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# Emerging electric passenger car markets in Europe: Can Poland lead the way?

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## Introduction

Poland is one of the largest passenger car markets in Europe by sales. In 2019, over 555,000 new passenger cars were registered in Poland, ranking sixth among the countries of the European Union and European Free Trade Association (EFTA).[1] Higher numbers were only registered in Germany (3.6 million), the United Kingdom (2.3 million), France (2.2 million), Italy (1.9 million), and Spain (1.3 million).[2]

Poland's passenger car fleet is currently dominated by combustion engine cars. In 2019, 71% of newly registered cars in Poland were running on gasoline, followed by diesel cars with a share of 20%. Hybrid electric vehicles (HEVs) accounted for 7% of the fleet, and liquefied petroleum gas fueled vehicles (LPGs) and compressed natural gas (CNG) vehicles had a combined share of 1.5%. Only a small proportion of new passenger cars were electric vehicles (0.5%), of which 0.3% were battery electric vehicles (BEVs) and 0.2% were plug-in hybrid electric vehicles (PHEVs).[3] In comparison, the average share of new electric passenger cars registered in the EU and EFTA countries was 3.6% in 2019. In addition to the 555,000 new passenger cars, almost 930,000 used passenger cars were imported and registered in Poland in 2019. In the first half of 2019, 52% of these cars were running on gasoline and 44% on diesel. The remaining 3.5% included 0.2% electric vehicles, 0.1% BEVs and 0.1% PHEVs.[4] In the first six months of 2020, registrations of new

1 The countries of the European Free Trade Association (EFTA) include Iceland, Liechtenstein, Norway, and Switzerland.

2 ACEA – European Automobile Manufacturer's Association, "New passenger car registrations European Union," (2020), https://www.acea.be/uploads/press_releases_files/20200116_PRPC_1912_FINAL.pdf

3 ACEA – European Automobile Manufacturer's Association," Fuel types of new cars: petrol +11.9%, diesel -3.7%, electric +80.5% in fourth quarter of 2019," (2020), https://www.acea.be/press-releases/article/fuel-types-of-new-cars-petrol-11.9-diesel-3.7-electric-81.3-in-fourth-quart

4 Polski Związek Przemysłu Motoryzacyjnego (Polish Association of Automotive Industry)," First registrations of used PC (imported to Poland) 2019-2020," (8 June, 2020), https://www.pzpm.org.pl/en/Automotive-market/Used-Passenger-Car-Import-to-Poland/First-Registrations-of-Used-PC-imported-to-Poland2/First-Registrations-of-Used-PC-imported-to-Poland-2019-2020-pdf

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electric passenger cars accounted for 1.5%, and the first registration of used BEVs and PHEVs stood at 0.2%.[5]

Air quality in Polish cities is among the poorest in the EU. In 2017, Poland ranked second-to-last among the EU-28 countries, exceeding the particulate matter (PM2.5) concentration limit of 20 µg/m$^3$.[6] Although the main cause of poor air quality is a large number of small household heating units which burn coal, wood, or household waste,[7] motorized vehicles also contribute significantly to pollution. The country has one of the oldest vehicle fleets in Europe with an average vehicle age of 14 years in 2018 compared to 11 years in the EU, which is partially due to the large number of used vehicles imported.[8] In 2018, 80% of passenger cars on Poland's roads were more than 10 years old.

To meet carbon dioxide ($CO_2$) emission targets set by the EU, improve local air quality, and boost the economy, the Polish government is committed to promoting the electrification of its vehicle fleet. This briefing provides an overview of policy measures adopted by the national government and local authorities to transition towards electric vehicles. The focus is on passenger cars, which are responsible for 61% of total $CO_2$ emissions from road transport in Europe.[9]

## Electric passenger car market and public charging infrastructure

An increasing number of Polish consumers are showing an interest in electric cars. Recent surveys show that between 28% and 45% of citizens and businesses in Poland would consider buying an electric car.[10]

At the same time, registrations of new electric passenger cars in Poland have shown a positive trend. In 2019, a total of about 2,600 new electric cars were registered in Poland, a share of 0.5%. In comparison to the 28-EU Member states and the EFTA countries, Poland ranked near the bottom in terms of new registration shares. Only the Czech Republic, Greece, Slovakia, Lithuania, and Estonia recorded a lower uptake, as shown in Figure 1.[11] Germany recorded the highest number of new electric passenger car registrations, about 108,000 in 2019, more than 40 times the number in Poland. Norway, the leading electric vehicle market with an electric passenger car registration share of 58% in 2019, was 57.5 percentage points above the share of Poland.[12]

5 Peter Mock, *Market Monitor – European passenger car registrations: January-June 2020*, (ICCT: Washington, DC, 2020), https://theicct.org/sites/default/files/publications/MarketMonitor-July-EN-20200805.pdf

6 European Environment Agency, "Air quality in Europe — 2019 report," EEA Report No 10/2019, (16 October, 2019), https://www.eea.europa.eu/publications/air-quality-in-europe-2019

7 International Bank for Reconstruction and Development / The World Bank, "Fighting smog: energy efficiency and anti-smog in single family buildings in Poland," (May 2018), https://openknowledge.worldbank.org/bitstream/handle/10986/30190/127331-REVISED-PolandCuREnergyEfficiencyen.pdf?sequence=1&isAllowed=y

8 ACEA – European Automobile Manufacturer's Association, "ACEA Report. Vehicles in use in Europe 2019," (2019), https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf

9 European Parliament, "$CO_2$ emissions from cars: facts and figures (infographics)," (18 April 2019), https://www.europarl.europa.eu/news/en/headlines/society/20190313STO31218/co2-emissions-from-cars-facts-and-figures-infographics

10 Polish Alternative Fuels Association (PSPA), "Barometr Nowej Mobilności 2019/20 (New mobility barometer 2019/20)," (2019), https://pspa.com.pl/assets/uploads/2020/01/barometr_nowej_mobilnosci_2019_raport_S.pdf; Polish Alternative Fuels Association (PSPA), „STREFY CZYSTEGO TRANSPORTU Raport (Clean Transport Zones Report)," (2019), https://pspa.com.pl/assets/uploads/2019/09/Strefy_Czystego_Transportu_raport.pdf

11 ACEA – European Automobile Manufacturer's Association, "New passenger car registrations European Union"

12 Dale Hall, Sandra Wappelhorst, Peter Mock, and Nic Lutsey, *European electric vehicle factbook,* (ICCT: Washington, DC, 2020), https://theicct.org/publications/european-electric-vehicle-factbook-20192020

