ERA-NET Cofund

Electric Mobility Europe (EMEurope)

D6.5 - Best practice catalogue for policy makers No. 2

[Version: 25 February 2020]

EMEurope is co-funded by the European Commission as part of the ERA-NET Cofund scheme under Horizon 2020 Programme for EU funding programme for research and innovation under grant agreement no. 723977.

Table of Contents

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Glossary

AC	Alternating Current
ACEA	European Automobile Manufacturers' Association
AFID	Alternative Fuels Infrastructure Directive
BEV	Battery Electric Vehicle
CPO	Charging Point Operator
DC	Direct Current
EAFO	European Alternative Fuels Observatory
EBA	European Battery Alliance
EEA	European Economic Area
EGVIA	European Green Vehicles Initiative Association
EVSE	Electric Vehicle Supply Equipment
FCEV	Fuel Cell Electric Vehicle
GHG	Greenhouse Gas
GSG	Government Supporting Group
HOV	High Occupancy Vehicle
ICCT	International Council on Clean Transportation
ICEV	Internal Combustion Engine Vehicle
IEA HEV TCP	International Energy Agency – Hybrid and Electric Vehicle – Technology Collaboration Programme
LCEV	Light Commercial Electric Vehicle (here: N1)
NEDC	New European Driving Cycle

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

OECD	Organisation for Economic Cooperation and Development
PHEV	Plug-in Hybrid Electric Vehicle
POLIS	Network of European cities and regions
PT	Public Transport (here: M2, M3)
PTW	Powered Two-Wheelers
R&D	Research and Development
R&I	Research and Innovation
SME	Small and Medium Enterprise
STRIA	Strategic Transport Research and Innovation Agenda
SV	Small and Light Vehicles (here: M1)
TCO	Total Cost of Ownership
VAT	Value-Added Tax

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Summary

Though total greenhouse gas (GHG) emissions in the EU-27 fell by 24 % between 1990 and 2019[1], since 1990 they have increased in the transport sector.[2] Nonetheless, due to the significantly lowered limit for fleet emissions under Regulation (EU) 2019/631 and heavy fines for non-compliance, the EU-wide CO_2 emission targets for vehicle fleets are boosting the sale of electric cars. This was evident in 2020, when the total number of electric cars sold in Europe more than doubled despite the COVID-19 crisis, which led to a 25 % drop in car sales in Europe.

In addition to the regulatory framework, many countries and regions in Europe offer measures to increase the demand of electric vehicles. By the end of 2020, such incentives existed in 26 countries of the EU-27[3] including all countries/regions involved in the policy cooperation activities of ERA-NET Cofund Electric Mobility Europe (EMEurope). Financial incentives were used most frequently, ranging from purchase incentives for eco-friendly automobiles to support for installation of charging infrastructure, but non-financial benefits have also been implemented to support the electrification of road transport.

The number of new registrations and the share of electric cars in total stock varies greatly in the EMEurope countries. An analysis of the recent development of the transport electrification in countries and regions shows a clear correlation between the status quo of transport electrification and the number and extent of measures offered to support it. In countries where above-average (financial and non-financial) incentives for electric mobility have been offered over a longer period of time, the share of electrically powered vehicles in the total vehicle stock is likewise above average, and vice versa. Moreover, it is evident that the measures can be used to influence the stock development of certain drive technologies. Significantly stronger financial support for BEVs can lead to a greater increase in the number of vehicles using this technology. With uniform funding intensity, other factors, such as charging infrastructure, appear to exert a greater influence on the development of vehicle numbers per drive technology. In addition, clear and binding targets are proving to be an effective way to drive transportation electrification.

[1] European Environment Agency 2020: Total greenhouse gas emission trends and projections in Europe

[2] European Environment Agency 2020: Greenhouse gas emissions from transport in the EU

[3] ACEA (2020): Overview - Electric vehicles: Tax benefits & purchase incentives in the European Union, link: www.acea.be/publications/article/overview-of-incentives-for-buying-electric-vehicles

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

1. Introduction

Transport continues to be a key source of air pollution and a main contributor to climate change. According to a report from the International Energy Agency[4], recent developments show that global greenhouse gas emissions from the transport sector have further increased in 2019. At just under 0.5 %, however, the increase in 2019 was lower than in previous years (1.9 % annually since 2000) due to efficiency improvements, electrification and wider use of biofuels. Nevertheless, transportation is still responsible for 24 % of direct carbon dioxide (CO_2) emissions from fuel combustion.

Greenhouse gas emissions in the EU-27 fell by 24 % between 1990 and 2019.[5] However, transport is the only sector whose emissions have increased since 1990. In the last 5 years, an increase in transport emissions of about 9 % could be observed.[6] Nonetheless, due to the significantly lowered limit for fleet emissions under Regulation (EU) 2019/631, the tipping point seems to have been reached in 2020 after years of rising CO_2 emissions from new cars sold.[7] The average emission of passenger cars registered in the EU in 2019 was 122.4 grams of CO_2 per kilometer (NEDC), well above the stricter limit of 95 g CO_2 / km that entered into force in 2020.[8] According to a recent study by ICCT[9], new registrations of battery electric cars and plug-in hybrids soared in 2020; consequently, average CO_2 emission levels of new cars dropped significantly to an estimated level of 107 g/km.

With heavy fines for non-compliance, the EU-wide CO_2 emission targets for vehicle fleets give a boost to supply and sale of electric cars (battery electric, BEV and plug-in hybrid electric, PHEV). Despite the COVID-19 crisis, which led to reduced car sales in Europe by 25 % in 2020, the total number of electric cars sold in Europe has more than doubled, rising from about half a million in 2019 to more than 1.3 million in 2020 (more than a million in the EU-27), surpassing the Chinese EV market for the first time.[10,11]

In addition to the regulatory framework that forces car makers to produce and sell more electric cars, also many countries offer EV stimulus measures to increase demand. By the end of 2020, such incentives have been put in place in 26 out of the 27 EU countries[12] including all

[4] IEA (2020), Tracking Transport 2020, IEA, Paris, link: www.iea.org/reports/tracking-transport-2020

[5] European Environment Agency 2020: Total greenhouse gas emission trends and projections in Europe, December 2020, link: www.eea.europa.eu/data-and-maps/indicators/greenhouse-gas-emission-trends-7/assessment

[6] European Environment Agency 2020: Greenhouse gas emissions from transport in the EU, December 2020, link: www.eea.europa.eu/data-and-maps/daviz/greenhouse-gas-emissions-from-transport#tab-chart_1

[7] T&E (2020): Mission (almost) accomplished! Carmakers' race to meet the 2020/21 CO_2 targets, and the EU electric cars market. www.transportenvironment.org/sites/te/files/publications/2020_10_TE_Car_CO_2_report_final.pdf

[8] REGULATION (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO_2 emission performance standards for new passenger cars and for new light commercial vehicles

[9] ICCT 2021: Market Monitor European Passenger Car Registrations, January–December 2020, link: theicct.org/sites/default/files/publications/MarketMonitor-EU-jan2021.pdf

[10] T&E (2020): CO_2 targets propel Europe to 1st place in emobility race, link: www.transportenvironment.org/sites/te/files/publications/2020%20EV%20sales%20briefing.pdf

[11] T&E (2020): Mission (almost) accomplished! Carmakers' race to meet the 2020/21 CO_2 targets, and the EU electric cars market link: www.transportenvironment.org/sites/te/files/publications/2020_10_TE_Car_CO_2_report_final.pdf

[12] ACEA (2020): Overview - Electric vehicles: Tax benefits & purchase incentives in the European Union, link: www.acea.be/publications/article/overview-of-incentives-for-buying-electric-vehicles

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

EMEurope countries/regions. The most common governmental incentives used are financial measures, such as purchase incentives, tax benefits and VAT benefits for eco-friendly automobiles, which were increased in some countries in 2020 as part of corona economic stimulus packages. Furthermore, benefits such as free-parking or free-charging in certain areas of cities, fee exemptions for bridge/tunnel use etc. were implemented in several European countries and regions to support the electrification of road transport.

Nonetheless, incentives to either produce or buy more electric vehicles are not sufficient for the transition to climate and environmentally friendly transport. The availability of charging infrastructure is key for the roll-out of electrification and since the numbers of electric vehicles keep increasing, investments in charging infrastructure became part of several European countries' priorities. The number of vehicles per charging point and investments in charging infrastructure in European countries and regions differ enormously, as shown in chapter 3. Larger investments are generally necessary to electrify transport in European countries.

This catalogue aims at giving an overview of the recent development in countries and regions involved in the policy cooperation activities of ERA-NET Cofund Electric Mobility Europe (EMEurope). For this purpose, the results of the *State of the art survey No. 2 - National, Regional and EU measures to establish and support electric mobility*[13] carried out between July and August 2020 and supplemented by additional information from several documents mentioned by participating countries and regions are examined in more detail against the background of the development of electric mobility. In addition to general information on activities to foster the electrification of transport, COVID-19 crisis influence, activities in networks and current measures to support the electrification (categories: small vehicles, public transport and logistic and freight) and the charging infrastructure were queried in detail. In order to determine the recent numerical development of the electrification of transport, data on EVs and public charging points in the participating countries[14] available in the European Alternative Fuels Observatory (EAFO) portal[15] were used (sections 1.1 and 1.2).

1.1 Vehicles stock and recent development

Car sales in the EU fell by 25 % in 2020, mainly as a result of the COVID-19 crisis. At the same time, the total number of electric cars (xEVs) sold in Europe European Economic Area (EEA) more than doubled from around half a million in 2019 to more than 1.2 million in 2020[9], significantly exceeding expectations of around 1 million xEVs sold in 2020[16]. Due to the rapidly increasing number of electric vehicles in the market with 143 new electric vehicle models

[13] State of the art survey No. 2 -National, Regional and EU measures to establish and support electric mobility, ERA-NET COFUND EMEurope, survey carried out in July-August 2020, link: www.electricmobilityeurope.eu/networks

[14] Exception for Belarus, as no data is available in the EAFO portal. Data collected for Belarus was made available by NASB. To be noted: data for 2020 is not official yet and changes/corrections might still ocurr.

[15] EAFO, link: www.eafo.eu

[16] Lucien Mathieu and Julia Poliscanova, Mission (almost) accomplished! Carmakers' race to meet the 2020/21 CO_2 targets, and the EU electric cars market, Transport and Environment, October 2020, link: www.transportenvironment.org/sites/te/files/publications/2020_10_TE_Car_CO2_report_final.pdf

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

launched in 2019[17] and the widely spread EV stimulus measures, the market share of xEVs in the EEA increased from 3 % in 2019 to 11 % in 2020[9].

