higher than the percentage in Manche. There was no clear trend visible in fast charger availability at the national levels and in the rural regions with a high BEV share of new passenger car registrations in 2020.

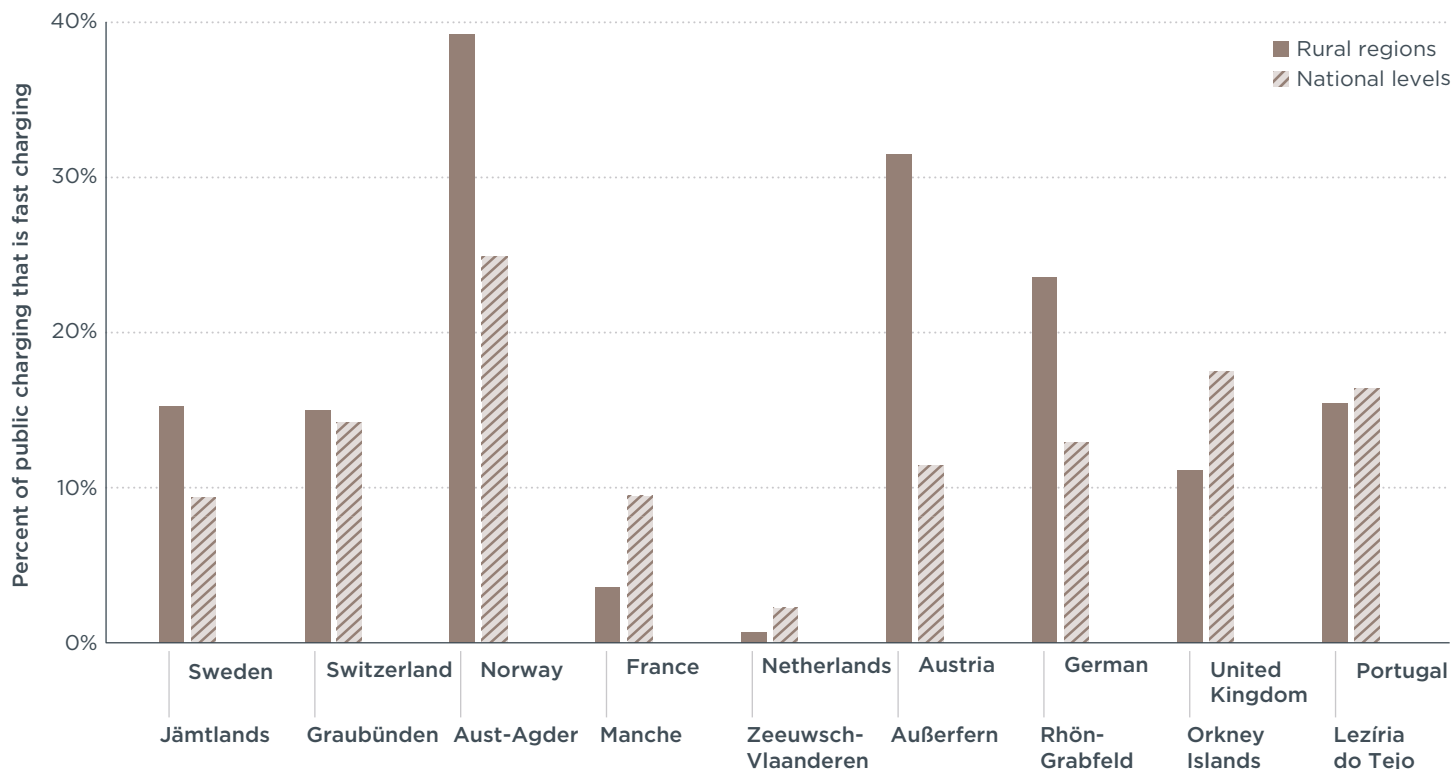


Figure 9. Comparison of public chargers that are fast chargers in rural regions to national averages in 2020. Rural regions with a country's highest BEV share in new passenger car registrations in 2020 and equal to/above the European average are displayed.

Policy actions and measures to spur BEVs

In 2020, policies at the EU level were created or updated with the goal of decarbonizing the transportation sector. These include measures that promote zero-emission vehicles, such as the EU carbon dioxide (CO₂) regulations for new passenger cars.²⁵ Further policy actions have occurred at the national and local levels as well and benefit the electrification progress in rural regions. Here we analyze the policies that have changed or been introduced since 2019 with the focus on policies concerning electric vehicle purchase and operation, charging infrastructure deployment, and the integration of battery electric cars into local fleets.

²⁵ Sandra Wappelhorst, Uwe Tietge, Georg Bieker, and Peter Mock, *Europe's CO₂ emission performance standards for new passenger cars: Lessons from 2020 and future prospects*, (ICCT: Washington DC 2021). <https://theicct.org/publication/europes-co2-emission-performance-standards-for-new-passenger-cars-lessons-from-2020-and-future-prospects/>.

Electric vehicle purchase and operation

Electric vehicle purchase and operational measures reduce the overall costs of ownership and minimize the cost gap compared to combustion engine vehicles. These come in the form of purchase incentives, tax benefits, and parking benefits, among others.