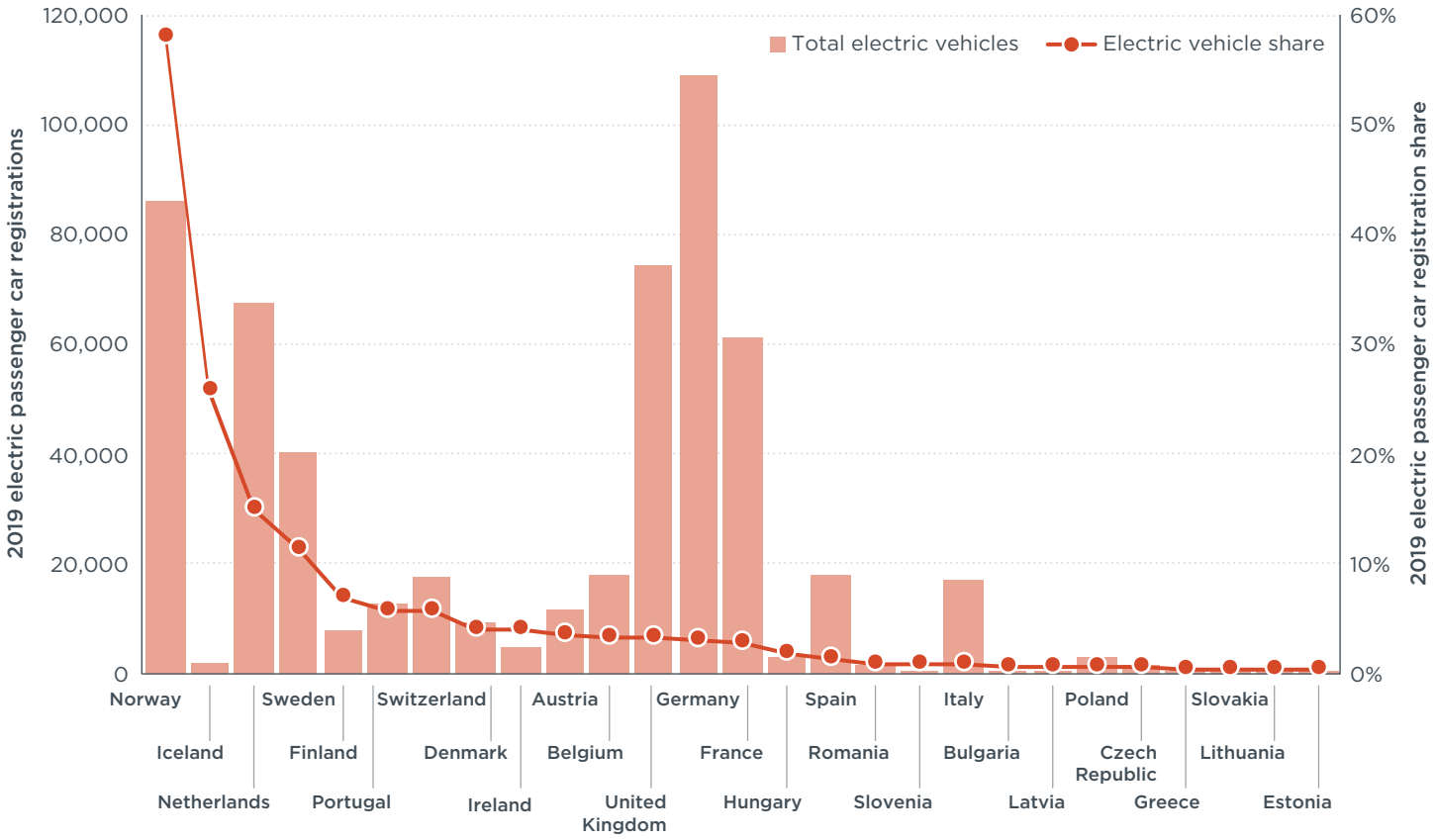


**Figure 1.** Total and share of new electric passenger car registrations in select European countries in 2019.

Figure 2 shows the share of electric passenger car registrations by subregion (Polish *podregiony*), using Nomenclature of Territorial Units for Statistics third level (NUTS 3) jurisdictions.[13] One or more NUTS 3 subregions with at least 250,000 inhabitants are defined as metropolitan regions.[14] Non-metropolitan subregions are typically more rural areas characterized by small and medium-sized towns and municipalities. The figure illustrates that generally metropolitan regions with larger cities, such as Warsaw and Szczecin, experienced the highest electric passenger car uptakes. In total, 92% of all new electric cars were registered in metropolitan regions compared to 8% in the non-metropolitan subregions. This ratio was similar for BEVs and PHEVs. The corresponding rate for all new passenger car registrations was 81% in metropolitan regions versus 19% in more rural areas.

13 See information on Nomenclature of Territorial Units for Statistics (NUTS) classification and Metropolitan regions: "Regions and cities – Overview," Eurostat, accessed July 9, 2020, https://ec.europa.eu/eurostat/web/regions-and-cities/overview

14 Eurostat, Metropolitan regions, (n.d.), https://ec.europa.eu/eurostat/web/metropolitan-regions/background

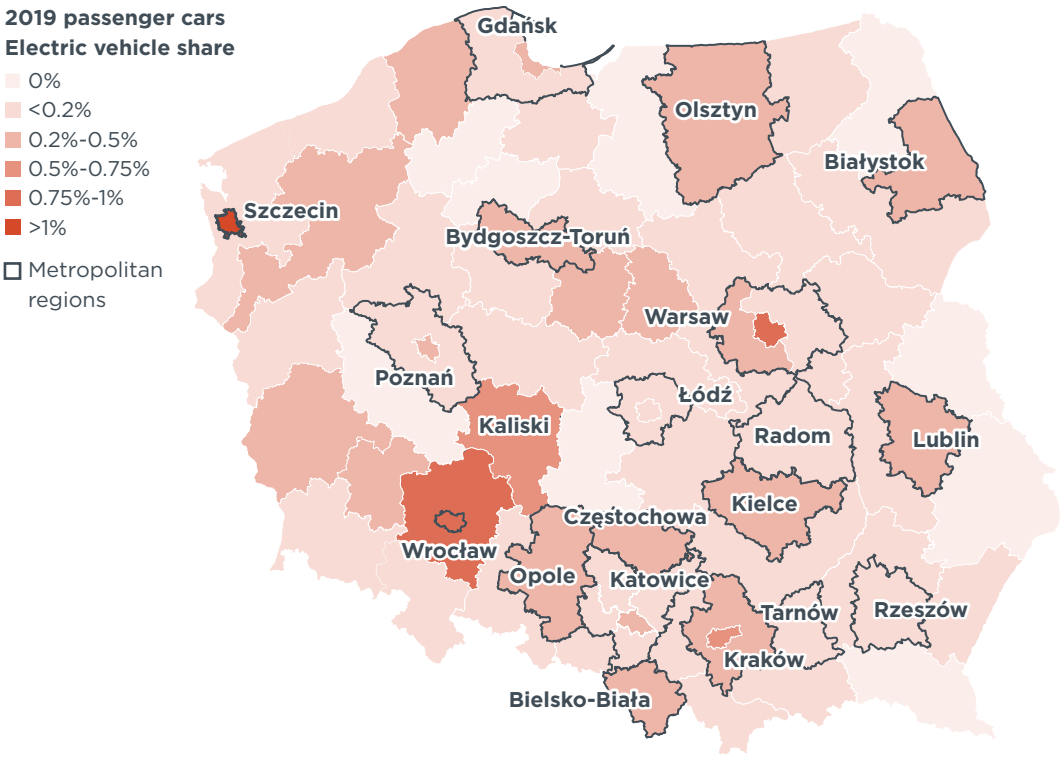


**Figure 2.** 2019 registration share of electric passenger cars in Poland by NUTS 3 regions. Map adapted from Dale Hall, Sandra Wappelhorst, Peter Mock, and Nic Lutsey, *European electric vehicle factbook*, (ICCT: Washington, DC, 2020), https://theicct.org/publications/european-electric-vehicle-factbook-20192020

The majority of new electric passenger cars were registered in the capital city of Warsaw (1,300), accounting for the second-highest share in Poland with 1.0%. The city of Szczecin recorded the highest share at 1.1% but represented a significantly smaller market with only about 100 new electric cars registered throughout 2019. The subregions with the third- and fourth-highest shares were outside the metropolitan regions. The subregion of Wrocław, adjacent to the city of Wrocław and home of the production plant of the battery cell manufacturer LG Chem, accounted for a 0.9% share, and the subregion of Kaliski, north east of Wrocław, had a share of 0.6%.

Poland recorded a positive trend in BEV and PHEV adoption over the past months (Figure 3). By the end of 2019, there were over 8,600 electric passenger cars on Poland's roads. At the end of June 2020, the number was almost 12,300.[15] Since July 2019, the electric passenger car stock in Poland showed a slow but steady increase. This increase slowed to +4% in April 2020 compared to +9% in March, likely as the result of the COVID-19 outbreak, but recovered slightly in May and June with an increase of +5% each, compared to the previous month. While PHEVs recorded the highest uptakes in February and March of +11% and +13%, respectively, the development for BEVs was more balanced with the highest increase of +6% in both January and March 2020 compared to the electric passenger car stock of the previous month. However, in comparison to larger electric vehicle markets, stock figures are still at a very low level. In Germany, for instance, the electric passenger car stock accounted for almost 240,000 vehicles by the end of 2019, more than 27-times higher than Poland.[16] On a per capita basis, there were

15 Polski Związek Przemysłu Motoryzacyjnego (Polish Association of Automotive Industry), "E-mobility index," (21 July, 2020), https://www.pzpm.org.pl/en/Automotive-market/E-mobility-index/Year-2020/E-mobility-index-June-20202

16 Kraftfahrt-Bundesamt, Annual balance – vehicle stock, (2020), https://www.kba.de/DE/Statistik/Fahrzeuge/Bestand/Jahresbilanz/b_jahresbilanz_inhalt.html?nn=2601598

0.2 electric passenger cars per 1,000 inhabitants in Poland compared to 3 electric cars per 1,000 inhabitants in Germany.