However, the number of new registrations and the share of electric cars in the total stock varies greatly in the individual member states and EMEurope countries, respectively. While the share of electric passenger cars is close to 4 % in Sweden, in other countries only 2 in 10,000 (0.03 %) passenger cars are electrified. Disparities are even stronger in public transport. With the exception of the Netherlands (12.2 %), Sweden (3.5 %) and Austria (1.7 %), the share of electrified buses in the total local public transport fleet is below 1 % in all EMEurope countries/regions. For light commercial vehicles, the share of electrified vehicles is between 0 and 1 %. The highest shares are found in Sweden (1 %), France (0.95 %) and Germany (0.90 %). These are almost exclusively BEVs. In the heavy-duty sector, only a few battery electric vehicles can be found in some EMEurope countries like the Netherlands (0.09 %), Germany (0.04 %) and Sweden (0.02 %), yet no PHEVs at all.

Despite the increasing number of new vehicle registrations in almost all EMEurope countries, the xEV vehicle stock remains very small compared to the total vehicle stock. In the **light vehicle sector**, the share of BEVs ranges from 2 (Turkey) to 204 (Netherlands) per 10,000 cars and the share of PHEVs from 1 (Turkey) to 271 (Sweden) (Figure 1, 1st vertical axis). A comparison of light vehicle stocks between end 2019 and end 2020 shows increases ranging from 41 % (Austria) to 145 % (Finland) for BEVs and from 13 % (Netherlands) to 191 % (Finland) for PHEVs (Figure 1, 2nd vertical axis). Belarus showed an increase of 357 %[18] in the stock of EVs (BEV and PHEV together) between December 2019 and end November 2020. This is an impressive increase, however the share of EVs is 2 out of 10,000 light vehicles.

[17] McKinsey Electric Vehicle Index: Europe cushions a global plunge in EV sales, July 2020.

[18] Number given by an official source, but not yet published. Date: 1 December 2020. Corrections until publication might still occur.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

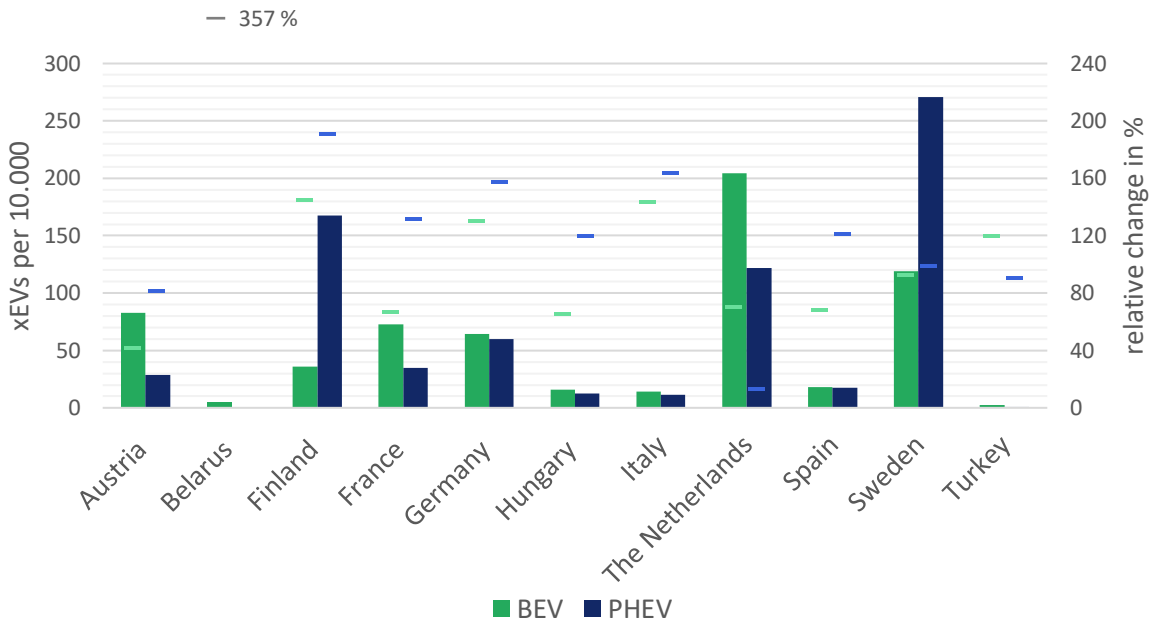

Figure 1 Share of light vehicles (BEVs and PHEVs) per 10.000 vehicles in EMEurope participating countries (1st vertical axis) and relative change between 2020 and 2019 (2nd vertical axis).

With the exception of Finland and Sweden, both having very high PHEV stocks by comparison, BEV stocks are higher than PHEV stocks in the **light vehicle sector** in all EMEurope countries, even if only slightly higher in some cases. In addition, it can be seen that, with the exception of the Netherlands and Turkey, PHEV stocks are growing stronger than those of BEV. The strongest growth in both BEVs and PHEVs can be observed in Finland.

In the **public transport sector (buses)**, the number of vehicles in the European market continues to grow rapidly. According to ACEA, electric bus registration in the European Union increased by 170.5 % from 594 units in 2018 to 1,607 buses sold in 2019, making up 4.0 % of total new bus registration.[19] In 2020, the battery-electric bus market increased 22 % in Western Europe (with the addition of Poland). Until present date, 5,087 e-buses have been delivered since 2012 in this area.[20] What is interesting, nearly 75 % of them have been handed over in 2019 and 2020.The share of BEVs is below 1 % in all EMEurope countries except the Netherlands (12.2 %), Sweden (2.9 %) and Austria (1.7 %) (Figure 2, 1st vertical axis). A comparison of vehicle stocks between end 2019 and end 2020 shows increases between 9.1 % (Italy) and 114 % (Germany) and a slight decrease in Austria (-0.6 %) as well as no change in stock in Turkey (Figure 2, 2nd vertical axis). In contrast to the BEVs, PHEVs in public transport are found in very small numbers in only a few countries like Sweden (0.6 %), Germany (0.2 %) and Spain (0.1 %).

[19] Sustainable Bus, April 2020: Electric bus registrations in the EU increased by 170 per cent in 2019, link: www.sustainable-bus.com/news/bus-market-eu-2019-electric-bus-acea

[20] Sustainable Bus, February 2020: The pandemic doesn't stop the European e-bus market: +22 % in 2020, link: www.sustainable-bus.com/?url=https%3A%2F%2Fwww.sustainable-bus.com%2Fnews%2Feurope-electric-bus-market-2020-covid%2F

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

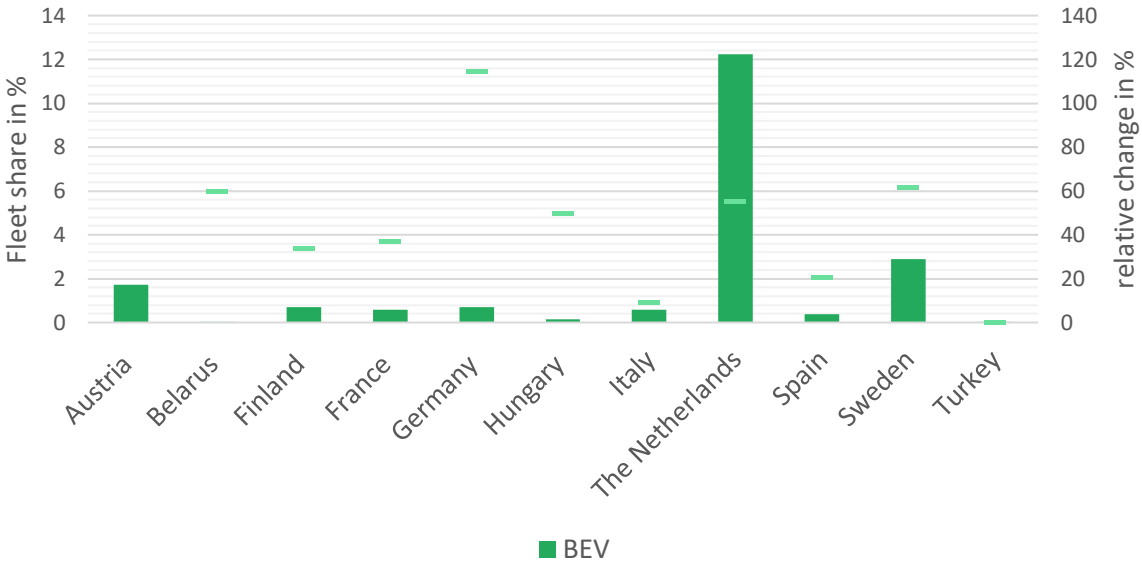

Figure 2 Share of electric buses in EMEurope participating countries (1st vertical axis) and relative change between 2020 and 2019 (2nd vertical axis).

Light commercial EVs (LCEVs) reached 380,000 units globally in 2019.[21] LCEVs are part of the vehicle fleet in all EMEurope countries except Turkey (Figure 3, 1st vertical axis). The proportion of BEVs per 10,000 vehicles is highest in Sweden (100), France (94) and Germany (89). The shares are also comparatively high in Austria (73) and the Netherlands (60). With an increase of 137 %, the largest boost in the vehicle stock is to be found in Finland (Figure 3, 2nd vertical axis). For other countries, the growth rates range between 14 and 51 %. Plug-in hybrids are hardly present in this vehicle category and therefore not displayed in Figure 3. As an example, Germany has the second highest share with 0.7 PHEVs per 10,000 light commercial vehicles behind Finland, having a share of 3.2 PHEVs.

[21] The Global Electric Vehicle Market In 2020 – Virta, link: www.virta.global/global-electric-vehicle-market

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

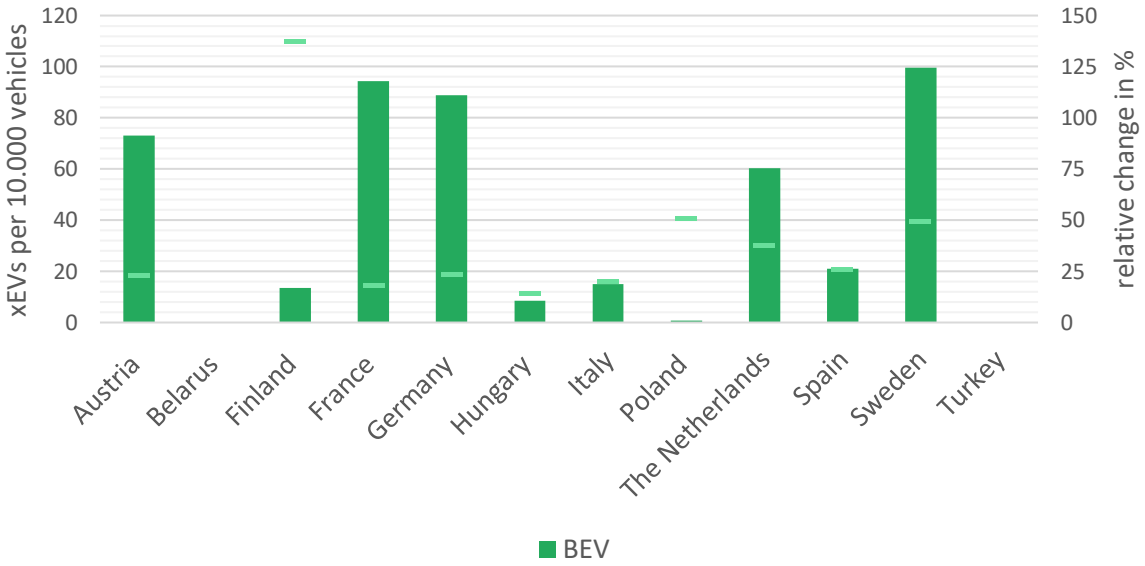

Figure 3 Share of light commercial vehicles (BEVs) in EMEurope participating countries (1st vertical axis) and relative change between 2020 and 2019 (2nd vertical axis).