National BEV purchase incentives are financial contributions by national governments to bolster BEV sales. In 2020, these existed in Austria, France, Germany, Portugal, Sweden, the Netherlands, and the United Kingdom, and therefore benefitted uptake in their respective rural regions. France extended its BEV purchase incentive in 2020 to cover up to €7,000 for individuals and up to €5,000 for companies as a part of its COVID-19 relief fund.²⁶ Portugal offered €3,000 to individuals and €2,000 to companies who purchased a BEV.²⁷ The United Kingdom offered a plug-in grant in for BEVs in 2020 at a rate of £3,000 (€3,600) for individuals as well as companies.²⁸ Austria provided stronger purchase incentives for BEVs as a part of the COVID-19 recovery package, raising the private purchase incentive from €3,000 to €5,000 in July 2020, and providing a €4,000 company purchase incentive for a BEV at a maximum purchase price of €60,000.²⁹ Germany raised its purchase incentive to €9,000 for BEVs under €40,000 in June 2020 as a part of the COVID-19 recovery package, which applied to individuals and companies. Sweden offered individuals and companies up to 60,000 SEK (€6,000) for BEVs in 2020.³⁰ The Netherlands provided €4,000 for a new BEV for individuals.³¹

Local BEV purchase incentives are financial subsidies from regional and local governments that can complement national incentives to further help reduce the purchase cost and thereby increase the uptake of BEVs. These were present for some of the rural regions selected for the analysis. Normandy, a French metropolitan region, offered its own regional BEV purchase incentive in 2020, benefiting drivers in Manche, with up to €2,500 available depending on the income of the applicants.³² Tyrol, Austria, which includes the region of Außerfern, offered companies a funding bonus of up to 30% of the list price at a maximum of €3,000 on BEVs with a maximum price of €60,000 in 2020.³³

National BEV registration tax benefits lower costs on new BEV registrations and are an added incentive for consumers opting for a BEV. One-time registration tax benefits for BEV owners were present at the national level in Austria, France, Norway, Portugal, the

26 Republique Française, Bonus écologique pour une voiture ou une camionnette électrique ou hybride [Green bonus for an electric or hybrid car or van], (2021), <https://www.service-public.fr/particuliers/vosdroits/F34014>.

27 Fundo Ambiental, Incentivo pela Introdução no Consumo de Veículos de Baixas Emissões [Incentive for the Introduction in the Consumption of Low Emission Vehicles], (2021), <https://www.fundoambiental.pt/avisos-2021/mitigacao-das-alteracoes-climaticas/incentivo-pela-introducao-no-consumo-de-veiculos-de-baixas-emissoes-2021.aspx>; MOB.I, Benefits and incentives to the acquisition of an electric vehicle, (2021), <https://www.mobie.pt/en/mobilidade/benef%C3%ADcios-incentivos>.

28 Department for Transport, Low-emission vehicles eligible for a plug-in grant, (2021), <https://www.gov.uk/plug-in-car-van-grants>.

29 Umweltförderung, Förderungsaktion E-Mobilität für Betriebe 2021 [Funding Campaign E-Mobility for Companies 2021], (2021), <https://www.umweltfoerderung.at/betriebe/foerderungsaktion-e-mobilitaet-fuer-betriebe-2021.html>; Umweltfoerderung, Förderungsaktion E-Mobilität für Betriebe 2021 [Environmental Promotion, Promotional Campaign for E-mobility for Companies 2021], (2021), <https://www.umweltfoerderung.at/betriebe/foerderungsaktion-e-mobilitaet-fuer-betriebe-2021/navigator/fahrzeuge/aktion-e-pkw-fuer-betriebe-2021.html>.

30 Transport Styrelsen, Bonus - till bilar med låg klimatpåverkan [Bonus - for cars with a low climate impact], (December 2021), <https://transportstyrelsen.se/sv/vagtrafik/Fordon/bonus-malus/bonus/beraknad-preliminara-bonus/#:~:text=F%C3%B6r%20bilar%20tagna%20i%20trafik%20f%C3%B6rsta%20g%C3%A5ngen%20mellan%20den%201.kronor%2C%20f%C3%B6r%20varje%20gram%20koldioxid>.

31 Sandra Wappelhorst, "Small but mighty: The Netherlands' Leading Role in Electric Vehicle Adoption [blog post]", *ICCT Staff Blog*, (February 18, 2021) <https://theicct.org/small-but-mighty-the-netherlands-leading-role-in-electric-vehicle-adoption/>.

32 Région Normandie, IDEE Action Mobilité durable: Aide à l'acquisition pour les particuliers de véhicule électrique ou GNV [Normandy Region, IDEE Sustainable Mobility Action: Aid for the acquisition of electric vehicles or GNVs for individuals], (2021), <https://www.normandie.fr/idee-action-mobilite-durable-aide-lacquisition-pour-les-particuliers-de-vehicule-electrique-ou-gnv>.

33 Land Tirol, "Sonderförderungsprogram für den Planungsverband 9 Oberes und Oberstes Gericht [Special Support Program for the Planning Association 9 Upper and Supreme Court]," (2021), https://www.tirol.gv.at/fileadmin/themen/arbeit-wirtschaft/wirtschaftsfoerderung/downloads/programm_2014/Richtlinien_bis_31.12.2021/SFP-Oberes-Gericht.pdf.