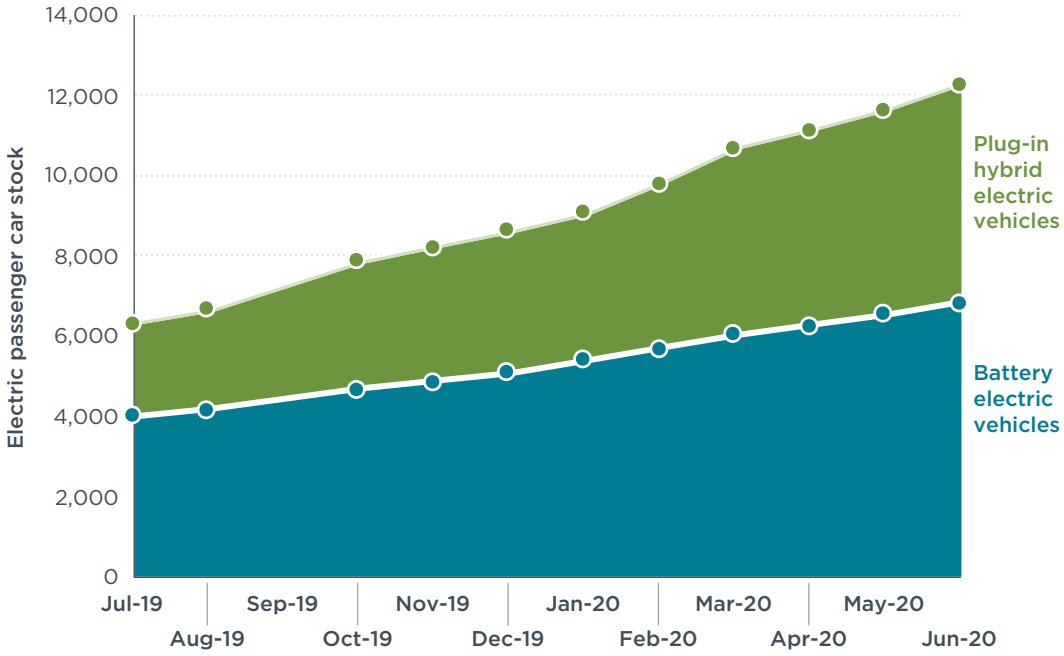


**Figure 3.** Development of electric passenger car stock in Poland between July 2019 and June 2020.

To create demand for electric vehicles and drive their uptake, a certain number of models on the market is crucial.[17] In 2019, new registrations of passenger cars in Poland included eight different battery electric and 14 plug-in hybrid models, only taking into account those models with at least 20 registrations. The top three favorable BEV models were the BMW i3, the Nissan Leaf, and the Hyundai Kona. For PHEVs, the Mini Countryman, the BMW 530, and the Kia Optima accounted for the largest registration shares among all new electric passenger car registrations. In comparison, consumers in Germany registered about 30 different BEV and almost 40 PHEV models in 2019.[18]

In parallel with the increasing number of electric passenger cars in Poland, the public charging infrastructure network has been continuously extended. The number of charging stations increased between July 2019 and June 2020 from almost 800 to about 1,200 (Figure 4).[19] The majority of charging stations (67%) were alternating current (AC) compared to 33% being direct current (DC) charging stations. The number of AC charging stations experienced the highest increase in August 2019 (+16%), while DC charging stations increased by +7% in January 2020. By the end of June 2020, drivers of an electric vehicle had access to over 2,200 public charging points, an electric vehicle to charging point ratio of 5:1, more favorable than the ratio of around 10:1 recommended by the European Commission in 2014 as part of the Alternative Fuels Infrastructure Directive.[20] By the end of June 2020, 64% of the public charging points were Type 1 (up to 7.4 kW, AC) and Type 2 (up to 43 kW, AC), 15% CHAdeMO (up to 50 kW, AC/DC), 14% CCS (up to 50 kW, AC/DC), and 7% Tesla Supercharger charging points.

17 Peter Slowik and Nic Lutsey, *The continued transition to electric vehicles in U.S. cities,* (ICCT: Washington, DC, 2018), https://theicct.org/sites/default/files/publications/Transition_EV_US_Cities_20180724.pdf

18 Dale Hall, Sandra Wappelhorst, Peter Mock, and Nic Lutsey, *European electric vehicle factbook,* (ICCT: Washington, DC, 2020), https://theicct.org/publications/european-electric-vehicle-factbook-20192020

19 Polski Związek Przemysłu Motoryzacyjnego, "E-mobility index"

20 Official Journal of the European Union, Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure, (22 October, 2014), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0094

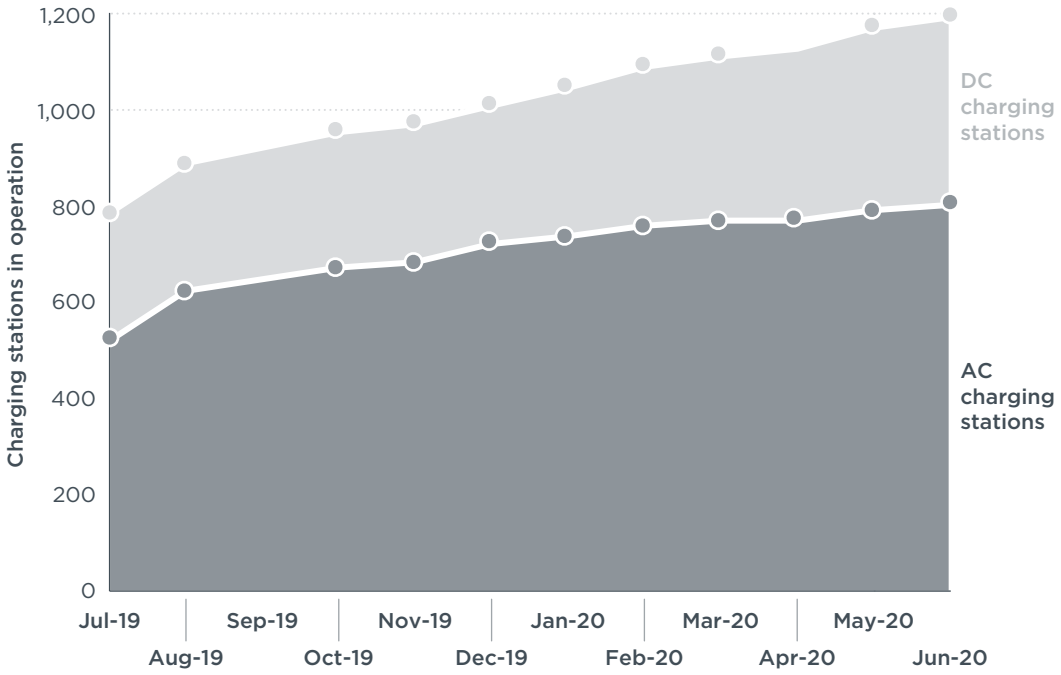


**Figure 4.** Charging stations in operation in Poland between July 2019 and June 2020.

Most of the public charging infrastructure network has been rolled out in major cities. By the end of June 2020, there were almost 150 charging stations available in Warsaw, followed by Katowice (over 70), Kraków, Gdańsk, and Wrocław with about 50 charging stations each, and Poznań (almost 40).[21]

## Policies driving the electric passenger car market

The Polish national government has adopted a variety of policies to drive the electrification of its vehicle fleet. At local levels, authorities are increasingly using their power to spur electric vehicle adoption yet with different approaches.[22] The following section gives an overview of these developments and future plans with focus on the passenger car market. Despite many actions at local levels, we focus on policies adapted in the cities of Kraków, Poznań, Szczecin, Warsaw, and Wrocław, which recorded the highest electric vehicle uptakes in 2019. The majority, or 68%, of all new electric passenger cars were registered in these five cities in 2019.

### Electric vehicle goals (national/local)

The Polish government has set ambitious targets for the adoption of electric vehicles. In 2016, the government announced a goal to have 1 million electric vehicles on its roads by 2025. The "Strategy for Sustainable Transport Development until 2030" from September 2019 altered this plan, stating that "the number of electric and hybrid cars could reach 600,000 by 2030."[23] As outlined in the strategy, the goal encompasses BEVs, PHEVs, FCEVs, and hybrid electric vehicles (HEVs). In the short-term, the government aims to have 50,000 electric vehicles on the roads of the 32 Polish agglomerations by the end

21 Polski Związek Przemysłu Motoryzacyjnego, "E-mobility index"

22 Monika Helak, "Ranking elektromobilnych miast. Jak polskie samorządy wprowadzają e-rewolucję w transporcie? (Ranking of electromobility cities. How do Polish local governments introduce the e-revolution in transport?)," (Polityka Insight, November, 2019), https://www.politykainsight.pl/en/_resource/multimedium/20182683

23 Ministry of Infrastructure, "Strategy for Sustainable Transport Development until 2030," (24 September, 2019), https://www.gov.pl/web/infrastruktura/projekt-strategii-zrownowazonego-rozwoju-transportu-do-2030-roku2

of 2020, as identified in the National Framework for Alternative Fuels Infrastructure Development Policy.[24]

At the city level, Warsaw has pledged to make a major area of its city zero emission by 2030. The city is part of the global C40 network and is one of 35 cities which signed the Fossil Fuel Free Streets Declaration, pledging to reduce the number of polluting vehicles on streets and a transitioning away from vehicles powered by fossil fuels.[25]

## Electric vehicle strategic and legal framework

Over the past years, the Polish government has published and adopted a number of strategic plans and legal frameworks and provided funding to support the uptake of electric vehicles in the country.