In the **heavy duty sector**, BEV are found in very small numbers in only a few countries like The Netherlands (0.09 %), Germany (0.02 %) and Austria (0.02 %). No PHEVs are found in this vehicle category.

1.2 Charging Infrastructure

With the number of electric vehicles steadily increasing, a Europe-wide charging infrastructure sufficiently developed is key to the intended electrification of transport. Currently, the number of charging points per country diverge immensely in Europe. According to EAFO, the number of charging points in the European Union increased by 39.2 %[22] between end 2019 and end 2020 to a total of 204,219 public charging points (fast and normal). All participating EMEurope countries show an increase in the numbers of charging points in 2020 compared to 2019. These countries apply different measures to incentivise the expansion of the charging infrastructure and some of these differences are reflected in Figure 4.

The number of public AC charging points is higher than the number of DC charging points in all countries. At around 64 thousand, most normal charging (AC) points are currently available in the Netherlands, followed by France (42,000) and Germany (37,213). Less than 1,500 normal charging points can be found in Belarus, Hungary and Turkey. At present there are most fast charging (DC) points in Germany (7,456) and France (4,045) and less than 500 of them in Belarus, Turkey, Hungary and Finland.

With the exception of Finland, Italy and Sweden, the relative increase is higher for fast charging points than for normal charging points in all countries. Turkey is the country with the highest relative change in both normal and fast charging. Apart from Italy, all countries show a clear

[22] EAFO, Data updated in December 2020, www.eafo.eu/knowledge-center/data-updated

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

difference between the developments of these infrastructures. Either the increase of normal charging is more pronounced (e.g. Sweden) or that of fast charging (e.g. the Netherlands).

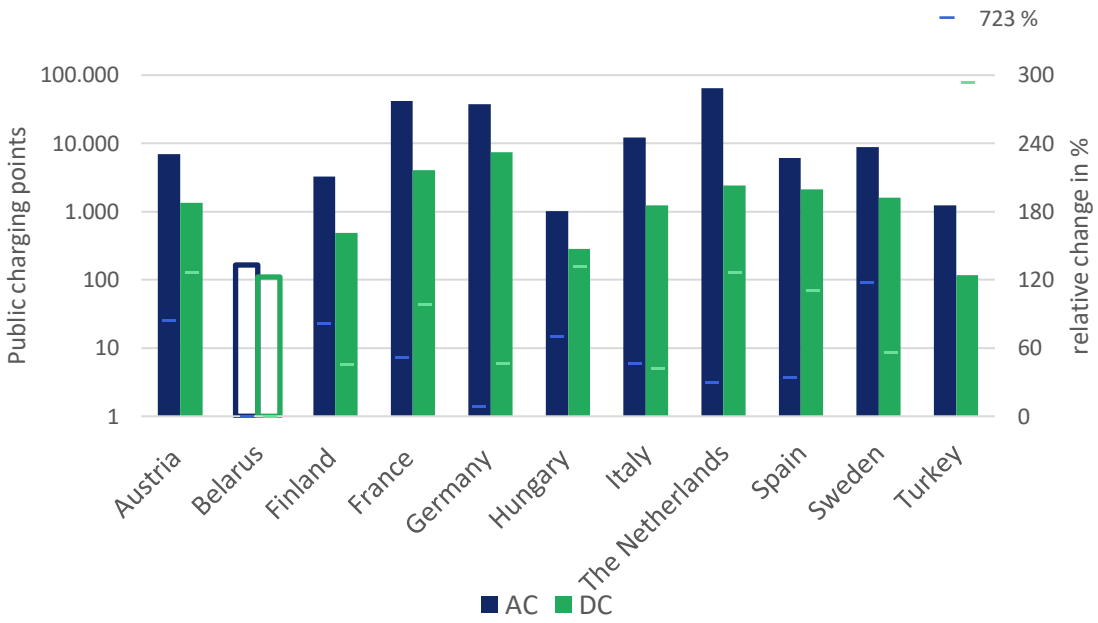

Figure 4 Number of public normal charging (AC) and fast charging (DC) points in EMEurope participating countries (1st vertical axis) and relative change between 2020 and 2019 (2nd vertical axis).

1.3 Climate policy EU level[23,24,25]

One of the top priorities of the European Union (EU) is the European Green Deal, which aims at reducing net emissions of greenhouse gases in 2050 to zero. Aligned with the European Green Deal and Paris Agreement, the Commission proposed the 2030 Climate Target Plan, aiming at a reduction of greenhouse gas emissions to at least 55 % below 1990 levels by 2030. Not less than 30 % of the EU multiannual budget, together with the Next Generation EU, will be dedicated to climate-relevant spending, consistent with the Paris Agreement. Member states recovery and resilience plans and related spending will have to effectively contribute to the green and the digital transitions necessary in the different sectors, including transport, in Europe or to addressing the challenges resulting from them.

CO_2 emissions from fossil fuel combustion are the largest source of greenhouse gas emissions in the EU. Transport (all modes) accounts for a quarter of the emitted greenhouse gases in the EU and still shows increasing emissions. To achieve climate neutrality, a reduction of 90 % of transport emissions is needed by 2050.

[23] Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions the European Green Deal, COM/2019/640 final

[24] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Stepping up Europe's 2030 climate ambition - Investing in a climate-neutral future for the benefit of our people, COM(2020) 562 final, September 2020

[25] Communication from the Commission - The European Green Deal, COM(2019) 640 final, December 2019

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

To this end, the share of renewable energy in the transport sector has to increase to around 24 % by 2030, which is hardly attainable without further development and deployment of e.g. electric vehicles. For road transport, in parallel to applying emissions trading at the level of the fuel supplier and road pricing in line with the ongoing revision of the Eurovignette Directive, only stringent CO_2 emissions performance standards can ensure the commercialization of modern and innovative clean vehicles, including vehicles that feature strong reductions in fuel consumption, or electric drive trains of battery or fuel cell electric vehicles causing no tank-to-wheel emissions at all. The Commission will revise and strengthen the CO_2 standards for cars and vans for 2030 by June 2021.

On the one hand, secure access to sustainably produced batteries will be critical to rolling out electric vehicles, while clean hydrogen will be crucial for decarbonising heavy-duty transport. On the other hand, an appropriate roll-out of infrastructure for recharging and refueling of alternatively-powered vehicles is a basic requirement. The upcoming revision of the Alternative Fuels Infrastructure Directive is a key initiative in this regard. In the coming months, the Commission will also assess what is required in practice for this sector to contribute to achieving climate neutrality by 2050 and at what point in time internal combustion engine vehicles should be banned from the market.

1.4 Activities in networks

There are many networks in Europe and beyond focusing on the electrification of transport. They differ in their composition, as the drivers and members of these network belong to distinct types of organizations (government, industry, research, services, etc.) and there is a very broad range of focus (e.g. technology, policy, type of transport, type of vehicle, infrastructure). In many cases, a deeper exchange between some of these networks proves to be beneficial for all parts involved, avoiding duplication of investments and creating synergies. Not only the European Commission strives for synergies, but the networks themselves often look for their counterparts. Besides, in many cases, the same organizations are members in several networks and synergies are usually seen as positive within these organizations.

Apart from two countries, all other eleven countries and regions participating in the EMEurope Survey No.2 are member in at least one network focusing on electric mobility. The networks indicated differ greatly on their scope and activities. Some of them concentrate exclusively on gathering and compiling information from the different partners (e.g. European Alternative Fuels Observatory (EAFO), International Energy Agency – Hybrid and Electric Vehicle – Technology Collaboration Programme (IEA HEV TCP), some of them serve as a platform for discussions on the implementation of actions (e.g. Government Supporting Group (GSG)) and others are initiatives for the implementation of common projects and activities (e.g. EMEurope, European Battery Alliance (EBA), Network of European cities and regions (Polis)). When questioned about which networks and/or stakeholders should be involved in the policy activities of the EMEurope network, the participating countries and regions offered very different suggestions, ranging from automotive industry associations (e.g. European Association of automotive suppliers (CLEPA)) to agencies as the International Energy Agency (IEA), but the involvement of local authorities was highlighted most frequently, indicating that there is a need to strengthen the exchange with organizations planning and implementing activities on local level.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

2. Policy measures

The European Commission intends to make Europe the first climate neutral continent by 2050. In order to achieve this goal, the EC created a set of policy initiatives grouped under the European Green Deal. It pursues a plan to increase the EU 2030 emission reduction to at least 50 % and towards 55 % with goals extending to many different sectors, including transport.[26]

In the transport sector, a strategy on "Sustainable and Smart mobility" is deemed to be implemented. The scenarios underpinning the strategy, common to those supporting the 2030 climate target plan, demonstrate that the combination of policy measures set out in this strategy can deliver a 90 % reduction in the transport sector's emissions by 2050. Taking also into account the analysis presented in the accompanying Staff Working Document, various milestones are set out to show the European transport system's path towards achieving our objectives of a sustainable, smart and resilient mobility, thereby indicating the necessary ambition for our future policies, such as having at least 30 million zero-emission vehicles in operation on European roads by 2030.[27]

For the achievement of emissions targets set to reduce or stop climate damage, governments around the world have created or implemented incentives to increase or speed up the uptake of electric vehicles. These administrators make use of financial or non-financial incentives, adapted to socio-economic and cultural factors (e.g. purchasing power, behaviour and acceptance). Four types of benefits to foster the electrification of road transport are distinguished in this document:

- financial incentives
- non-financial benefits
- charging infrastructure, and
- research and innovation.