Netherlands, and the United Kingdom in 2020.³⁴ For example, the United Kingdom fully exempted zero-emission vehicles from the registration tax in 2020.³⁵

National BEV ownership tax benefits also play an important role in reducing costs for BEV owners. Tax breaks for ownership taxes for BEVs existed in Austria, France, Germany, Norway, Sweden, Portugal, the Netherlands, and the United Kingdom in 2020. For example, Portuguese purchasers of BEVs did not pay the mandatory road tax and have a full deduction of the standard 23% value-added tax (VAT) on the vehicle's gross price if the vehicle does not exceed a price of €62,500.³⁶ In the United Kingdom and Austria, BEVs were fully exempt from the ownership tax.³⁷

Local BEV tax benefits exempt BEVs from additional charges levied by local and regional governments. In 2020, Normandy, the metropolitan region of Manche offered a waiver for BEVs of the €35 regional registration tax on fiscal horsepower.³⁸ In Graubünden, an 80% reduction on ownership taxes was applied to vehicles emitting less than 90 g/km of CO₂ in 2020.³⁹

National BEV company car tax benefits reduce taxes specifically for companies. Here, we refer to it from an employee's perspective in the context of the private usage of a company car. Employees who receive a company vehicle for private use from their employers must pay additional income taxes for this usage. These benefits aimed at BEVs existed in 2020 in Austria, Germany, Portugal, Sweden, the Netherlands, and the United Kingdom. In Austria, the benefit-in-kind tax benefit was altered in 2020 to only benefit BEVs and low-emission vehicles with maximum emissions of 118 g CO₂/km.⁴⁰ In the United Kingdom, BEVs were exempt from the benefit-in-kind tax if the range was over 130 miles or roughly 209 km.⁴¹

National toll, bridge, or ferry discounts also act to encourage electric vehicle purchase by reducing the costs of operation. Norway was the only national government of focus to provide discounts on tolls for cars that are emission-free in 2020.⁴²

National speed limit waivers allow for electric vehicle drivers to drive faster than combustion engine vehicle drivers in designated areas. The Austrian federal government was the only country of focus to implement this policy in 2020, allowing BEVs to drive at 130 km per hour on designated highways, versus 100 km per hour for combustion engine vehicles.⁴³

Local parking benefits promote electric vehicles through reduced parking-related costs and offer higher convenience to electric vehicle users. In Manche, BEV drivers benefitted

34 ACEA, ACEA Tax Guide, (2020), <https://www.acea.auto/publication/acea-tax-guide-2020/>.

35 Department for Transport, Vehicle tax rates, (2022), <https://www.gov.uk/vehicle-tax-rate-tables>.

36 MOBI.E, Benefits and incentives to the acquisition of an electric vehicle, (2021), <https://www.mobie.pt/en/mobilidade/benef%C3%AAdcios-incentivos>.

37 Government of the United Kingdom, "Policy paper: Vehicle Excise Duty," (2015), <https://www.gov.uk/government/publications/vehicle-excise-duty/vehicle-excise-duty>.

38 Republique Françoise, Coût de la carte grise (certificate d'immatriculation) [Cost of the gray card (registration certificate)], (2021), <https://www.service-public.fr/particuliers/vosdroits/F19211>.

39 Kanton Graubünden, Verordnung zum Einführungsgesetz zum Bundesgesetz über den Strassenverkehr [Ordinance on the Introductory Act to the Federal Law on Road Traffic], https://www.gr-lex.gr.ch/app/de/texts_of_law/870.110/versions/3212.

40 Bundesministerium Finanzen, LStR 2002 – Wartungserlass 2016 [Maintenance Decree], (2022), <https://findok.bmf.gv.at/findok?execution=e1s1>.

41 EDF Energy, Road tax & company car tax on electric cars, (2021), <https://www.edfenergy.com/electric-cars/tax-road-company>.

42 Ministry of Transport, Norway is Electric, (2021), <https://www.regjeringen.no/en/topics/transport-and-communications/veg/faktaartikler-vei-og-ts/norway-is-electric/id2677481/>.

43 Bundesministerium Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie, Elektroautos [Electric vehicles], (2022), [https://www.bmk.gv.at/themen/klima_umwelt/luft/recht/e_autos.html#:~:text=F%C3%BCr%20diese%20Kraftfahrzeuge%20\(KFZ\)%20gelten,KFZ%20mit%20Diesel%20oder%20Benzinmotoren](https://www.bmk.gv.at/themen/klima_umwelt/luft/recht/e_autos.html#:~:text=F%C3%BCr%20diese%20Kraftfahrzeuge%20(KFZ)%20gelten,KFZ%20mit%20Diesel%20oder%20Benzinmotoren).

from some free parking options, such as in the city of Cherbourg-en-Cotentin in 2020.⁴⁴ Some municipalities within Aust-Agder provide parking benefits to electric vehicles. For example, Arendal allows limited free parking for BEVs depending on the location.⁴⁵

Charging infrastructure policies

Public charging infrastructure deployment in rural regions should occur in parallel with the rate of electric vehicle uptake to ensure adequate charging options are available. To enhance charging infrastructure deployment, countries and regions have put forward measures to incentivize home installation as well as increase public charging access, therefore benefitting rural regions.