» In March 2017, the government adopted the Electromobility Development Plan which provides a strategy for electric vehicle and charging infrastructure deployment in Poland with the aim to improve air quality and foster economic growth.[26]

» In the same month, the government adopted the National Framework for Alternative Fuels Infrastructure Development Policy in order to implement EU Directive 2014/94 on the deployment of alternative fuels infrastructure. The framework includes the goal to install 6,400 charging points, including 400 fast charging points, on the Trans-European Transport Network (TEN-T) by 2020.[27]

» The Law on Electromobility and Alternative Fuels came into force in February 2018 and is the first legislation on electromobility in Poland. It lists detailed targets and measures for the uptake of electric vehicles by public institutions, including public transportation vehicles, and charging infrastructure in most populated cities (over 100,000 inhabitants).[28]

» In June 2018, the Law on Biocomponents and Liquid Biofuels was amended, and introduced the Low Emission Transport Fund to promote the development of alternative fueled vehicles.[29] In July 2019, the management of the Fund was entrusted to the National Fund for Environmental Protection and Water Management, which took on the task of funding the electrification of Poland's vehicle fleet.[30]

At local levels, the government with co-funding from the EU is supporting the efforts of municipalities to grow the electrification of its fleets. For example, within the national program GEPARD II funding is provided for over 200 local governments to develop electromobility strategies.[31]

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24 Ministry of State Assets, "Electromobility in Poland (archive version)," (n.d.), https://www.gov.pl/web/aktywa-panstwowe/elektromobilnosc-w-polsce

25 C40 Cities Climate Leadership Group, Our Commitment to Green and Healthy Streets. Fossil Fuel Free Streets Declaration, (accessed 29 April, 2020), https://www.c40.org/other/green-and-healthy-streets

26 Ministry of State Assets, "Electromobility in Poland (archive version)"

27 Ministry of State Assets, "Electromobility in Poland (archive version)"

28 Kancelaria Sejmu (Chancellery of the Seym), Ustawa z dnia 11 stycznia 2018 r. o elektromobilności i paliwach alternatywnych [Law of 11 January 2018 on electromobility and alternative fuels], (2018), http://prawo.sejm.gov.pl/isap.nsf/download.xsp/WDU20180000317/T/D20180317L.pdf

29 Ministry of Climate, Low Emission Transport Fund, (n.d.), https://www.gov.pl/web/klimat/fundusz-niskoemisyjnego-transportu

30 Kancelaria Sejmu, Dz. U. 2019 poz. 1527 USTAWA z dnia 19 lipca 2019 r. o zmianie ustawy o biokomponentach i biopaliwach ciekłych oraz niektórych innych ustaw [Dz. Laws of 2019, item 1527 LAW of 19 July 2019 on amending the act on biocomponents and liquid biofuels and some other acts), (July 2019), https://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20190001527/T/D20191527L.pdf?fbclid=IwAR3vV4S81Y_kMoEKtR75PC-yC0eKGY2FRWLiH9rlu6aNSNPf2_na8yAXsbY

31 National Fund for Environmental Protection and Water Management, "GEPARD II - low-emission transport. Part 2, Strategy for electromobility development," (2020), http://nfosigw.gov.pl/oferta-finansowania/srodki-krajowe/programy-priorytetowe/gepard-ii--transport-niskoemisyjny-czesc-2/informacje-o-naborze-/

## BEV and PHEV purchase incentives (national)

To address the cost gap between electric and conventional cars, the Polish government launched three incentive schemes in June 2020 for the purchase of a new electric vehicle not previously registered.[32] One incentive scheme called "Green Car" is targeted at private individuals and supports the purchase of a new purely electric (BEV or FCEV) car. The aid covers 15% of the purchase price with a maximum amount of PLN 18,750 (€4,400) and is capped at a gross purchase price of PLN 125,000 (€29,000). Another program, "eVAN," provides one-time incentives up to PLN 70,000 (€16,000) for businesses purchasing or leasing a zero-emission delivery van. The third program under the name "Koliber" benefits micro, small, and medium-sized businesses, and targets zero-emission passenger transport. The purchase or lease of an electric car is supported with up to PLN 25,000 (€6,000). The budget secured by the government for all three programs will allow the co-financing of about 4,000 electric cars and vans. All programs are aimed at the purchases of new BEVs rather than PHEVs.

## Electric vehicle registration tax benefit (national)

In Poland, taxes and fees apply when purchasing or registering a car for the first time. This includes one-time payments such as value added tax (VAT), a registration fee, and excise duty. VAT accounts for 23% of the vehicle's price, without exemptions for electric cars. A registration tax is not imposed when registering a vehicle for the first time. Only a registration fee and a fee for an identification card is necessary, totalling about €60, without benefits for purchasers of an electric car. When registering a new or used imported passenger car in Poland for the first time, an excise tax of 3.1% of a vehicle's net value is imposed if the engine capacity is up to 2,000 $cm^3$, and 18.6% is imposed for cars above 2,000 $cm^3$.[33] The Law on Electromobility and Alternative Fuels suggests exemptions on excise taxes for electric passenger cars (BEVs, PHEVs), FCEVs, hybrid vehicles (HEVs), and mild hybrid electric vehicles (MHEVs). The excise tax is waived for zero-emission electric cars (BEVs, FCEVs) without a defined timeframe. In contrast, for PHEVs the excise duty waiver is valid until February 2021 under current plans.[34] As an example: The purchaser of a gasoline Volkswagen Golf with an engine capacity of 1,498 $cm^3$ has to pay excise duty of €500, compared to almost €600 for a diesel model (1,968 $cm^3$). Yet, for a vehicle with a higher engine capacity, i.e. above the threshold of 2,000 $cm^3$, one-time payments could reach several thousands of euros. For a diesel Mercedes X-class sport utility vehicle, with an engine displacement of 2,298 $cm^3$, the one-time excise duty would be more than €5,500. However, for most brands sold in Europe, the average engine displacement of new passenger cars has been below 2,000 $cm^3$ over the past 20 years.[35]

## Electric vehicle usage tax benefit (national)

Unlike most countries in Europe, the Polish government does not impose periodical ownership taxes for owning a car,[36] instead choosing to levy taxes on the fuel or electricity used to power the vehicle. For Euro-Super 95 and diesel, the tax share in

32 National Fund for Environmental Protection and Water Management, "On June 26 at 9:00, calls for new programs for electromobility," (25 June 2020), http://www.nfosigw.gov.pl/o-nfosigw/aktualnosci/art,1603,nfosigw-dofinansuje-zakup-pojazdow-elektrycznych.html

33 Kancelaria Sejmu, Ustawa z dnia 6 grudnia 2008 r. o podatku akcyzowym (Act of 6 December 2008 on excise duty), (8 May, 2020), http://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20090030011/U/D20090011Lj.pdf

34 Ministry of State Assets, "Exemption from excise duty on electric, hybrid and hydrogen powered vehicles is not public aid," (14 January 2019), https://www.gov.pl/web/aktywa-panstwowe/zwolnienie-z-podatku-akcyzowego-od-pojazdow-elektrycznych-hybrydowych-i-napedzanych-wodorem-nie-jest-pomoca-publiczna1?fbclid=IwAR0CC5RiRfpWIUfyeuqlNR8vrg5m1oPNSjulnQLa8EgccyEnD65-kAWjeCg

35 Peter Mock ed., *European vehicle market statistics 2019/2020,* (ICCT : Washington, DC, 2019), https://theicct.org/publications/european-vehicle-market-statistics-20192020