Financial incentives include purchase subsidies, tax and/or VAT reductions for eco-friendly automobiles. **Non-financial benefits** offer advantages to drivers of electric vehicles that can also be indirectly financial, but mainly offer conveniences in everyday transportation challenges. These benefits include special lanes use (e.g. bus lane, HOV lane), free parking or free charging in certain areas of cities, fee exemptions for bridge/tunnel use, etc. Incentives for broadening the **charging infrastructure**, although mainly financial, are considered in a separate category. **Research and innovation** incentives are essential for the development of the products and services related to electric mobility, especially to protect jobs and market in Europe.

Eleven out of thirteen countries and two regions responding to the second EMEurope survey implemented all types of measures above, with all countries implementing at least one type of

[26] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - The European Green Deal, COM(2019) 640 final, December 2019

[27] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Sustainable and Smart Mobility Strategy – putting European transport on track for the future, COM(2020) 789 final, December 2019

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

benefit, a financial or R&I incentive (Figure 5). In this document, a correlation between the vehicles stock, infrastructure and measures is investigated (see chapter 3).

2.1 Financial incentives

In preparation for creating favorable conditions for a transition towards electric mobility, 26 out of the 27 EU countries offer financial incentives[28] for electric vehicles purchase at present. In 20 EU member states direct **purchase subsidies** (such as bonus payments or premiums) are offered to buyers of electric vehicles whereas in 6 member states, **tax benefits** (reductions or exemptions for electric cars) are granted.

Purchase subsidies serve to overcome the price gap between ICE and electric vehicles and support the market uptake for the latter. These are effective means to facilitate the ramp-up and dissemination of alternatives to internal combustion engine vehicles (ICEVs), such as battery electric vehicles (BEVs) and plug-in hybrid vehicles (PHEVs)[29]. In most cases, a buyer is offered a lump prime directly by the government or in partnership with the automobile industry if choosing a BEV or PHEV instead of an ICEV. In some countries or regions, the subsidies are not fixed but a percentage of the car price. In addition, approaches such as competitive procurement are being pursued for public service fleets, though they usually represent a fairly limited volume of vehicles. Purchase subsidies for public transport (e.g. electric buses) are in place in a few countries and they also show a positive effect on the image and further leverage of the technologies[30].

Tax benefits (registration, ownership, company) are provided by national governments and local authorities in order to stimulate the market uptake of electric vehicle sales by reducing or closing the gap between more expensive electrically-chargeable cars and conventionally fueled vehicles. This financial incentive can be offered as a one-time tax reduction on vehicle acquisition, such as VAT or registration tax, or as an annual vehicle ownership tax reduction, such as road tax or income tax for privately used company vehicles. Since VAT exemption for electric vehicles is a special form of tax benefit, it is dealt with separately. In most cases, electric vehicles are exempt from vehicle acquisition taxes whereas annual vehicle ownership taxes are commonly reduced in dependence on CO_2 emissions of the vehicle. Contrary to other financial support, tax benefits can be set up in a budget-neutral way, which is a significant advantage. For low or zero emission vehicles, the state can offer tax reliefs, which can be refinanced through corresponding tax increases for heavy polluters. As opposed to privately used company cars, however, company cars are currently anyway under-taxed in most OECD countries (taxable benefit).[31] Hence, fostering electric and low or zero emission vehicles would

[28] ACEA (2020). Overview - Electric vehicles: Tax benefits & purchase incentives in the European Union.

[29] IEA, Ministerial, Clean Energy and EVI. Global EV Outlook 2018. France: International Energy Agency, 2018

[30] ERA-NET Cofund Electric Mobility Europe (EMEurope), State of the art survey no. 1 – national, regional and EU measures to establish and support electric mobility, 2018

[31] OECD, September 2014, link: www.oecd.org

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

necessarily mean raising tax levels for conventional (ICEV) vehicles, which may cause acceptance problems for the previous profiteers.

Value-added tax (VAT) benefits are related to reductions of the general, broadly based consumption tax assessed on the value added to goods and services in the European Union. VAT can be applied to vehicles, fuels, electricity, vehicle parts, etc. A few countries use the exemption or reduction of VAT as means of promotion of electric mobility. The benefit can be directly related to the vehicle or to its specific use or needs, e.g. VAT deduction for electricity. In Germany a temporary general VAT reduction was granted until end of 2020 to mitigate the impact of the COVID-19 pandemic. This is therefore not a specific measure to promote electric mobility, but it does affect the purchase of electric vehicles, etc.

Other financial incentives offered by national governments and local authorities give battery and plug-in electric vehicles users advantages over conventional vehicles drivers. Most often, electric vehicle drivers benefit from incentives such as free parking in busy areas or car parks, duty exemptions when using regional toll roads and in some places have free access on ferries, tunnels and bridges. Usually a special registration number for electric vehicles is necessary to enjoy these privileges. The special registration serves as an indicator allowing authorities to provide and supervise those incentives.

Another financial benefit for private electric vehicles owners is the possibility of charging their vehicles for free at their employers' premises without declaring this as a monetary benefit in their income tax. In some countries, employers who grant this advantage can deduct the benefit from their payroll tax (e.g. Germany).

In addition to the financial benefits, financial disadvantages for conventional vehicles can also favor the purchase of an electric vehicle, as is the case with bonus-malus programmes in Sweden or France, for example. The current Finance Bill 2020, which was passed in France at the end of 2019, provides a maximum bonus of EUR 6,000 for private individuals for vehicles with CO_2 emission levels up to 20 g / km (mainly BEVs) and an increase in the maximum malus payable for new high-emission vehicles (> 185 g CO_2 / km, NEDC) from EUR 10,500 in 2019 to EUR 20,000 in 2020.[32]

2.2 Non-financial benefits

Non-financial incentives comprehend a wide range of measures, which can be tailored to specific users groups and regions or communities. These incentives can offer direct benefit to users, such as bus or carpooling lane use in rush hours, or influence the users to choose electric mobility as means of transportation, by supporting companies to overcome bureaucracy, as e.g. in the case of charging point installation.

In several countries, those **local or regional incentives** are offered to promote the electric vehicles market. The incentives are available additionally to or independently of other incentives. As an example, a city might decide to reserve free parking slots for electric vehicles

[32] The ICCT: Actions speak louder than words: the French commitment to electric vehicles | International Council on Clean Transportation, link: theicct.org/blog/staff/actions-speak-louder-words-french-commitment-electric-vehicles

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

in its city center or incentivize public transport companies to buy electric vehicles by building charging infrastructure along the bus lines. Many examples are in place and they most commonly show the combination of measures adapted to a region or city need.

As an example, Los Angeles, California/USA allows EVs to use carpooling lanes, which is a significant incentive in areas with high congestion.[33] In China, Beijing and Shanghai imposed a cap on new license plates every year, with the aim of controlling vehicle stock to mitigate traffic congestion. New license plates are given out by lottery in Beijing in separate license plate lottery systems for BEVs and non-BEVs, with much higher odds for a license for BEVs. Shanghai offers a free license plate for electric vehicles, while combustion vehicles are subject to auction.[34]

Several countries make use of communication campaigns and demonstration events to reach the public and answer questions related to the use and maintenance of electric vehicles, e.g. in Catalonia region[35] and USA[36].

2.3 Charging infrastructure investments

Charging infrastructure as well as the extent of information about charging station locations, types, payments procedures and availability have been growing in European countries and contribute enormously to the up-taking of electric mobility in Europe. However, a much faster electrification of the transport sector is necessary to reduce EU greenhouse gas emissions by at least 55 % by 2030, compared to 1990 levels and later, to achieve the pollutants emissions reduction targets by 2050.[37] Despite of meaningful improvements in the area of charging infrastructure, most European countries do not have a wide-spread and cross-border easy-to-use system and information on charging locations, and their quantity is usually not sufficient. Even with increasing registration numbers and charging points there is still insecurity on the users' side concerning re-charging possibilities.

With the aim of creating uniform conditions, the EU adopted the Alternative Fuels Infrastructure Directive (AFID) in 2014. The Directive recommends the installation of around one public recharging point per ten charging electric vehicles across the European Union, including wireless charging and battery-swapping. In 2018, the European Parliament highlighted the need to accelerate the development of alternative fuel infrastructure. It stressed the connection between the availability of alternatively fueled vehicles, the deployment of alternative fuels infrastructure and consumer demand for these technologies. Though not binding, several

[33] D. Auverlot, N. Meilhan, B. Mesqui, A. Pommeret, Overview of government policies to promote ultra-low emission vehicles", France Stratégie, May 2018.

[34] D. Hall, H. Cui, and N. Lutsey, Electric vehicle capitals: Accelerating the global transition to electric drive", ICCT, October 2018.

[35] Memòria de lÍnstitut Català dÉnergia 2017, Generalitat de Catalunya.

[36] Forth Mobility, forthmobility.org/showcase

[37] European Commission website, link: ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

member states are striving to implement charging infrastructure according to the AFID recommendations. The public charging infrastructures of EMEurope countries presented in this catalogue showed an average of 9.7 electric vehicles per charging point by December 2020, which is very close to the AFID recommendation. In some countries, this rate is above the recommendation, including Sweden (18.9), Finland (15.0), Germany (13.9), and Spain (11.8), and in some countries, the rate is well below the recommended value, including Turkey (2.9), the Netherlands (4.5) and Belarus (5.8). A closer analyses of the situation for each country is presented in chapter 3. The European Commission will revise the 2014 AFID in 2021 to fill the gaps in the build-up of infrastructure and to replace the system of national plans with more efficient instruments, such as binding and enforceable targets.[38]

In the meantime, European countries have developed and implemented national, regional and local measures to accelerate the growth of the charging network for electric vehicles. As the countries were left to develop their own targets, they followed different strategies. For example, the Netherlands started to promote the development of a charging infrastructure earlier than most European countries. The rollout of public and semi-public charging points (including fast charging points) was heavily reliant on Green Deal funding (2016-2020).[39] As in the case of the Netherlands, Germany also started to support the implementation of charging infrastructure as early as 2015.[40] In addition, some regions have introduced funding frameworks for the development and operating of charging infrastructure, which supplement the governmental funding programmes and can be regarded as co-financing.

2.4 Research and Innovation funding

To achieve the climate goals in Europe for years 2030 and 2050, transportation needs to become cleaner, emitting less pollutants and using less resources. Though the number of battery-electric and plug-in hybrid vehicles on the road is currently increasing, further development and improvement are necessary for a faster upscaling of electric mobility in Europe. At this, research and innovation (R&I) play a very important role, providing answer to many arising issues, such as grid balance, interoperability, use of resources, recycling procedures, etc.