National public charging infrastructure initiatives foster deployment of charging points through financial aid. Austria, France, Germany, Norway, Portugal, Sweden, the Netherlands, and the United Kingdom all had some sort of public funding for charging infrastructure installation in 2020. Austria provided ranked funding for publicly accessible chargers, with the funding amount depending on the type of charger installed, and in 2020 raised the funding for companies who build public charging points up to €15,000.⁴⁶ The ADVENIR program in France was renewed in 2020 and provided charging incentives for public points with maximum funding amounts of up to 60% for chargers in public parking lots, and 50% for residential buildings, with total amounts given dependent on the type of building and charger. France also included €100 million for the construction of corridor fast charging as a part of the COVID-19 Green Recovery plan passed in June 2020.⁴⁷ The “Fundo Ambiental” in Portugal provided municipalities funding for charging stations of up to 50% of the installation and purchase costs with a limit of €2,000 per station for normal chargers and €4,000 for fast chargers. In 2020, the United Kingdom pledged an additional £1.3 billion for rapid charging points along major roads as a part of the “Ten-point plan for a green industrial revolution.”

National private charging infrastructure measures incentivize convenient at-home charging options, which is of interest in rural regions due to the higher share of one- and two-family homes compared to urban regions. In 2020, national private charging measures were found in Austria, France, Germany, Sweden, and the United Kingdom. Austria increased funding for at-home-chargers in 2020 to €600 for charging cables, €600 for wall boxes in one- or two-family homes, €900 for smart wall boxes meant for multi-family houses and €1,800 for sharing in community apartment complexes.⁴⁸ The United Kingdom introduced the On-Street Residential Chargepoint Scheme (ORCS) in 2020 to provide funding to individuals living in residential areas without access to charging points at home.⁴⁹ The scheme requires funding to be used in areas where off-street charging is not available. The French ADVENIR program provided up to 30%

44 ACTU, Cherbourg: le stationnement gratuit prolongé pour certains véhicules [Cherbourg: Extended free parking for certain vehicles], (2021), https://actu.fr/normandie/cherbourg-en-cotentin_50129/cherbourg-le-stationnement-gratuit-prolonge-pour-certains-vehicules_42280560.html.

45 Arendal Kommune, Electric Car, (2021), <https://www.arendal.kommune.no/tjenester/vei-parkering-og-havn/parkering/elbil/>.

46 Umweltfoerderung, Förderungsaktion E-Ladeinfrastruktur [Promotion action E-Charging Infrastructure], (2021), <https://www.umweltfoerderung.at/betriebe/foerderungsaktion-e-ladeinfrastruktur/navigator/mobilitaetsmanagement/foerderungsaktion-e-ladeinfrastruktur.html>.

47 Marie Rajon Bernard, Dale Hall, and Nic Lutsey, *Charging Infrastructure to Support the Electric Mobility Transition in France*, (ICCT, Washington DC 2021). <https://theicct.org/publications/france-evs-infrastructure-transition-nov21>.

48 Umweltfoerderung, Förderungsaktion E-Ladeninfrastrukture für Private [Environmental Promotion, Promotion of E-charging Infrastructure for Private Individuals], (2021), <https://www.umweltfoerderung.at/privatpersonen/foerderungsaktion-e-mobilitaet-fuer-private-2020-2021/navigator/fahrzeuge-1/foerderungsaktion-e-mobilitaet-fuer-private-2020-2021.html>.

49 UK Office for Zero Emission Vehicles, “On-Street Residential Chargepoint Scheme guidance for local authorities,” (2021), <https://www.gov.uk/government/publications/grants-for-local-authorities-to-provide-residential-on-street-chargepoints/grants-to-provide-residential-on-street-chargepoints-for-plug-in-electric-vehicles-guidance-for-local-authorities>.

for chargers in private parking lots in 2020. In Germany, the KfW, a German state-owned bank, provided funding of €900 for private wall boxes.⁵⁰

Local charging infrastructure deployment measures complement national initiatives to increase charging points through additional funding. Tyrol provided funding of €3,000 per private or public fast charging station for companies through the “Oberes und Oberstes Gericht” program in 2020, benefitting Außerfern.⁵¹ The home renovation subsidy offered Außerfern drivers €1,000 for pre-installation needs, such as wire cables and pipes, funded via Tyrol’s housing subsidy department.⁵² In Lezíria do Tejo, local municipalities that make up the province provide local public charging stations. The city council of Almeirim deployed public charging stations in 2020 through cooperation with the National Electric Mobility Network, Mobi.E, a public company that manages the electric charging infrastructure network.⁵³

Charging infrastructure is reimbursed in Scotland via the Energy Saving Trust, benefitting the Orkney Islands, which included up to £350 for private homes.⁵⁴ Rhön-Grabfeld benefitted from the Bavarian charging infrastructure program, providing funding for public charging stations in 2020.⁵⁵ Aust-Agder sought to expand public charging infrastructure through its Regional 2030 plan.⁵⁶ Jämtlands provided financial support for non-public chargers through the “Ladda bilen” program. Graubünden’s charging infrastructure plan continued in 2020, which provided public charging points, and qualifying communities in the region could receive funding for public charging stations from the City of Zurich electricity provider.⁵⁷