36 ACEA – European Automobile Manufacturer's Association, "2020 ACEA Tax Guide," (2020), https://acea.be/uploads/news_documents/ACEA_Tax_Guide_2020.pdf

the end consumer price was 58% and 54%, respectively, in July 2020.[37] Taxes on fuels in Poland consist of a 23% VAT, an excise tax of PLN 1.520 (€0.35) per 1,000 liters for gasoline fuel and PLN 1.151 (€0.27) for diesel fuel, and a fuel tax. The fuel tax rates are PLN 155.49 (€36) for 1,000 liters of gasoline and PLN 323.34 (€75) per 1,000 liters of diesel.[38] In 2019, an emission surcharge of PLN 80 (€19) per 1,000 liters fuel (gasoline and diesel) was introduced to finance, among others, the development of electromobility in Poland.[39] In terms of electricity costs for charging an electric car, households consuming between 5,000 and 15,000 kWh electricity per year paid about 18% tax on the end consumer price based on average prices for the second half of 2019.[40]

## Excursus: Effects of incentives and tax breaks on vehicle costs

Figure 5 shows the effects of taxes, tax breaks, and one-time purchase incentives on the total cost of ownership for newly purchased cars. For comparison, we choose the gasoline and diesel versions of the Volkswagen Golf, the best-selling passenger car model in the EU,[41] and the battery electric Nissan Leaf, one of the few BEVs available in Poland that is eligible for a bonus. The costs are shown over a period of 4 years, discounted at 6% for annual cost components, and assume private holders, similar to previous studies.[42] In the absence of registration and ownership taxes, the cost comparison includes the one-time costs of car purchase (base price, VAT, excise duty, registration fee) and fuel costs, differentiated by pre-tax and taxed price. Information on fuel consumption is based on the New European Driving Cycle (NEDC). To reflect vehicle real-world consumption for fuel cost calculation, we apply an adjustment factor of 1.37 for gasoline cars and 1.45 for diesel to the NEDC fuel consumption and energy consumption values.[43] Fuel prices as of July 6, 2020[44] were used, and electricity prices for household consumers with a consumption between 5,000 and 15,000 kWh were applied, based on average prices in Poland in the second half of 2019 and the assumption that private holders charge their electric car at home.[45] Due to lack of data on average distance travelled in Poland per year, we assume 13,000 km.[46]

37 European Commission, Total taxation share in the end consumer price for Euro-Super 95 and diesel oil, (25 May 2020), http://ec.europa.eu/energy/maps/maps_weekly_oil_bulletin/latest_taxation_oil_prices.pdf

38 Minister Infrastruktury, "Obwieszczenie ministra Infrastruktury z dnia 25 lutego 2020 r. zmieniające obwieszczenie w sprawie wysokości stawki opłaty paliwowej na rok 2020 (Notice infrastructure minister of February 25, 2020 amending the notice on the amount of the fuel surcharge rate for 2020)," (25 February 2020), http://isap.sejm.gov.pl/isap.nsf/download.xsp/WMP20200000211/O/M20200211.pdf

39 Kancelaria Sejmu, "USTAWA z dnia 27 kwietnia 2001 r. Prawo ochrony środowiska (ACT of 27 April 2001 Environmental Protection Law)," (27 April 2020), http://isap.sejm.gov.pl/isap.nsf/download.xsp/WDU20010620627/U/D20010627Lj.pdf

40 Eurostat, Electricity prices for household consumers – bi-annual data (from 2007 onwards), (28 April 2020), https://ec.europa.eu/eurostat/statistics-explained/index.php/Electricity_price_statistics#Electricity_prices_for_household_consumers

41 Peter Mock, *European vehicle market statistics 2019/2020*

42 Sandra Wappelhorst, Peter Mock ed., and Zifei Yang, *Using vehicle taxation policy to lower transport emissions: An overview for passenger cars in Europe,* (ICCT, Washington, DC, 2018), https://theicct.org/sites/default/files/publications/EU_vehicle_taxation_Report_20181214_0.pdf

43 Uwe Tietge, Sonsoles Díaz, Peter Mock, John German, Anup Bandivadekar and Norbert Ligterink, *From laboratory to road – A 2016 update of official and 'real-world' fuel consumption and $CO_2$ values for passenger cars in Europe,* (ICCT: Washington, DC, 2016), https://www.theicct.org/sites/default/files/publications/ICCT_LaboratoryToRoad_2016.pdf

44 EC – European Commission, Weekly Oil Bulletin, (2020), https://ec.europa.eu/energy/data-analysis/weekly-oil-bulletin_en?redir=1

45 Eurostat, Electricity prices for household consumers – bi-annual data (from 2007 onwards), (28 April 2020), https://ec.europa.eu/eurostat/statistics-explained/index.php/Electricity_price_statistics#Electricity_prices_for_household_consumers

46 ACEA – European Automobile Manufacturer's Association, "ACEA Report. Vehicles in use Europe 2018," (2018), https://www.acea.be/uploads/statistic_documents/ACEA_Report_Vehicles_in_use-Europe_2018.pdf

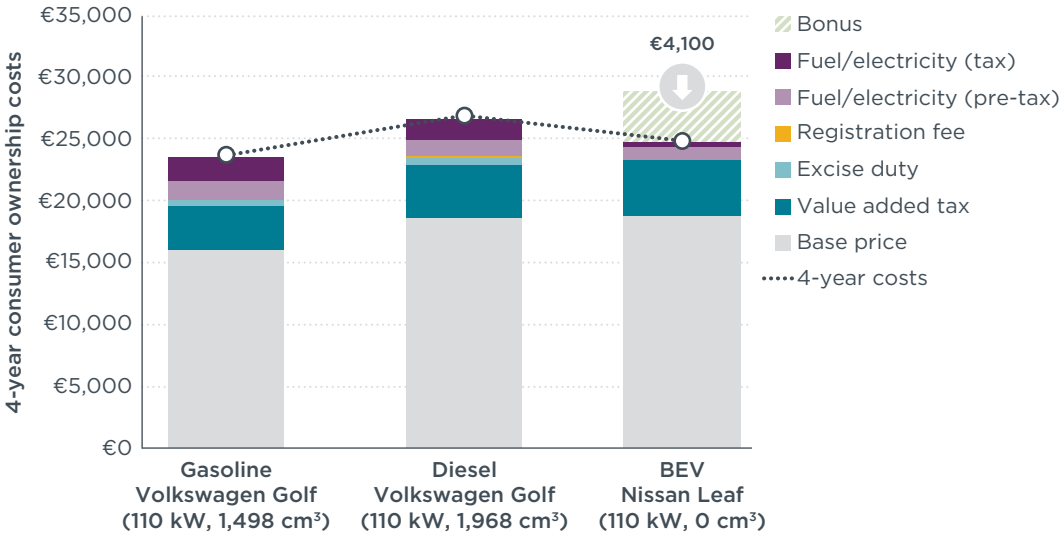


**Figure 5.** Comparison of 4-year consumer ownership costs for a gasoline and diesel Volkswagen Golf and BEV Nissan Leaf.

Based on these assumptions, comparing the conventional Volkswagen Golf models with the electric Nissan Leaf shows that the newly introduced bonus payment on car purchase brings the 4-year cost down by about €4,100, or 15% of the gross purchase price, for the Nissan Leaf. Yet, even with the bonus included, the Nissan Leaf still has a €3,000 cost disadvantage over the gasoline Volkswagen Golf. Over a holding period of 4 years, the cost disadvantage remains, yet at a smaller level, at over €1,000. The reduction is the result of the €500 excise tax on gasoline and lower electricity costs of about €1,500 over 4 years compared to 4-year gasoline fuel costs of more than €3,000. In contrast, compared to the Volkswagen Golf diesel, the Nissan Leaf bears almost identical purchase costs and has a cost advantage of €2,000 over four years, again due to the one-time bonus and advantages on excise tax and fuel costs.

## Electric vehicle company car benefit for employers and employees (national)

In the end of 2019, only 32% of electric cars in Poland were owned by private individuals. The majority of electric cars (68%) were owned by businesses.[47] Of these, leasing companies accounted for 50%, carsharing companies for 18%, and car dealers for 10%. The remaining 22% accounted for manufacturer importers, car rental companies, and others. The Law on Electromobility includes specific tax incentives for electric company cars. This involves longer depreciation write-offs compared to conventional cars for companies purchasing a vehicle. Under the current policy, the maximum passenger car value that can be deducted if a company car is used for business purposes is PLN 150,000 (€35,000) for combustion engine and hybrid cars. For electric cars, the amount is significantly higher at PLN 225,000 (€52,000).[48] In contrast to electric company cars only used for business purposes, there are currently no special provisions for employees privately using an electric company car.