The European Union has recognised the importance of research and innovation for the deployment of electric vehicles and developed several dedicated programmes in the past few years. Apart from including topics related to zero emission vehicles in road transport in its regular Framework Programmes, a partnership with the industrial sector on electric vehicles was initiated over 10 years ago, the European Green Vehicles Initiative Association (EGVIA). In addition, the EU supported the creation of two ERA-NET initiatives (Electromobility +, 2010-2015; EMEurope, 2016-2021), the Battery Alliance and most recently the creation of two

[38] European Parliament, link: www.europarl.europa.eu/legislative-train/theme-a-european-green-deal/file-revision-of-the-directive-on-deployment-of-alternative-fuels-infrastructure

[39] "Electric transport in the Netherlands - 2016 highlights", Netherlands Enterprise Agency, April 2017.

[40] (only in German) Förderrichtlinie Ladeinfrastruktur für Elektrofahrzeuge, www.bmvi.de/SharedDocs/DE/Artikel/G/foerderrichtlinie-ladeinfrastruktur-elektrofahrzeuge.html

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

partnerships mainly dealing with electrification topics (2Zero and Batteries, both 2021-2027) plus a number of initiatives having electrification of road transport as key topic (Clean Energy Transition, Clean Hydrogen, Driving Urban Transitions, etc.).

The automotive sector is the EU's number one investor in research and development, responsible for 29 % of total spending, which is due to the strength of the automotive industry in several European countries. The EU automotive manufacturers' investments in R&D in 2019 increased by 6.1 % to reach EUR 60.9 billion.[41] As the demand for electric vehicles increases and new and stricter directives comes into play, the automobile industry is heavily investing in research and innovation of clean vehicles. The number of battery electric (BEV), plug-in hybrid (PHEV) and fuel cell (FCEV) models available has increased from about 60 at the end of 2018 to a total of 176 models in 2020[42]. This is the result of high investments in research and development of new materials, products and services.

Research and Innovation is necessary to find solutions to a climate neutral transportation system. In many pre-funding programmes, focus has shifted from the product (vehicle) itself to implementation. Though further vehicle development (e.g. batteries, materials) is highly important to make electrification more ecological, current investments also strongly focus on processes (e.g. recycling, energy production, resources use, harmonisation issues) and services (e.g. adjustments to local needs, digitalisation).

Many EU member states have dedicated research and innovation programmes for electrification of road transport. In coordination with Member States and transport stakeholders, the Strategic Transport Research and Innovation Agenda (STRIA), a roadmap for Transport Electrification[43] aims to set out common priorities to support and speed up the research, innovation and deployment process leading to radical technology changes in transport. According to the EMEurope Survey[13] realised in July and August 2020, 11 out of 13 countries and regions responding to the survey dispose of specific funding schemes for small electric vehicles. This number drops to 8 and 7 out of 13 for the categories "public transport" and "urban freight and logistic", respectively. However, even if these countries and regions do not offer a dedicated funding programme to the research and innovation of specific vehicle types and segments, all EMEurope partner countries and regions invest in research and innovation for the electrification of road transport. In these cases, the programmes available have usually a broader scope and/or specific user/stakeholders groups, as e.g. SMEs, Industry, Universities and Research Organisations.

[41] Research and Innovation | ACEA - European Automobile Manufacturers' Association, link: www.acea.be/industry-topics/tag/category/research-and-innovation

[42] Electric Surge - Carmakers' EV plans across Europe: 2019 to 2025, European Federation for Transport and Environment AISBL, July 2019.

[43] SWD(2017) 223 final, Commission Staff Working Document - Towards clean, competitive and connected mobility: the contribution of Transport Research and Innovation to the Mobility package, May 2017

[13] State of the art survey No. 2 -National, Regional and EU measures to establish and support electric mobility, ERA-NET COFUND EMEurope, survey carried out in July-August 2020, link: www.electricmobilityeurope.eu/networks

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

2.5 Overview of measures applied

Fourteen countries and two regions participate in the EMEurope initiative and most of them apply several measures to support and foster the electrification of road transport. Detailed information on the current measures to establish and support electric mobility applied by eleven countries and two regions can be found in the document *State of the art Survey no.2 – National, REgionla and EU measures*[13] and in several documents and websites of the responsible ministries and agencies. The results of the survey and further information served as base for this catalogue.

The icons used in this and the following chapter represent the type of policy measures used in European countries, regions or cities (Table 1). The representation of the measures was made for categories Small Vehicles, Public Transport, Logistic and Freight, which are additionally indicated in different colours light blue, green and yellow to facilitate the overview of measures in the EMEurope countries/regions.

In Figure 5, an overview of all available measures is shown. All EMEurope countries (Austria, Belarus, Germany, Finland, France, Hungary, Italy, Spain, Sweden, the Netherlands and Turkey) and regions (Catalonia and Piedmont) participating in the survey have at least one type of measure implemented to support the electrification of transport.

[13] State of the art survey No. 2 -National, Regional and EU measures to establish and support electric mobility, ERA-NET COFUND EMEurope, survey carried out in July-August 2020, link: www.electricmobilityeurope.eu/networks

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Table 1 Meaning of icons and graphics applied in this document.

Icon	Type of measure
	Financial incentive
	Non-financial benefits
	Charging Infrastructure investments
	Research and Innovation funding
Colors of graphics	**Category of transport**
	Small and light Vehicles (SV)
	Public Transport (PT)
	Logistic and Freight (LF)
	All categories

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Figure 5 Overview of types of measures implemented in EMEurope partner countries.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3. The electrification of transport - conditions & progress (in EMEurope countries and regions)

3.1 General findings / Measures and the COVID-19 impact

The outbreak of the COVID-19 pandemic has raised concerns regarding transportation electrification that economic countermeasures could prompt governments to reduce incentives for electric cars, for example, to free up funds for other purposes, as a result of which the spread of electric vehicles would slow down. However these fears proved to be unfounded.

In the second EMEurope Survey, ten of the countries/regions surveyed indicated that the outbreak of COVID-19 is affecting or will affect programmes to promote transport electrification in their country/region. However, in most cases it was stated that existing measures have been extended, new programmes would be installed or at least reconsidered. The aim is often to push forward the electrification of transport and to manage the economic consequences of the crisis. In two cases, the negative influence at organisational level was also cited, e.g. in terms of restricted communication. In two further occasions, there was a negative answer to the question whether or not the outbreak of COVID-19 is affecting or will affect programmes to promote transport electrification in the country/region; in one case, however, with the additional remark that sustainability and low carbon future will still be pursued.

Accordingly, most EMEurope countries indicated that either existing measures to promote transport electrification have been maintained or even expanded, despite the impact of the COVID-19 outbreak. Some countries even indicated that they had implemented new measures. The positive trend in electric vehicle sales in 2020 can be partly attributed to these decisions. As described in the introduction, the number of electric cars sold in Europe increased significantly in 2020, despite the fact that EU passenger car sales declined by about 25 % during the same period due to the Covid-19 crisis.

The stimuli most frequently offered in EMEurope countries/regions in the **light vehicle** sector belong to the categories of financial incentives and R&I support measures. Tax breaks are proposed in 12 of 13 EMEurope countries/regions, purchase incentives in 12 of 13 and R&I funding programs in 11 of 13. Financial benefits in the form of VAT reductions (5/13) as well as non-financial benefits like lane use advantages (5/13) and priorities when using electric vehicles (4/13) are offered least frequently. In terms of **charging infrastructure**, all three priorities (public, semi-public & private) are supported by many EMEurope countries/regions. However, in the second EMEurope Survey[13] questions on this topic were often not answered. Across all categories, most incentives are offered in Austria (13/14), France (14/14) and Spain (13/14), the fewest in Finland (5/14), Piedmont (5/14) and Turkey (0/14).

The stimuli most frequently offered in EMEurope countries/regions in the **public transport** sector are purchase incentives and R&I funding programs, provided in 10 respectively 8 of 13 countries/regions. Only a few EMEurope countries/regions offer non-financial incentives (1/13)

[13] State of the art survey No. 2 -National, Regional and EU measures to establish and support electric mobility, ERA-NET COFUND EMEurope, survey carried out in July-August 2020, link: www.electricmobilityeurope.eu/networks

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

or support the expansion of the charging infrastructure (2/13). However, no detailed information is available in these categories for many countries. Considering all categories, most stimuli are offered in Austria (4/6) and Belarus (5/6). At most one measure is offered in the Netherlands, Hungary and Turkey as well as in Catalonia and Piedmont.

In the **logistic and freight** sector, purchase incentives and R&I funding programs are most frequently offered in EMEurope countries/regions. These kind of benefits are provided in 9 respectively 7 of 13 countries/regions. Only one EMEurope country, Belarus, offers non-financial incentives as well as support of the expansion of the charging infrastructure for this sector. Like in the public transport sector, no detailed information is available for both categories for many countries. Austria and Belarus implemented the most incentives in all categories with 4 out of 6 each. No measures are offered in the Finland, Catalonia and Turkey.

Even though several EMEurope countries/regions do not have R&I especially dedicated to the electrification of road transport, all EMEurope countries/regions support research and innovation in the field. This support is made using other, often more general funding programmes with a broader scope.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2 Findings per country and region

3.2.1 Austria

Number of public charging points	
Normal charging	Fast charging
6,885	1,347

Vehicles (M1&N1) per public charging point
Normal and Fast charging
7.2

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com. (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	41,646 (0.83 %)	175 (1.72 %)	3,241 (0.74 %)	12 (0.02 %)
PHEV	14,545 (0.29 %)	-	-	-

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Austria: following clear goals and targets for the decarbonisation of the transport sector

Austria wants to achieve a largely climate-neutral transport sector by 2040. In addition to the shift in traffic modes, the expansion of public transport and the promotion of active forms of mobility, this also means the predominant switch to zero-emission vehicles in road traffic based on renewable energy. This includes in particular the electrification of road traffic (public transport, logistics traffic and individual traffic).[44]

For many years, the Austrian government has been supporting the electrification of transport through first specific programmes at national and regional/local level, with legal and policy measures dating back as far as 2009 and featuring a dedicated Research and Development Programme in 2008. Currently, the number of electric passenger vehicles (BEV and PHEV) accounts for 1.12 % of the total fleet and estimations show a steady growth in number of passenger electric vehicles and powered two-wheelers (PTW).[45]

The public transport sector shows a slight decrease in number of battery-electric buses available by 0.6 % in 2020 compared to 2019, due to the decrease of one electric bus. Nevertheless, the 1.72 % share of the total stock is the third highest of all the countries considered.

Since the publication of the previous version of the EMEurope Catalogue for policy makers, the market for electric vehicles has improved considerably. Compared to 2019, the stock of BEVs and PHEVs among small and light vehicles increased significantly by 41 and 81 %, respectively, but rather moderately compared to other countries.

This positive development in registrations of electrically powered vehicles also has its repercussions in the charging infrastructure. The total recharging points targeted within the Austrian implementation obligation of AFID amounts to 3,500 (public and private) in 2020[46]. According to EAFO, by end of 2020 Austria reached 8,232 public recharging points, which is more than double of the target, and representing an increase of at least 84 or 127 % respectively for normal and fast charging in 2020 compared to the previous year.