Charging privileges are tax breaks for the installment of public charge points, free charging opportunities, or other benefits. Austria, France, the Netherlands, Sweden, and the United Kingdom all had charging privileges in 2020. France gave a tax credit for projects related to energy efficiency, which included funding of up to €300 for charging infrastructure installments in private homes. The Austrian government provided a tax privilege to private electric vehicle owners who charge for free at their place of employment by exempting the benefit-in-kind tax in 2020. In the United Kingdom, companies who installed charging infrastructure were given a 100% first-year allowance on equipment used for the charge points.⁵⁸ The Netherlands provided special tax incentives for charging point installation and provided free installation of public charging points to those without private points available, including in

50 KfW, Ladestation für Elektroautos – Wohngebäude [Charging Stations for Electric Vehicles – Residential Buildings], (2022), [https://www.kfw.de/inlandsfoerderung/Privatpersonen/Bestehende-Immobilie/F%C3%B6rderprodukte/Ladestationen-f%C3%BCr-Elektroautos-Wohngeb%C3%A4ude-\(440\)/](https://www.kfw.de/inlandsfoerderung/Privatpersonen/Bestehende-Immobilie/F%C3%B6rderprodukte/Ladestationen-f%C3%BCr-Elektroautos-Wohngeb%C3%A4ude-(440)/).

51 Land Tirol, Sonderprogramm Oberes und Oberstes Gericht [Special Program Superior and Supreme Court], (2021), <https://www.tirol.gv.at/arbeit-wirtschaft/wirtschaftsfoerderung/sonderprogramme/sonderprogramm-oberes-und-oberstes-gericht/>.

52 Land Tirol, Förderungen Elektromobilität [Promotion Electromobility], (2021), <https://www.energie-tirol.at/foerderungen/foerderungen-elektromobilitaet/>.

53 O Almeirinense, Almeirim terá postos de carregamentos para carros eléctricos [Almeirim will have charging stations for electric cars], (2020), <https://almeirinense.pt/2020/03/04/almeirim-tera-postos-de-carregamentos-para-carros-eletricos/>.

54 Energy Savings Trust, Domestic charge point funding, (2022), <https://energysavingtrust.org.uk/grants-and-loans/domestic-charge-point-funding/>.

55 Bayerisches Staatsministerium für Wirtschaft, Landesentwicklung und Energie, Ladeninfrastruktur für Elektrofahrzeuge in Bayern [State Development and Energy, Charging Infrastructure for Electric Vehicles in Bavaria], (2021), <https://www.stmwi.bayern.de/foerderungen/ladeinfrastruktur/>.

56 Agder fylkeskommune, Regional planstrategi for Agder 2020-2024 [Regional plan strategy for Agder 2020-2024], <https://sru.agderfk.no/api/utvalg/200040/moter/200148/behandling/5/1>.

57 Kanton Graubünden, Masterplan Ladeninfrastruktur E-Mobilität Kanton Graubünden [Master Plan Charging Infrastructure E-Mobility Canton Graubünden], https://www.gr.ch/DE/institutionen/verwaltung/diem/aev/dokumentation/EnergieeffizienzDokumente/Masterplan_Ladeinfrastruktur_E-Mobilitaet_Graubunden.pdf; Swiss eMobility, Funding measures in Switzerland, (2021), https://www.swiss-emobility.ch/de/elektromobilitaet/Foerdermassnahmen/#tab_d970360e352a2cd719ca142f68bb5508_1.

58 HM Revenue and Customs, First year allowance for electric charge-points, (2018), <https://www.gov.uk/government/publications/first-year-allowance-for-electric-charge-points/first-year-allowance-for-electric-charge-points>.

Zeeuwsch-Vlaanderen.⁵⁹ Some cities in the district of Jämtlands provided electric vehicle charging for free in 2020.

National charging goals are established by governments to push for increased charging points at the country level. While all nine nations have policies for charging infrastructure deployment, Austria, Norway, Portugal, and Sweden have yet to establish official national charging goals. In 2020, Germany established a goal of 1 million charging stations by 2030. Switzerland sought to establish fast charging infrastructure along the national motorway network and at all rest stops.⁶⁰ The Netherlands sought to multiply the charging point levels in 2020 eight-fold by 2030.⁶¹ The French national government established a target of 7 million chargers by 2030 in 2015 and, as stated in the 2020 Green Recovery Plan, seeks to establish 100,000 public chargers by 2021.⁶² The United Kingdom seeks to increase high powered charging availability to over 2,500 points by 2030.⁶³

Local charging goals are created by local governments and can involve establishing the number of charge points desired and strategic location planning. The Orkney Islands have an electric vehicle strategy with the general goal of expanding public charging availability.⁶⁴ Drivers in Außerfern benefitted from Tyrol's charging infrastructure goal of more than 1,000 charge points by 2020, and this goal was extended to increase charge points by 40% by 2030.⁶⁵ In 2017, Graubünden published a charging infrastructure masterplan outlining future charging requirements of between 4,500 and 8,800 charging stations for public use by 2035.⁶⁶

Local planning and fleets

Efforts to boost electric vehicle uptake at the local and rural level include setting regional electric vehicle stock goals, promoting awareness, and local fleet electrification. These can be effective strategies in tackling local problems related to electrification such as charging gaps or misinformation.