## Electric vehicle parking benefit

The Electromobility Law exempts BEV drivers from parking fees in paid public parking zones. The city of Szczecin already introduced preferential parking fees for

47 Krzyczkowska, Zuzanna, "There are already 10,000 electric cars on Polish roads. When will there be a million?," *Moto.pl,* 14 January, 2020, https://moto.pl/MotoPL/7,88389,25597232,na-polskich-drogach-jest-juz-10-tysiecy-samochodow-elektrycznych.html

48 PwC, Doing business in Poland 2019, (2019), https://www.pwc.pl/pl/pdf/doing-bussiness-in-poland-2019.pdf

low-emission vehicles in 2014, allowing owners of an electric or hybrid car emitting up to 100 g $CO_2$/km to buy a 12-month subscription for parking in the inner-city paid parking zone for PLN 10 (€2.00).[49] Reduced parking fees in other cities range from PLN 2 (€0.50) per hour in the city of Wrocław,[50] to €5 for 3-hour parking in Poznań.[51] Some cities also offer reduced parking fees for PHEVs, such as the cities of Kraków[52] and Poznań.[53]

## Electric vehicle access benefit (national)

According to the Electromobility Law, local governments must allow BEV drivers access to bus lanes, although cities can enact requirements on minimum occupancy to limit this access. In addition, the law gives local authorities a legal basis to implement clean transport zones (CTZs), allowing access to electric vehicles (BEVs, FCEVs) and gas-powered vehicles (CNGs, LPGs) only. Despite the exclusion of PHEVs by definition, municipalities can expand the catalogue of allowed vehicles to include PHEVs. According to the law, a CTZ can also only be established in city centers of cities with more than 100,000 inhabitants. A monetary penalty on non-compliant vehicles can be imposed and used for the purpose of marking the CTZs, purchasing of zero-emission buses, and covering the costs of performing analyses. The maximum penalty for non-compliant vehicles cannot exceed PLN 2.50 PLN (€0.50) per hour according to the law.[54] However, the current regulations are too vague to be implemented by the municipalities, and the government is therefore working on changing and specifying these regulations.[55] To date, a CTZ has only been introduced in Kraków, starting in January 2019. However, due to appeals of business owners living within the zone, almost all constraints for combustion-engine vehicles in the zone have been abolished.[56] The city of Poznań performed a public consultation about the development of electromobility in the city between April and May 2020, including proposals for the introduction of a CTZ.[57]

## Electric vehicle charging benefit (local)

In Poland, no city offers a comprehensive network of free charging options for electric vehicles at city owned or managed public parking spaces. Yet, this policy is a common measure in the early electric vehicle transition stage in cities outside Poland such as

49 City Council of Szczecin, "City Council of Szczecin of 26 May 2014 on the announcement of the consolidated text of the resolution on the establishment of a paid parking zone, fees for parking vehicles on the public roads of the City of Szczecin and the way of collecting them," (26 May 2014), https://spp.szczecin.pl/pliki/uchwala-jt.pdf

50 Wroclaw, Paid parking zone, (23 July 2019), https://www.wroclaw.pl/en/paid-parking-zone

51 Telewizja, "The last day of cheap parking in Poznan," (29 May 2020), https://poznan.tvp.pl/48288715/ostatni-dzien-taniego-parkowania-w-poznaniu

52 Dziennik Urzędowy Województwa Małopolskiego [Official journal province of Malopolska], Uchwala Nr XXII/456/19 Rady Miasta Krakowa z dnia 17 lipca 2019 roku w sprawie zmiany uchwały Nr LXXXIX/2177/17 Rady Miasta Krakowa z dnia 22 listopada 2017 r. w sprawie ustalenia strefy płatnego parkowania, ustalenia opłat za postój pojazdów samochodowych na drogach publicznych w strefie płatnego parkowania, wprowadzenia opłaty abonamentowej dla niektórych użytkowników dróg oraz sposobu pobierania tych opłat [Resolution No. XXII/456/19 KRAKOW City Council of 17 July 2019 on the amendment of Resolution No. LXXXIX/2177/17 of the Krakow City Council of 22 November 2017 on the establishment of a paid parking zone, the establishment of parking fees for motor vehicles on public roads in the paid parking zone, the introduction of a subscription fee for certain road users and the method of collecting these fees], (17 July, 2019), http://mi.krakow.pl/pdf/akty-prawne/uchwala-nr-xxii45619.pdf

53 Telewizja, "The last day of cheap parking in Poznan"

54 Law of 11 January 2018 on Electromobility and Alternative Fuels, version from May 22, 2020, Journal of Laws, https://sip.lex.pl/akty-prawne/dzu-dziennik-ustaw/elektromobilnosc-i-paliwa-alternatywne-18683445

55 Łukasz Dubiński, "Clean transport zones (administrative and legal analysis)," (3 July 2019), https://www.cire.pl/item,182937,2,0,0,0,0,0,strefy-czystego-transportu-analiza-administracyjno-prawna.html

56 Municipal Krakow, ABC of clean transport zone in Kazimierz, (19 February, 2019), https://www.krakow.pl/aktualnosci/226585,29,komunikat,abc_strefy_czystego_transportu_na_kazimierzu.html; Municipal Krakow, "What is left of the Clean Transport Zone in Kazimierz," (6 March 2019), https://www. krakow.pl/aktualnosci/227935,26,komunikat,co_zostalo_ze_strefy_czystego_transportu_na_kazimierzu.html

57 Poznan City Hall, "Public consultation on the draft Strategy for Electromobility Development for the City of Poznań until 2035 - INTERNET CONSULTATION," (2020), https://www.poznan.pl/mim/konsultujemy/konsultacje-spoleczne-dotyczace-strategii-rozwoju-elektromobilnosci-dla-miasta-poznania-do-roku-2035-konsultacje-internetowe,p,38117,38125,52515.html

Oslo and Paris.[58] There are selected programs, such as in Warsaw where drivers of an electric vehicle can charge their car for free in one out of five assigned car parks, if the driver possesses an ECO card.[59] An increasing number of retailers are also offering free charging at semi-public spaces.

### Public electric vehicle procurement (national/local)

The Law on Electromobility also sets fleet and procurement targets for electric vehicles. For the central administration's car fleet, which includes government ministries, at least 10% of the fleet is required to be comprised of electric vehicles from 2022, and at least 20% electric vehicles are required from 2023. The target for the share of electric vehicles in the fleets of local administrations with more than 50,000 inhabitants is 10% by 2022. In addition, the law sets targets for other vehicles in addition to passenger cars. For example, the target for zero-emission buses is 5% by 2021, 10% by 2023, and 20% by 2025 in cities with more than 50,000 inhabitants.

To reach these targets, local governments across Poland are beginning to introduce electric vehicles to their municipal fleets. In terms of passenger cars, the city council of Warsaw opened a tender in late 2019 to lease the first 16 electric cars for its municipal fleet.[60] In mid-2019, the city council of Wrocław added eight electric cars to its municipal fleet.[61] Kraków ordered 47 electric cars in the end of 2019, which will be rented over a three year period.[62] The city of Poznań tested three electric and natural gas vehicles in early 2020.[63] The municipal of Szczecin had just over 10 electric cars in its fleet in mid-2019.[64]

## Policies driving charging infrastructure deployment

Building the necessary charging infrastructure, increasing consumer's accessibility, and addressing potential barriers is crucial in the transition to electric vehicles. This includes public charging as well as the possibility to charge an electric car at home or at workplaces.

### Charging infrastructure goals (national)

The National Framework for Alternative Fuels Infrastructure Development Policy includes a target of 6,000 publicly accessible normal charging points and 400 fast charging points by the end of 2020,[65] which is likely to be delayed by one year due to the impacts of the COVID-19 pandemic. In comparison, the German government has

58 Sandra Wappelhorst, Dale Hall, Michael Nicholas, and Nic Lutsey, *Analyzing policies to grow the electric market in European cities,* (ICCT, Washington, DC, 2020) https://theicct.org/sites/default/files/publications/EV_city_policies_white_paper_fv_20200224.pdf

59 City Warsaw, P+R car parks, (21 May 2020), https://warszawa19115.pl/-/parkingi-p-r

60 Editorial Office in Warsaw, "Town hall invests in electric cars. Officials will drive them for 5 years," (12 January, 2020), https://warszawa.naszemiasto.pl/ratusz-inwestuje-w-samochody-elektryczne-urzednicy-beda/ar/c1-7501377

61 Janusz Krzeszowski, "Eco-friendly Nissan will replace the most worn-out combustion cars in the office," (30 May, 2019), https://www.wroclaw.pl/srodowisko/ekologiczne-nissany-auta-elektryczne-w-urzedzie-miejskim-wroclawia