This favourable recent development in the electrification of road transport in Austria can be correlated to measures implemented for its support. Throughout the past 10 years, Austria has implemented all types of incentives (financial, non-financial, charging infrastructure and funding for research and innovation) for all transport categories, as shown in the three charts illustrating the Austrian map. Some measures need time to generate results and many have been updated to adapt to better match emerging market and user needs. Several legal and policy measures entered into force or were updated in 2019, leading to stronger incentives for users and providers of electric mobility in Austria. Long-term strategies, together with adjustments and new measures seems to be a very purposeful approach, with Austria occupying a prominent position in the electrification of transport in Europe.

[44] (only in German) Dekarbonisierung des Verkehrs als Ziel, link: www.bmk.gv.at/themen/mobilitaet/alternative_verkehrskonzepte/elektromobilitaet/entwicklung/dekarbonisierung.html

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

[45] (only in German) Richtlinie 2014/94/EU des Europäischen Parlaments und des Rates vom 22. Oktober 2014 über den Aufbau der Infrastruktur für alternative Kraftstoffe Artikel 10 – Berichterstattung und Überprüfung – Annex

[46] (only in German) Erfüllung der österreichischen Umsetzungsverpflichtung von Richtlinie 2014/94/EU des Europäischen Parlaments und des Rates vom 22. Oktober 2014 über den Aufbau der Infrastruktur für alternative Kraftstoffe Artikel 10

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.2 Belarus [47]

Number of public charging points
Normal and Fast charging
275*
*28/09/2020

Vehicles (M1&N1) per public charging point
Normal and Fast charging
5,8

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com. (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	1,600* *30/11/2020	80	1	-
PHEV		-	-	-

[47] The data used for the rate calculation was not yet published and might still be corrected before publication. Additionally, the data comes from a source different from the data used for other countries in this document and has a slightly different timeframe as indicated in the table above.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Learning from others: Belarus is following other European countries steps

In Belarus the first incentives to foster electric mobility were only recently implemented (March 2020). These benefits are described in the Decree of the President of the Republic of Belarus No. 92 “On stimulation of the electric cars usage” and are mainly related to tax reductions. Additionally, benefits are provided for building charging infrastructure for electric vehicles (not applied to legal entities and individual entrepreneurs).

Furthermore, the State Programme for Development of Electric Transport for 2021-2025 and for the period up to 2030 is expected to be timely approved. Currently the main developments are carried out in the frames of the State Programme of Scientific Investigations "Mechanics, metallurgy, diagnostics in mechanical engineering" for 2016-2020, subprogramme "Auto-Tractor-Combine building" of the State Programme "Mechanical Engineering and Engineering Technologies" for 2016-2020 and separate innovative projects.[13]

The Belarussian Government is working on new measures to stimulate the purchase of electric vehicles, both individuals and legal entities. Currently, for individuals there are already zero rates of customs duties and VAT when importing electric vehicles from abroad. This measure has significantly increased the number of electric cars in the country, reaching more than 1,600 by end of November 2020, compared to 350 in December 2019. An additional option is currently being worked out. According to this, a kind of compensation is to be granted when an electric car is purchased, provided that a car with an internal combustion engine is handed in for recycling. There are no further details of this program yet, however Belarussian authorities are looking at analogue European incentives to subsidize electric transport. Furthermore, Belarus bets in the promotion of electric mobility via events, such as the forum for the development of electromobility E-Mobility 2020, first held in Minsk in October 2020.

In Belarus, the purchase of electric buses is centralized and the country is investing in the production of such vehicles, also for export, as the case of Belkommunmash buses. The number of registered e-buses increased from 30 in 2019 to 80 in 2020 and this number is expected to increase further.

Belarus number of electric vehicles in the category N1 is neglectable, but this is about to change. The MAZ-4381E0 electric truck with average dimensions: gross weight - 12.5 tons, carrying capacity – 5,700 kg and maximum speed of 85 km / h was presented at the 23rd international Exhibition of Technologies and Innovations in Industry "Techninoprom" in October 2020.

Since 2018, 270 charging stations for electric vehicles have been installed in Belarus and this number is about to increase with the new incentives for building charging infrastructure.

Even though the absolute number of xEVs is low compared to other European countries, Belarus is making steps to improve the uptake of e-mobility in the country. The latest measures increasing the support to charging infrastructure and including tax benefits seem to have worked out, giving one of the highest increases among EMEurope countries in the number of EVs (BEV and PHEV) in the M1 category (357 %) by end 2020.

This project has received funding from the European Union’s Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.3 Finland

Number of public charging points	
Normal charging	Fast charging
3,244	484
Vehicles (M1&N1) per public charging point	
Normal and Fast charging	
15.0	

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com. (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	9,697 (0.36 %)	87 (0.69 %)	444 (0.13 %)	7 (0.01 %)
PHEV	45,620 (1.68 %)	2 (0.02 %)	107 (0.03 %)	-

[13] State of the art survey No. 2 -National, Regional and EU measures to establish and support electric mobility, ERA-NET COFUND EMEurope, survey carried out in July-August 2020, link: www.electricmobilityeurope.eu/networks

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Finland: strong speed up of the role out of electrification of transport

In 2012, Finland established the Finnish Climate Change Panel, an independent think tank that advises the Finnish ministerial working group on energy and climate policy. The work of the Panel is based on the Climate Change Act and gives recommendations from research and higher-level educational institutions.[48]

Among the EMEurope partner countries, Finland has the third-highest share of electrified small and light vehicles (BEVs and PHEVs) of all countries (over 2 %), with PHEVs accounting for just under 1.7 % of the total stock, the second-highest share in a country comparison. The highest increases in the BEV (+ 145 %) and PHEV (+ 191 %) stocks compared to other countries between 2019 and 2020 will have contributed to this. The purchase or lease of these vehicles is currently (2019-2021) supported by a EUR 2,000 purchase subsidy from the Finnish government.

Despite the investment support offered by the government, the increase is clearly lower for electric buses (+ 33.8 %). For light commercial vehicles, on the other hand, Finland again showed the largest relative increase in vehicle ownership between 2020 and 2019 (+ 137 %), although the absolute number of vehicles is comparatively small.

Although the number of public charging points in Finland increased by 81.6 % (AC) and 45.4 % (DC) between 2019 and 2020, Finland has the second highest rate of xEV per charging point compared to other EMEurope partner countries (rate of 15.0) due to the enormous increase in the number of electric vehicles. To overcome this barrier, in July 2020 the Finish government updated the decree on infrastructure support for electric vehicles in transport for 2018-2021. The objective is to promote the use of electricity in road transport by driving investment in the expansion of the electric vehicle (EV) charging network. The purpose of the amendments to the government decree is to permit more targeted allocation of financing to projects with the greatest impact. Specifically, efforts will be made to improve the coverage of the EV charging station network by prioritizing projects in municipalities which, at the start of the tendering process, had no high power charging stations.[49] Financing will be awarded to charging systems for local public transport (buses), high power charging systems (DC charging power of more than 22 kW) and conventional charging stations for vehicles.

In Finland, existing R&D programmes do not directly support the roll out of electric vehicles. However, non-specific programmes allow for further research and innovation in the electrification of road transport.

In spite of comparatively few measures to support electrification of transport, xEVs (M1 and N1) are currently increasing nowhere as strongly as in Finland. Considering the facts that Finland currently makes no distinction in purchase incentives between BEVs and PHEVs (M1) and that, in addition, the public charging infrastructure is not very densely developed, the significantly higher share of PHEVs seems consequential. As a result of the expansion of the charging infrastructure, this situation could change quickly, especially in view of the eco-tax, which makes BEVs much more attractive.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.4 France

Number of public charging points	
Normal charging	*Fast charging*
42,000	*4,045*

Vehicles (M1&N1) per public charging point
Normal and Fast charging
10.1

Type of measure	SV	PT	LF	
Category	*Small & light (M1)*	*Buses (M2, M3)*	*Light com. (N1)*	*Trucks (N2, N3)*
Number of vehicles (fleet share)				
BEV	*277,001 (0.72 %)*	*565 (0.60%)*	*57,503 (0.95 %)*	-
PHEV	*132,309 (0.35 %)*	-	*22 (-)*	-

[48] The Finnish Climate Change Panel - Ilmastopaneeli.fi, link: www.ilmastopaneeli.fi/en/

[49] Updates to the decree on infrastructure support for electric vehicles and the use of biogas in transport (valtioneuvosto.fi), link: valtioneuvosto.fi/en/-/1410877/updates-to-the-decree-on-infrastructure-support-for-electric-vehicles-and-the-use-of-biogas-in-transport

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

France: re-investing in electric mobility

France has been the first European country to launch series production of electric vehicles and initially became the largest European market for it. Since 2007, a number of local and national policies were implemented in France to accelerate the development of electromobility, targeting the higher cost of electric and hybrid vehicles and the need of a dense charging infrastructures network.[50] In 2009, the administration adopted the Low Carbon Vehicle Plan and offered a range of incentives to simultaneously tackle supply- and demand-side constraints. On the R&D side, the government agency Ademe promotes cooperative applied research. Furthermore, investments in charging infrastructure were announced, one of the highest subsidies in the world (EUR 7,000, later reduced to EUR 6,300) for the purchase of a BEV offered, and several large semipublic companies nudged to announce the purchase of 100,000 e-vehicles by 2015.[51]

In response to the Covid-19 crisis, France has announced an auto industry rescue plan in May 2020 worth EUR 8.8 billion, which includes substantial support for vehicle electrification. With it, France intends to put one million zero-emission cars on the roads within five years and become the "top producer of these vehicles in Europe". Support measures include purchase subsidies for electric cars as well as for conversions of ICEs to electric ones, expansion of charging infrastructure and support for the consolidation of automotive production in France to bring it back from other countries. Research and development in this sector will get a boost of a further EUR 150 million.[52]

All these measures are showing good results. By end of 2020, the number of light electric vehicles totaled 277,001 (BEV) and 132,309 (PHEV), showing an increase of 67 % and 131 %, respectively, compared to 2019. These results are still far from the target of 1,000,000 electric vehicles within 5 years. Despite the purchase subsidies and tax benefits offered by the government, the increase is clearly lower for electric buses (+ 37.1 %). Nonetheless, France has the second highest rate of light commercial vehicles (94 per 10,000 vehicles) among the EMEurope partner countries. A consequential development, as French OEMs were quick to respond to the opportunities as early as 2008 and began electrifying light commercial vehicles, many of which were sold to the French government and the state postal service.[53]

Investment in public charging will be accelerated to the tune of "tens of millions more euros." The goal is to have 100,000 charging stations in operation in 2021. By end of 2020, France was occupying the second place among EMEurope partner countries concerning the charging infrastructure. However, the number of public charging points, totaling 46,045 (AC and DC), is well behind plan.