Promoting awareness involves spreading information via events, surveys, or online portals to consumers about the financial and environmental benefits of BEVs. Actions to raise awareness were undertaken in Außerfern, Manche, Rhön-Grabfeld, and the Orkney Islands. Außerfern participates in the "So fährt Tirol 2050" initiative which generally aims to boost e-mobility and awareness.⁶⁷ The Orkney Islands Council has implemented a citizen's survey on electric vehicles and charging infrastructure and is also a participant in Scotland's "Switched on Towns and Cities Challenge Fund," an initiative aimed at

59 Municipality of Middleburg, Charging points for Electric Transport, (2021), https://www.middelburg.nl/oopladdpunten-elektrisch-vervoer?origin=/Inwoners/Verkeer_en_vervoer/Oopladdpunten_voor_elektrisch_vervoer.

60 Federal Department of the Environment, Transport, Energy and Communications, Joint roadmap to promote electromobility signed, (2018), <https://www.admin.ch/gov/de/start/dokumentation/medienmitteilungen.msg-id-73457.html>.

61 Netherlands Enterprise Agency, The National Charging Infrastructure Agenda, (November 2022), <https://english.rvo.nl/information/electric-transport>.

62 Marie Rajon Bernard, Dale Hall, and Nic Lutsey, *Charging infrastructure to support the electric mobility transition in France*, (ICCT: Washington DC, 2021). <https://theicct.org/publication/charging-infrastructure-to-support-the-electric-mobility-transition-%E2%80%AFin-france%E2%80%AF/>.

63 Department for Business, Energy, and Industrial Strategy, Ten point plan for a green industrial revolution, (2020), <https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution>.

64 Orkney Islands Council, Orkney Electric Vehicle Strategy 2018-2023, (2022), <https://www.oref.co.uk/draft-orkney-electric-vehicle-strategy-2017-2022/>.

65 Land Tirol, Aktionsprogramm E-Mobilität in Tirol [Action Program E-mobility in Tyrol], (2021), <https://www.tirol.gv.at/meldungen/meldung/aktionsprogramm-e-mobilitaet-in-tirol-1/>.

66 Umweltfoerderung, Förderungsaktion E-Ladeinfrastruktur [Funding Action E-charging Infrastructure], (2021), <https://www.umweltfoerderung.at/betriebe/foerderungsaktion-e-ladeinfrastruktur/navigator/mobilitaetsmanagement/foerderungsaktion-e-ladeinfrastruktur.html>.

67 Land Tirol, So Fahrt Tirol 2050: FLUGS und FloMOBIL [This is how Tyrol drives 2050: Flights and FloMOBIL], (2021), <https://www.tirol.gv.at/meldungen/meldung/so-faehrt-tirol-2050-flugs-und-flomobil/>.

helping local authorities support the transition to electric vehicles.⁶⁸ In addition, the Orkney Islands 2023 electric vehicle strategy analyzes electromobility needs in terms of tourism, charging needs, and future policy planning.

Manche benefits from the “Normandie Mobilité Electrique” initiative, which promotes cooperation among electromobility stakeholders, optimization of charging infrastructure placement, and information on electric vehicles.⁶⁹ Electromobility information is available via the Rhön-Grabfeld website and the region has organized electromobility fairs to increase awareness of the benefits of electric vehicles.⁷⁰

Goals of a 100% electric vehicle stock seek to fully electrify municipal vehicle fleets. Local fleet electrification occurred in Lezíria de Tojo via national and local funding to electrify municipal stocks. The National Environmental Fund in 2020 allowed for two electric vehicles per municipality with additional purchases occurring at the discretion of the local authorities. In Jämtlands, the 100% renewable fueled vehicle goal was in place in 2020, as was Aust-Agder’s goal of electrifying all transport by 2030.⁷¹ Zeeuwsch-Vlaanderen also sought to have 100% emission free public transport by 2025, passenger cars by 2035, and all mobility by 2040. The “So fährt Tirol 2050” initiative seeks to make regional mobility free from fossil fuels by 2050, benefitting Außerfern.

Electric car sharing initiatives existed in some of the rural regions of focus in 2020 and allow for electric travel without the need of vehicle purchase. These programs, such as the Orkney Islands’ Co-Wheel Car Club, allowed for people living in the region to experience using electric vehicles without having to purchase them. Municipal electric car sharing initiatives also existed in Zeeuwsch-Vlaanderen and was supported in Außerfern via the “So fährt Tirol 2050” initiative.

Summary of policy actions and measures

The summary of policy instruments in place in the rural regions of focus can be seen in Table 2. The regions with the most policy instruments were Außerfern and the Orkney Islands, which had 15 and 13 measures at the local, regional, and national levels, respectively. The region with the lowest number of measures was Graubünden, with three policy instruments at the local and regional levels. The average number of actions for all nine regions stood at just over nine. Every region saw an ownership tax benefit at the national or regional level as well as funding programs for public charging infrastructure. Few communities saw benefits in terms of parking privileges, carsharing initiatives, and stock goals which, if implemented, could help spur electric vehicle growth in rural regions.

68 Orkney Islands Council, Orkney folk invited to take part in electric vehicle survey, (2020), <https://www.orkney.gov.uk/OIC-News/Orkney-folk-invited-to-take-part-in-electric-vehicle-survey.htm>.