62 Wojciech Kwinta, "The first electric cars for Krakow municipal institutions are already here," *inzynieria.com* 3 November, 2019, https://inzynieria.com/energetyka/wiadomosci/56970,pierwsze-samochody-elektryczne-dla-krakowskich-instytucji-miejskich-juz-sa

63 Poznan City Hall, "The city of Poznań is testing electric cars," (3 February, 2020), https://www.poznan.pl/mim/info/news/miasto-poznan-testuje-elektryczne-samochody,143016.html

64 Marcin Gigiel, "President Krzystek will use a company electric car," (19 April, 2019), https://wszczecinie.pl/aktualnosci,prezydent_krzystek_bedzie_korzystal_ze_sluzbowego_samochodu_elektrycznego.id-31640.html

65 Ministry of State Assets, Electromobility in Poland (archive version), (n.d.), https://www.gov.pl/web/aktywa-panstwowe/elektromobilnosc-w-polsce

been funding the deployment of publicly accessible charging stations over the past years with the aim to install at least 15,000 by the end of 2020.[66]

The Law on Electromobility also specifies goals for the roll-out of the alternative-fuels infrastructure in cities, including charging stations for electric vehicles. Deployment targets depend on the population, number of registered cars, and the level of motorization. According to the law, by the end of 2020, there must be 1,000 publicly available electric car charging stations available in cities with more than 1 million inhabitants, where at least 600,000 motor vehicles have been registered, and where the motorization level is at least 700 motor vehicles per 1,000 inhabitants. The number of envisaged public charging stations gradually decreases to 60 in cities with more than 100,000 inhabitants, at least 60,000 vehicles on the roads, and at least 400 vehicles per 1,000 inhabitants. Apart from city targets, the legislation also considers the provision of charging infrastructure on main transit routes without specifying target figures.

### Charging infrastructure promotion (national/local)

As part of the incentive schemes for BEVs introduced by the Polish government at the end of June 2020, aid is also provided for installing charging infrastructure when purchasing or leasing a new car. Businesses purchasing or leasing a zero-emission van under the national eVAN support program can receive 50% of the eligible costs at a maximum aid of PLN 5,000 (€1,200) for a charging point up to 22 kW. Micro, small and medium-sized businesses purchasing or leasing a passenger car as part of the Koliber program can claim 20% of the eligible cost for a charging point up to 22 kW, but no more than PLN 25,000 (€5,800).[67]

Outside of national funding for charging points in the business and workplace context, there are no specific schemes targeting public and private charging options. On a local level there are also no support programs offered by the authorities at current.

### Electric vehicle ready building codes (national/local)

According to the Law on Electromobility, parking spaces in all newly built public and multi-family buildings shall be equipped with electrical wiring for charging capacities of at least 3.7 kW.  This applies to new developments in municipalities with over 100,000 inhabitants where more than 60,000 vehicles are registered and where the motorization rate is at least 400 cars per 1,000 inhabitants. Beyond the Law on Electromobility, there are currently no implementation provisions which specify the share or number of parking spaces to be equipped. A draft ordinance by the Minister of Energy, published in May 2019, suggests for public buildings a minimum connection capacity of 20% of the planned number of parking spaces and 3.7 kW. For multi-family buildings, the minimum connection capacity is 100% of the planned number of parking spaces and 3.7 kilowatts kW.[68] The draft regulation is still in consultation.

Beyond the national regulations, there are no specific or additional local-level laws.

66 Federal Ministry of Transport and Digital Infrastructure, "Funding guideline for charging infrastructure for electric vehicles," (2020), https://www.bmvi.de/SharedDocs/DE/Artikel/G/foerderrichtlinie-ladeinfrastruktur-elektrofahrzeuge.html

67 National Fund for Environmental Protection and Water Management, "On June 26 at 9:00, calls for new programs for electromobility"

68 Minister of Energy, Projekt z dnia 25 kwietnia 2019 r. Rozporządzenie Ministra Energii z dnia ... w sprawie sposobu ustalania mocy przyłączeniowej dla wewnętrznych i zewnętrznych stanowisk postojowych związanych z budynkami użyteczności publicznej oraz budynkami mieszkalnymi wielorodzinnymi (Draft of 25 April 2019, Management, Minister of Energy from the day ... on the method of determining the connection capacity for internal and external parking spaces related to public buildings and multi-family residential buildings), (25 April 2019), https://legislacja.rcl.gov.pl/docs//567/12321753/12591258/12591259/dokument394845.pdf

## Actions to raise awareness of electric vehicles

An increasing number of citizens and businesses in Poland would consider buying an electric car if certain preconditions are in place, such as incentives or favorable tax breaks for electric vehicle purchases or CAZs in cities.[69] To further raise awareness of electric vehicles and incentivize their adoption, individual and external factors can be addressed. Individual factors include addressing mobility routines, behavior, or attitudes. External factors largely include providing information about electric vehicles.

At the national level, there is no comprehensive information available that informs potential vehicle buyers about electric vehicles and charging infrastructure. The Polish government makes available the strategic framework, plans, and laws to promote electromobility in Poland.[70] Beyond, the vast majority of information so far is provided by private associations or institutions, such as the Alternative Fuels Market Observatory[71], the Polish Association of the Automotive Industry[72], the Automotive Market Research Institute[73], and the Electric Vehicles Promotion Foundation (FPPE) which launched a monthly Green Car Magazine in May 2020.[74]

Some local authorities provide information on city-specific electric vehicle regulations, such as the cities of Poznań and Warsaw, specifically about regulations for electric cars in paid parking zones on its municipal webpages.[75] Yet, comprehensive information from local authorities on electric cars and their benefits is largely missing.

To address potential individual barriers to electric vehicle adoption, test rides or services such as electric carsharing offer a low-threshold access to electric vehicles without the need to purchase an electric car. Electric carsharing offers have been provided by various companies in Poland. In 2019, Warsaw introduced a new carsharing service provided by InnogyGo, consisting of an all-electric vehicle fleet of 500 BMW i3s.[76] The provider 4Mobility offers electric cars in Warsaw, Poznań, Siedlce, and Rzeszów (Renault Zoe and/or Nissan Leaf).[77] The city of Wrocław also provided its municipal carsharing service with an all-electric fleet of 200 cars, however the service stopped operation in April 2020.[78]

## Summary

Table 1 provides an overview of select national and local policies implemented in the cities representing the highest electric passenger car registration shares in 2019. A total of 22 policies were analyzed, with dark green representing national and light green local policies. Policies that were applied at national and local levels in 2019 are shown with diagonal strips and counted as double.

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69 Polish Alternative Fuels Association (PSPA)," Barometr Nowej Mobilności 2019/20 (New mobility barometer 2019/20)," (2019), https://pspa.com.pl/assets/uploads/2020/01/barometr_nowej_mobilnosci_2019_raport_S.pdf; Polish Alternative Fuels Association (PSPA), „STREFY CZYSTEGO TRANSPORTU Raport (Clean Transport Zones Report)," (2019), https://pspa.com.pl/assets/uploads/2019/09/Strefy_Czystego_Transportu_raport.pdf

70 Ministry of State Assets, Electromobility in Poland (archive version), (n.d.), https://www.gov.pl/web/aktywa-panstwowe/elektromobilnosc-w-polsce

71 Alternative Fuels Market Observatory, Vehicles, (2020), https://orpa.pl/category/pojazdy/

72 Polski Związek Przemysłu Motoryzacyjnego (Polish Association of Automotive Industry), News, (n.d.), https://www.pzpm.org.pl/en

73 Automotive Market Research Institute, "Most compared models, (2002-2018)," https://www.samar.pl/__/43/Por%C3%B3wnywarka-samochod%C3%B3w.html

74 Electric Vehicles Promotion Foundation (FPPE), Green Car Magazine, (2020), https://fppe.pl/green-car-magazine/

75 Poznan City Roads Authority, "Electric cars do not pay in the paid parking area," (11 June, 2018), https://zdm.poznan.pl/pl/parkowanie-samochody-elektryczne-nie-placa-w-strefie-platnego-parkowania

76 Innogy, "Innogy goes on e-mobility offensive in Poland," (12 March, 2019), https://news.innogy.com/innogy-goes-on-e-mobility-offensive-in-poland/

77 4Mobility, Premium car sharing, (n.d.), https://4mobility.pl/

78 Gazeta Wrocławska, "Vozilla disappears from Wroclaw. Municipal Car Rental terminates its operations. What about cars?," (17 January, 2020). https://gazetawroclawska.pl/vozilla-znika-z-wroclawia-miejska-wypozyczalnia-aut-konczy-dzialalnosc-co-z-samochodami/ar/c1-14720892

The summary reveals the dominance of national policies, largely driven by the Law on Electromobility which specifies targets and policies for the adoption of electric vehicles—here with the focus on passenger cars. To address the existing cost gap between electric and conventional cars, the Polish government has implemented favorable tax breaks on registration, including a reduced excise duty, and launched three different incentives schemes for various consumer groups in mid-2020 after several postponements.