Since several years France has been implementing measures to support the rollout of electric mobility. In the past few years, the support has become stronger. The involvement of and support to all stakeholders seems to bring stronger results and although the given goals have not yet been achieved, clear progress has been made towards them.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

[50] Development of electromobility in France: Causes, facts and figures, EVS29 Symposium, Marie Castelli, Joseph Beretta, June 2016,

[51] Electric Vehicle Initiative and International Energy Agency 2013, 2015

[52] www.ecologie.gouv.fr/developper-lautomobile-propre-et-voitures-electriques

[53] The emergence of electromobility: Comparing technological pathways in France, Germany, China and India, Tilman Altenburg, Eike W. Schamp and Ankur Chaudhary, Science and Public Policy, 43(4), 2016, 464–475

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.5 Germany

Number of public charging points	
Normal charging	Fast charging
37,213	7,456

Vehicles (M1&N1) per public charging point
Normal and Fast charging
13.9

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com. (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	308,139 (0.65 %)	579 (0.71 %)	25,082 (0.90 %)	414 (0.04 %)
PHEV	287,037 (0.60 %)	129 (0.16 %)	189 (0.01 %)	-

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Germany: increased and coordinated investments showing faster results

On 9 October 2019, the German Federal Cabinet adopted the 2030 Climate Change Programme. By 2030, the carbon emissions of the transport sector should be reduced by at least 40 % compared to the baseline year 1990. In order to achieve this goals, the German Federal Government has adopted a set of measures to promote electric mobility, including financial incentives for electric vehicles and infrastructure, and a public procurement programme for the purchase of electric vehicles by public authorities. Furthermore, the Electric Mobility Act (EmoG) creates the legal basis for non-financial benefits, allowing municipalities to implement non-financial benefits in their jurisdiction, e.g. offering of parking advantages in crowded city areas, and driving in bus lanes.

To achieve the climate targets in the transport sector, at least 7 to 10 million EVs on German roads are needed by 2030 (15 - 20 % of all passenger cars). In an economic stimulus package following the Covid-19 crisis, the German government has included several measures to promote electric mobility. Additionally, the government is doubling its share of the purchase subsidy called environmental bonus (Eco-Bonus) in the form of a new “innovation premium”.

Between 2019 and 2020, there was an enormous increase of 130 % and 157 % in the number of BEVs and PHEVs, respectively, in the M1 category. Based on the total EV stock of nearly 600,000 light and small vehicles, the share increased up to 1.25 %. These results were made especially possible by exempting EVs from the motor vehicle tax, focusing funding of electric mobility and increasing environmental bonus. In the public transport sector, EVs account for 0.87 % of the whole fleet, lower than neighbors Austria and the Netherlands. Nonetheless, battery electric buses showed the highest increase (114 %) in the period reviewed.

In January 2020 a “National Coordination Centre for Charging Infrastructure" was established having as one of its goals 1 million publicly accessible charging points by 2030. The Charging Infrastructure (CIS) Master Plan includes legal, financial, strategic and coordinating measures for an adequate, reliable and user-friendly charging infrastructure for up to 10 million e-vehicles by 2030. With 44,669 public charging points (AC and DC) and a resulting rate of 13.9 vehicles per charging point, Germany has a comparatively less dense infrastructure, which is due to the recent enormous increase in the number of EVs. Accordingly, further investments are still necessary to achieve the targets for 2030.

Since 2009, the German Federal Government has provided over EUR 2.2 billion for research and development. Four ministries are involved in providing the funding according to the different focus and area of the corresponding programme.

Like France, Germany started programmes to foster the electrification of road transport several years ago while ICEVs still possessed several price advantages in the market. These programmes were mainly focused on research and piloting of electrification implementation. In the past few years, Germany has adopted more adequate and targeted measures, with higher investments and a clearer message to its citizens. These activities are showing results and if the recent approval trend for EVs continues, the target of 7 to 10 million registered electric vehicles in Germany by the year 2030 can be achieved.

This project has received funding from the European Union’s Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.6 Hungary

Number of public charging points	
Normal charging	Fast charging
1,008	287

Vehicles (M1&N1) per public charging point
Normal and Fast charging
8.6

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com. (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	6,101 (0.16 %)	30 (0.15 %)	406 (0.09 %)	1 (-)
PHEV	4,652 (0.12 %)	-	-	-

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Hungary: the expansion of incentives bringing first results

The electrification of transport is a high-priority political goal in Hungary, as the automotive industry is one of the most important drivers of the economy. Since September 2016, the Hungarian government has offered financial incentives such as purchase subsidies and tax benefits for the procurement of purely electric vehicles. The government supports the purchase of small vehicles as well as trucks (vehicle category N1 and N2) with a maximum permissible total weight of up to 4.25 tons. In 2019, the government launched the Green Bus Programme to support the purchase of environmentally friendly electric buses in settlements with more than 25,000 inhabitants over the next ten years. The Hungarian government provides non-financial benefits to owners of environmentally friendly passenger cars, light trucks and buses as well. BEV, PHEV and FCEV can be equipped with a green license plate that enables municipalities to provide free parking and entering to these vehicles.

In terms of the share of electrified vehicles in the fleet, Hungary has low values in each vehicle category compared to other EMEurope countries. Nonetheless, compared to 2019, the number of electrified vehicles has increased considerably in 2020. For light vehicles, the number of BEVs increased by 65 % and the number of PHEVs by 119 %. The number of electrified light commercial vehicles increased by 14 % and the number of battery-powered buses by 50 %.

Hungary does not offer support to the development of charging infrastructure. It has 287 DC and 1,008 AC public charging points, which corresponds to 8.6 xEV (M1 and N1) per charging point. Compared with other EMEurope countries, this is an average value. However, this has to be seen against the background of the comparatively very low absolute numbers of BEV and PHEV.

The measures to achieve the political goal of electrifying transport correlate with the growth figures for the respective vehicle categories. Though the measure to promote electrically powered buses was launched in 2019, it is likely that a stronger electrification of the bus fleet will take place in the near future. Promoting the expansion of the charging infrastructure could further accelerate the electrification of transport and ensure that the number of xEVs per charging point remains low.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.7 Italy

Number of public charging points	
Normal charging	Fast charging
12,150	1,231
Vehicles (M1&N1) per public charging point	
Normal and Fast charging	
7.9	

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com. (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	55,307 (0.14 %)	586 (0.59 %)	6,315 (0.15 %)	39 (- %)
PHEV	44,212 (0.11 %)	-	98 (-)	-

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Following the EU approach: Italy's Green New Deal [54]

The Italian government shares the 'European Green New Deal' approach and has launched its own 'Green New Deal': a green covenant with businesses and citizens that views the environment as the economic driver of the country, steering the national production system towards sustainability. As part of the Green New Deal, the Italian National Integrated Plan for Energy and Climate (PNIEC) establishes the national objectives for 2030 on the reduction of CO_2 emissions and implementation measures.

The cumulative target for battery electric vehicles is around 4 million (currently ca. 10 % of all passenger cars), giving a total number of approximately 6 million electric cars by 2030, if added to plug-in hybrid vehicles. However, with about 99,500 electric vehicles (BEV and PHEV) Italy is still very far from achieving this goal. In order to reach its objectives, Italy has recently revised its existing programmes with additional funds available for 2021 and 2022 as well as an extra EUR 1,500 per electric vehicle if an old car is scrapped.[55]

With the ecobonus (since March 2019) Italy has seen some good results for the uptake of electric vehicles: in 2020 the EVs (M1) stocks increased very significantly by 143 % and 163 % for BEVs and PHEVs, respectively. The ecobonus is an environmental measure aiming at complementing existing European legislation on air and environmental quality. The ecobonus scheme offers incentives for car purchases with emissions of up to 70 g / km of CO_2, in practice plug-in electric and hybrid cars (with a purchase price of up to EUR 50,000, excluding VAT). [56]

In 2016 the National Plan for Electric Vehicle Charging Infrastructure (PNIRE) was updated. The PNIRE set the goals of creating up to 13,000 slow or accelerated charging stations and 6,000 fast charging stations by 2020 (at a ratio of one public charging station to eight private charging stations). By end 2020, Italy had already topped its targets considering that the numbers presented in the table above refer to public charging stations only. Nonetheless, the number of vehicles per charging station is 7.9, which is better than the average in EMEurope countries.

Among the most significant measures to promote the electrification of transport in Italy are the ones involving research and innovation. The Economic Development Ministry has set EUR 7 million for the period 2019 - 2021 to support R&D activities on electrical mobility within 'ricerca di Sistema elettrico' and the funding programmes from the Ministry of University and Research is based on the National Research Plan PNR which has a large section on electric mobility. [13]

Furthermore, Italy is part of the EU Strategic Energy Technology Plan (SET-Plan) and a promoter of Mission Innovation launched at COP21 to boost frontier projects for clean energy technologies and committed to double public funds for R&D for clean energy (from EUR 222 million in 2013 to EUR 444 million in 2021). The development of models and tools to increase the penetration of the electric mobility in the transport sector and improvement of its integration and interaction with the electricity system are part of this Plan.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Piedmont

Priority: focus on electric and smart mobility [13]

The Italian automotive industry is primarily concentrated in Torino and in Piedmont: around 35 % of the 2,467 companies (with 160,000 employees) active in Italy are in fact established there. Piedmont stands out in Italy in terms of automotive components companies. Around 45 % of the national automotive sector's total revenue is generated there.[57]

The electrification of transport is one of Piedmont Region priorities. Since 2014, the Regional Government has established a Technical Board focused on Electric Mobility and Smart Mobility with the aim of coordinating the regional policy actions.

Currently the Technical Board is committed in the following actions:

- Development of the Regional Charging infrastructures
- Launch of Call for purchase of small vehicles and vehicles for public entities
- Participation to European projects (e-MOTICON, PREP-AIR and e-SMART)
- Publication of e-mobility guidelines
- Financing LPT fleet renewal with proper funds

Working on the updating of the national plan for electric Charging infrastructures (PNIRE) coordinated by the Italian Minister of Transport.

On top of national measures to foster the electrification of road transport in Italy, Piedmont applies several measures, financial or non-financial. It also uses European Regional Development Fund / ERDF) for funding of several projects, as the case of R&I projects participating in EMEurope.