69 Normandie Mobilité Electrique, NME Normandie Mobilité Electrique [NME Normandy Mobility Electric], (2021), <https://normandie-mobilite-electrique.fr/>.

70 Rhön-Grabfeld, E-mobility, <https://heimat.rhoen-grabfeld.de/wohnen/e-mobilitaet/>.

71 Agder fylkeskommune, “Regionplan Agder 2030 [Regional Plan Agder],” https://agderfk.no/_f/p1/i4d721a77-52f4-49e3-ba9e-42cb0c5a8b4e/regionplan-agder-2030.pdf.

Table 2. Selected national, regional, and local policies implemented in rural regions studied.

Rural NUTS 3 region, country	New battery electric passenger car registration share 2020	Electric vehicle purchase and operation							Charging infrastructure				Local planning and fleets		
		BEV purchase incentives	BEV registration tax benefits	BEV ownership tax benefits	BEV company car tax benefits	Toll, bridge, or ferry discounts	Speed limit privileges	BEV parking privileges	Public charging infrastructure funding programs	Private charging infrastructure funding programs	Charging privileges	Charging infrastructure goals	Awareness building	100% electric vehicle stock goals	Electric carsharing initiatives
Aust-Agder, Norway	48%														
Rhön-Grabfeld, Germany	25%														
Jämtlands, Sweden	12%														
Lezíria do Tejo, Portugal	11%														
Außerfern, Austria	10%														
Manche, France	10%														
Zeeuwsch-Vlaanderen, Netherlands	9%														
Orkney Islands, United Kingdom	9%														
Graubünden, Switzerland	6%														

Action at local government(s)

Action by regional government

Action by national government

Action at multiple levels

The BEV passenger car registration shares, BEV purchase incentives for private individuals, total normal and fast chargers per 100,000 population, chargers per 100 km², and number of policy actions for each region are displayed in Figure 10. Overall, most of the rural regions of focus had at least some level of purchase incentive present as well as a mix of other policy actions to encourage BEV purchases. This suggests that policy actions play an important role in encouraging BEV uptake in rural regions.

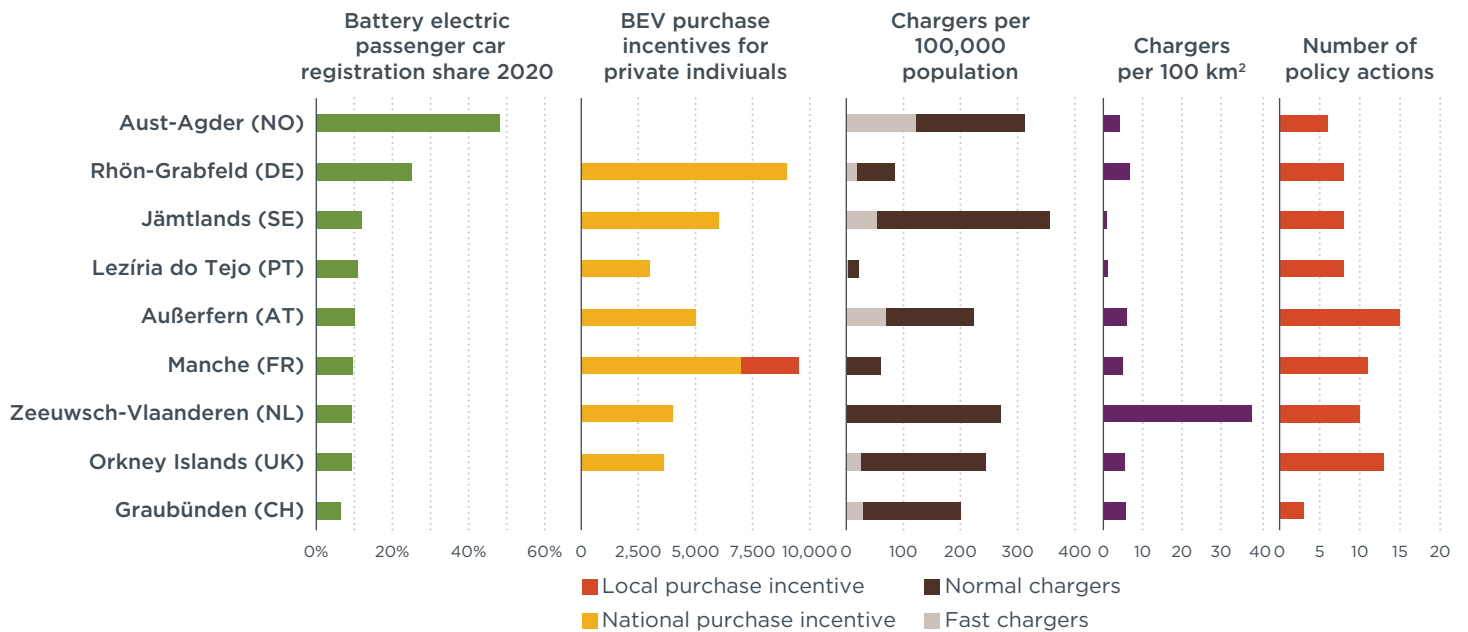


Figure 10. Battery electric passenger car share, BEV purchase incentive, number of public charging points per inhabitants and area, and number of policy actions in selected rural regions.