**Table 1.** Summary of promotion actions for select cities with the highest electric vehicle registration shares in 2019.

| | EV purchase and operation | | | | | | | | | | | | EV charging infrastructure | | | EV awareness raising | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | EV goals (national/local) | EV strategic and legal framework (national) | BEV purchase incentive (national) | PHEV purchase incentive (national) | EV registration tax benefit (national) | EV usage tax benefit (national) | EV company car benefit for employers (national) | EV company car benefit for employees (national) | EV parking benefit (national) | EV access benefit (national) | EV charging benefit (local) | Public EV procurement (national/local) | Charging infrastructure goals (national) | Charging infrastructure promotion (national/local) | EV-ready building codes (national/local) | EV information (national/local) | EV fleet services (local) | **Number of selected EV promotion actions (total 22)** |
| **City of Szczecin** 1.1% and ~100 total EVs registered in 2019 | ■ | ■ | ■ | | ■ | | ■ | | ■ | ■ | | ▨ | ■ | ■ | ■ | ■ | ■ | 14 |
| **City of Warsaw** 1.0% and ~1,300 total EVs registered in 2019 | ▨ | ■ | ■ | | ■ | | ■ | | ■ | ■ | | ▨ | ■ | ■ | ■ | ■ | ■ | 15 |
| **City of Wrocław** 0.6% and ~150 total EVs registered in 2019 | ■ | ■ | ■ | | ■ | | ■ | | ■ | ■ | | ▨ | ■ | ■ | ■ | ■ | ■ | 14 |
| **City of Kraków** 0.5% and ~170 total EVs registered in 2019 | ■ | ■ | ■ | | ■ | | ■ | | ■ | ■ | | ▨ | ■ | ■ | ■ | ■ | ■ | 14 |
| **City of Poznań** 0.4% and ~150 total EVs registered in 2019 | ■ | ■ | ■ | | ■ | | ■ | | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ | 13 |

■ National EV promotion action ▨ Local EV promotion action ■ National and local EV promotion action

**BEV** – Battery electric vehicle, **PHEV** – Plug-in hybrid electric vehicle, **EV** – Electric vehicle

There are also ambitious targets and policies in place for the deployment of charging infrastructure and measures to promote awareness, yet their implementation is at the early stages. This is also reflected in absolute numbers as well as shares of electric passenger car registrations. With the exception of Warsaw where about 1,300 new electric cars were registered in 2019, of which 500 were part of a new electric carsharing service, cities such as Kraków, Poznań, and Wrocław with a comparably high uptake across Poland, recorded only between 100 and 170 electric passenger car registrations.

## Conclusions

For environmental as well as economic reasons, Poland is committed to increasing the number and sales share of electric passenger cars. Within Europe, the country is one of the largest passenger car markets in terms of new registrations and is home to the largest European electric vehicle battery factory, LG Chem Wrocław Energy, situated

in the district of Wrocław.[79] To become a leading electric vehicle market as envisaged by the government, producing and selling cars within the country will be crucial, as experience in other markets show. In 2016, a joint venture of four state-owned power companies was formed to establish a Polish electric car brand and develop three versions of a compact electric car by 2022 or 2023.[80] In addition to securing existing and creating new jobs in electromobility, it could accelerate electric passenger car adoption, help to reduce transport-related $CO_2$ emissions, and improve local air quality in Polish cities.[81]

The Polish government is also seeking to increase the share of renewable energies. Today, the country depends to a high extent on coal-based electricity.[82] Poland's National Energy and Climate Plan sets a target of a 21% to 23% share of renewable sources in gross final energy consumption by 2030, which includes an increased share of renewable sources of energy for transport to 14% and a reduction of the share of coal in electricity production from 56% to 60 %.[83] Achieving the targets will also help to make the use of electric vehicles more climate-friendly in the years to come.

Yet, despite targets, strategies, necessary legal frameworks, and a strong industry in battery part production for electric vehicles, the uptake of the electric passenger car fleet has been comparably slow to date. The recently adopted purchase incentives for battery electric car purchasers, ranging between up to €4,400 for private individuals and up to €16,000 for businesses purchasing a delivery van, can bring down the costs at car purchase significantly. Yet, for private consumers opting for an electric car, cost parity at car purchase is only reached if comparing a BEV Nissan Leaf and a diesel Volkswagen Golf. The acquisition costs of a comparable gasoline Volkswagen Golf—71% of newly registered cars in Poland in 2019 were running on gasoline—is €3,000 lower despite the bonus for BEVs. At the same time, the majority of the Polish population is unable to afford a new electric car without higher aid amounts or tax advantages. In 2018, the average yearly disposable income per person ranged between €3,600 in the south-eastern province of Podkarpackie to €5,500 in the province of Mazowieckie, which includes the capital city Warsaw. Experiences from other countries such as Norway and Sweden show that reliable, stable, and significant tax advantages over combustion engine cars can make electric cars highly attractive economically.[84]

To grow the electric passenger car market in Poland, a well-balanced mix of strong and reliable policy measures addressing the cost, charging infrastructure, and information gap could help to increase the share of electric passenger cars significantly, as leading markets such as France, Germany, the Netherlands, and Sweden show. A key policy in the initial phase is the offering of significant purchase and tax incentives for buyers of an electric car to make them economically attractive compared to conventional cars. To sustainably counter-finance these purchase premiums, malus taxes for purchasers of a car with high $CO_2$ emissions could be established. In France and Sweden, such a bonus-malus system has helped to balance costs, lower the fleets $CO_2$ emissions, and stimulate

79 Elektrowoz, "Polish Electric Car: Protoype in 2020, production in 2023, for now Germany is doing everything," (12 December, 2019), https://elektrowoz.pl/auta/polski-samochod-elektryczny-prototyp-w-2020-produkcja-w-2023-na-razie-wszystko-robia-niemcy/

80 Electromobility Poland SA, About the project, (2020), https://electromobilitypoland.pl/o-projekcie/

81 Nic Lutsey, Mikhail Grant, Sandra Wappelhorst, and Huan Zhou, *Power play: How governments are spurring the electric vehicle industry,* (ICCT: Washington, DC, 2018), https://theicct.org/publications/global-electric-vehicle-industry

82 Central Statistical Office, Energy 2019, (16 June, 2019), https://stat.gov.pl/obszary-tematyczne/srodowisko-energia/energia/energia-2019-folder,1,7.html

83 Ministry of State Assets, "National energy and climate plan for 2021-2030 submitted to the European Commission," (30 December, 2019), https://www.gov.pl/web/aktywa-panstwowe/krajowy-plan-na-rzecz-energii-i-klimatu-na-lata-2021-2030-przekazany-do-ke

84 Sandra Wappelhorst, Dale Hall, Michael Nicholas, and Nic Lutsey, Analyzing policies to grow the electric market in European cities

electric vehicle purchases.[85] In the absence of a registration tax in Poland, excise duty could be based on $CO_2$ emissions rather than engine capacity, levying higher rates for high emitting cars. In parallel, extending the public charging infrastructure network will remain important in order to increase visibility and consumer convenience. In addition, governmental activities should continue or implement policies to address workplace and home charging opportunities and provide the relevant funding in the early adoption phase, as experience from other countries show that a large proportion of charging is done at home or workplaces.

Poland has the potential to serve as a model for other countries which are in the early stage of electric passenger car adoption. The implementation of strong policy measures and strategies can help to reduce transport-related $CO_2$ emissions and improve local air quality. In addition, the growing electric vehicle market could help to keep and create new jobs in Poland, turning the country into a major center of electric vehicle production.

85 Sandra Wappelhorst, Peter Mock, and Zifei Yang, *Using vehicle taxation policy to lower transport emissions: An overview for passenger cars in Europe;*
Sandra Wappelhorst and Uwe Tietge, "Sweden's new bonus-malus scheme: From rocky roads to rounded fells?(blog post)," (October 8, 2018), https://theicct.org/blog/staff/swedens-feebate-system-20181008
Sandra Wappelhorst, "Actions speak louder than words: the French commitment to electric vehicles (blog post)," (16 January, 2020), https://theicct.org/blog/staff/actions-speak-louder-words-french-commitment-electric-vehicles