Aust-Agder and Graubünden did not have any national or local purchase incentives and had fewer policy actions in place compared to other regions, with six actions for Aust-Agder and three for Graubünden. Despite this, both saw high shares of BEVs in new passenger car registrations for 2020, suggesting that socio-economic factors outside of policy actions also play an important role in electrification. Rhön-Grabfeld saw the second highest levels of BEV registrations and had the second highest amount in BEV purchase incentives, however, charging infrastructure was lower per population in comparison to the other rural regions of focus. Despite Außerfern and the Orkney Islands having the highest number of policy actions, these two regions had the fifth and eighth highest BEV registration rates, respectively, of the focus regions. Zeeuwsch-Vlaanderen, however, saw the highest number of chargers per 100 km², supported by charging goals, privileges, and funding programs. Lezíria do Tejo had the fourth highest registration level despite having the lowest purchase incentive and low amounts of chargers per population and by area relative to the other regions. This shows that no exact trend between policy initiatives and new BEV registrations was observed and that electric vehicle uptake in rural regions remains complex with many factors to consider.

Conclusions

Urban, intermediate, and rural regions in the 17 European countries analyzed in this paper continue to develop in terms of electric passenger car uptake. Rural regions in particular provide a compelling use case for the electrification of passenger cars. These regions generally see higher levels of passenger car usage and lower levels of public transportation availability compared to urban regions. At the same time, possible access to home charging is higher compared to urban regions due to a higher share of one- and two-family homes. Further understanding of how the rural BEV market is developing, and analysis of policies and actions in rural regions with high registration shares, can help to address inequities in electric vehicle access. From this analysis, the following conclusions can be drawn:

On average, the electric passenger car market continued to grow almost equally across urban, intermediate, and rural regions in 2020. In 2020, total new BEV registrations in the 352 urban regions of focus grew to around 372,000 vehicles, which is double the new registrations in 2019. In the 493 intermediate regions, BEV registrations grew

to over 260,000 vehicles. The 334 rural regions grew with total new BEV registrations almost 84,000. The lower totals in rural regions can be attributed to the smaller population and thus fewer new vehicle registrations. By new registration shares, the average market share of BEVs within each of the three different regional typologies (urban, intermediate, rural) was quite balanced in 2020, similar to 2019. Average market shares of BEVs in new passenger car registrations stood at nearly 6% in urban and rural regions and almost 7% in intermediate regions.

Distribution of new BEV registrations is not equally represented in European regions.

In the intermediate regions of focus, the average BEV market share of 6.7% was 0.5 percentage points higher than the 6.2% average seen in urban and rural regions. Looking at the regions which experienced BEV registrations equal to/above the European average, their share was the highest in intermediate regions (45%), followed by rural regions (42%), and urban regions (38%). However, variations existed within each regional typology. The urban region of Ceuta (Spain) on the African mainland recorded the lowest BEV share in new car registrations in 2020 at 0.2%, and the urban capital city of Oslo, the highest of 63%, a difference of 62.2 percentage points. In intermediate regions, the difference was 66.5 percentage points, with the Italian region of Crotone having the lowest BEV new car registration share at 0.1% and Hordaland, Norway having the highest at 67%. In rural regions the difference between the lowest and the highest uptake was less pronounced, with a 0% BEV share in new passenger car registrations in the Polish region of Swiecki and 48% in Aust-Agder, Norway.

BEV registration shares and levels of charging infrastructure vary in leading regions.

In the nine rural regions analyzed in more detail, 2020 BEV registration shares ranged between 6% in Graubünden and 48% in Aust-Agder. Six rural regions with the highest BEV share in new passenger car registrations in their respective countries experienced a higher uptake than their national averages. This was most pronounced in Rhön-Grabfeld, where the BEV registration share was more than three and a half times higher than in Germany in 2020 (25% versus 7%). Conversely, only Norway, the Netherlands, and Switzerland saw BEV shares up to two times higher than the respective rural region with the highest share in 2020. In terms of public charging infrastructure, apart from Lezíria do Tejo and Zeeuwsch-Vlaanderen, the rural regions of focus had higher number of public chargers per inhabitants when compared to the country at large. This trend was also true for five of the nine of regions when looking at the percentage of fast chargers available compared to the national share. The regions that saw a higher percentage of fast public chargers compared to the national levels in 2020 were Außerfern, Aust-Agder, Graubünden, Jämtlands, and Rhön-Grabfeld. Außerfern had a fast-charging percentage that was almost three times the national Austrian level.

A mix of local, regional, and national policies can help to positively influence BEV uptake in rural regions.

Beyond national policies, the nine rural regions have also adopted a mix of local and regional policies to spur BEV uptake. Typical national measures included purchase incentives and tax benefits for BEVs. All nine regions also benefited from some form of public charging infrastructure funding established at local, regional, and national levels, and some also benefited from private charging programs. Typical local and regional actions included setting electric vehicle goals, providing information and raising awareness, and carsharing initiatives.

Overall, the study shows that the electrification of passenger cars in rural regions plays an important role in decarbonizing road transportation. Continued policy development at the local, regional, and national levels, public charging infrastructure deployment, and efforts to raise awareness can help ensure that these regions continue to see further growth of electrification and are not left behind.