[54] Integrated National Energy and Climate Plan, Ministry of Economic Development, Ministry of the Environment and Protection of Natural Resources and the Sea and Ministry of Infrastructure and Transport, 2019

[55] Global EV Outlook 2020: Entering the decade of electric drive?, International Energy Agency, June 2020

[56] Focus Italy 2019: Report on the Italina Autmotive Industry, Italian Association of the Automotive Industry (ANFIA), Department of Studies and Statistics, May 2020

[13] State of the art survey No. 2 -National, Regional and EU measures to establish and support electric mobility, ERA-NET COFUND EMEurope, survey carried out in July-August 2020, link: www.electricmobilityeurope.eu/networks

[13] State of the art survey No. 2 -National, Regional and EU measures to establish and support electric mobility, ERA-NET COFUND EMEurope, survey carried out in July-August 2020, link: www.electricmobilityeurope.eu/networks

[57] Focus Italia 2019: Report on the Italian Automotive Industry, Automotive Industry 2020 by ITA - Italian Trade Agency

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.8 The Netherlands

Number of public charging points	
Normal charging	Fast charging
64,236	2,428
Vehicles (M1&N1) per public charging point	
Normal and Fast charging	
4.5	

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com. (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	182,481 (2.04 %)	1,227 (12.2 %)	6,188 (0.61 %)	148 (0.9 %)
PHEV	108,652 (1.22 %)	-	45 (-)	-

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

High electrification as a result of many years of extensive future-oriented measures

The Dutch government has set a target for 2030 to reduce greenhouse gas emissions by 49 % compared to 1990, which is enshrined in the Climate Act of May 28, 2019. Policies and measures to achieve these climate targets were first established within the Local Climate Agenda in 2011. The National Climate Agreement, finalized in June 2019, contains agreements with the sectors on how they will contribute to achieve the climate targets. Targets and ambitions in the mobility sector include sustainable energy sources, by 2025 medium-scale zero-emission city logistics zones in 30 to 40 major municipalities and by 2030 100 % of new cars sold should be zero-emission.

To achieve its goals, the Dutch government offers financial incentives in the form of purchase subsidies and tax benefits for the procurement of new as well as second-hand electric passenger cars. In the Logistic and Freight sector, the procurement of electric vehicles is co-financed via the demonstration programme "Climate Technologies and Innovations in Transport" (DKTI-transport), focusing specifically on entrepreneurs and stakeholders in the transport chain who want to invest in low carbon solutions.

Non-financial measures to support electrification of the transport sector, such as parking benefits or access to zero-emission zones, have not yet been implemented. However, some benefits are already offered, e.g. priority for zero-emission taxis at the Schiphol Airport and in some cities. The Electric Mobility Innovation and Acceleration Program (IAP), an integrated research and innovation program initiated by the Formula E team, is in force to advance research on electric mobility since 2018. In addition, there are funding programs to support research and innovation in this sector, such as DKTI-transport.

The expansion of the charging infrastructure is strongly supported by the Dutch government. The National Agenda for Charging Infrastructure, as part of the Climate Agreement, is a broadly supported multi-year policy agenda with the ambitions and measures to create a charging infrastructure network in the Netherlands that can meet the charging needs of the future. This includes strategic and data-driven placement of public charging infrastructure and a balance of charging infrastructure types for all modalities.

With a share of 3.26 %, the Netherlands has the second highest electrification rate of light vehicles (BEV and PHEV) in comparison with all EMEurope countries - in fact, it is the highest for BEVs. In terms of electrification of public transport, the Netherlands is the frontrunner with a 12.23 % share of electrically powered buses. Only in the case of light commercial vehicles other countries boast higher rates of electrification. Another peak value is the number of xEVs per charging point, which is 4.5 in the Netherlands despite a comparatively very high vehicle stock. This means that the Netherlands has one of the most dense charging networks - not only in Europe but in the world.

Thanks to broad-based and long-term support measures, the electrification of transport in the Netherlands is well advanced. The very positive development in the number of electric vehicles on the road and in the charging infrastructure makes it realistic to expect the ambitious targets of the National Climate Agreement to be achieved. In this respect, the comprehensive and future-oriented approach of the Netherlands can serve as a positive example for other countries pursuing similarly ambitious goals.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.9 Spain

Number of public charging points	
Normal charging	Fast charging
6,045	2,120

Vehicles (M1&N1) per public charging point
Normal and Fast charging
11.8

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com. (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	45,057 (0.18 %)	236 (0.38 %)	7,937 (0.21 %)	24 (-)
PHEV	43,481 (0.17 %)	55 (0.09 %)	8 (-)	-

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Spain: strengthened measures showing positive effects

In 2020, the Council of Ministers approved a Royal Decree laying the foundations of the second edition of the Incentive Program for Efficient and Sustainable Mobility (MOVES II). By means of MOVES II, the purchase of electric or plug-in hybrid vehicles, the installation of charging infrastructure and rental systems for electric bicycles, as well as the implementation of transportation plans for the workplace are supported with EUR 100 million. The renewal of vehicle fleets and public transport of autonomous regions and cities is also financially supported by MOVES II.

The national policy framework (MAN), which is in line with the Strategy for the Promotion of Alternative Energy (VEA), set a target of 150,000 electric vehicles by 2020. The purchase and use of small electrified vehicles is promoted in Spain through numerous incentives. The financial support amounts to EUR 4,000 - 5,000 for BEVs and EUR 1,900 - 2,600 for PHEVs for private individuals, depending on whether a vehicle older than seven years is scrapped in addition to the purchase of a new car. Furthermore, BEVs are exempt from registration tax and cities like Madrid or Barcelona offer reductions or exemptions from road tax. Some cities also offer free parking and allow BEV drivers to use lanes reserved for high occupancy traffic. Despite increases in the stock of electrified small vehicles of 68 % for BEVs and 120 % for PHEVs, currently only 0.35 % of the passenger vehicle stock are electric vehicles. In a comparison of all EMEurope countries, Spain is thus in the lower midfield.

The stock of battery-electric buses increased by around 20 % to 236 vehicles in 2020. As a result BEVs account for 0.38 % of the total stock. In contrast to many other EMEurope countries, Spain can boast 55 PHEV buses (0.09 %). Their stock increased by 15 % in the same period.

Analogous to the financial incentives for the purchase of small electrified vehicles, the purchase of vans and trucks by private individuals is also supported. Depending on whether an end-of-life vehicle is scrapped at the same time, the financial support ranges from EUR 4,400 to 6,000. The 7,937 battery electric light commercial vehicles (+ 26 %) currently in the stock account for around 0.21 % of the total fleet.

The expansion of the charging infrastructure in Spain is promoted by subsidies for private and public charging points. Both the number of normal charging points (+ 34 %) and the number of fast charging points (+ 111 %) have increased considerably in 2020. With respectively 6,045 and 2,120 charging points in absolute terms, there are 11.8 electrified vehicles per charging point in Spain. This is a comparatively high value. In Italy, for instance, there are 7.9 vehicles per charging point with a comparable number of electrified vehicles.

The original national policy framework (MAN) target for 2020 could not be met. Due to the significant increase in the budget of the new edition of the MOVES program and extensive support for R&I activities through different types of instruments targeting Spanish companies, to highlight the NextGeneration EU funds for the recovery of the economies, further positive development in the electrification of transport in Spain is expected. In particular, the expansion of the charging infrastructure should be further promoted.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Catalonia: a broad range of initiatives making the region a frontrunner

Catalonia stands out as one of the leading automotive production regions in Europe, manufacturing 20 % of all vehicles produced in Spain. In addition, Catalonia has a strong network of engineering companies and TIER suppliers. The most advanced R&D centers in the automotive industry are concentrated in the region and the Automotive Industry Cluster of Catalonia (CIAC) brings together more than 200 companies in the sector that are actively involved in projects to increase the competitiveness of the industry. Currently, Catalonia is also playing an important role in promoting the transformation of the automotive industry towards electric and connected vehicles.[58]

Drivers of xEVs benefit from a variety of advantages in Catalonia in addition to financial support for the purchase of electric vehicles in the form of subsidies and tax benefits. Depending on the city and vehicle type, xEVs have access to designated parking spaces with payment discounts or exemptions, and on-street charging at public charging points is free of charge. The Barcelona metropolitan area has also established the largest environmental zone in the world, allowing free circulation of electric and hybrid cars. In addition, Catalonia has an administrative agreement to purchase only zero-emission buses from 2025 and to achieve 100 % zero-emission public transport by 2030.

In Catalonia, numerous measures support the expansion of the charging infrastructure. Cities, companies and also private individuals are offered subsidies for the installation of charging points. When new parking garages are built, a minimum number of charging points is required, and there is an obligation to install charging infrastructure in every new residential building. In addition, different charging point operators are integrated into a payment system.

[58] The Sustainable Mobility and Smart Cities Industries in Catalonia

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.10 Sweden

Number of public charging points	
Normal charging	Fast charging
8,804	1,608

Vehicles (M1&N1) per public charging point
Normal and Fast charging
18.9

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	58,240 (1.19 %)	433 (2.90 %)	5,894 (1.01 %)	16 (0.02 %)
PHEV	132,440 (2.71 %)	93 (0.62 %)	4 (-)	-

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Sweden: unique mix of measures and high xEV shares - especially for company fleets

In 2017, a climate policy framework was introduced with a Climate Act that sets out Sweden's implementation of the Paris Agreement, with the goal of achieving net zero emissions of greenhouse gas (GHG) by 2045. The transportation sector has an interim goal of reducing its GHG emissions by 70 % by 2030 compared to 2010.

The electrification of transport has been supported by the Swedish government since 2018 with a bonus-malus system based on emission values for both passenger and light commercial vehicles. Additionally, owners of EVs are exempted of tax for three years and the tax for fringe benefits is lower for privately used company cars, if they are electrically powered. This seems to be a very effective incentive to promote the use of xEVs, given the high number of electric company cars, which account for 75 % of all small and light EVs in Sweden. Since 2016, the purchase of electric buses has been subsidized, with the extension of the benefit to private transport companies in 2018 and to heavy trucks and work machines in 2019. Cities and regions in Sweden with high xEV penetration have often consistently promoted xEVs as well as the expansion of charging infrastructure.

In 2015, the Swedish government launched Klimatklivet (Climate Leap), a general investment support program that grants subsidies of up to 50 % of the investment costs. It does not specifically target the deployment of charging infrastructure, however, more than 35,000 charging points have already been subsidized through this program. With 27,000 charging points, the majority are non-public installations for company fleet vehicles or for residents of apartment buildings. Climate Leap also funds depot and public fast-charging stations for buses and for electric trucks. In addition to Climate Leap, since 2018, private households have also received subsidy for the installation of a charging point at home. This has created a charging infrastructure ecosystem that benefits from interactions between private and public efforts.

In the category small and light vehicles, Sweden has the highest share of electrified vehicles in the total stock (3.90 %) of all EMEurope countries. The majority, about 70 % of the xEVs, are PHEVs. The share of electrified buses in the total fleet of 2.90 % in Sweden is significantly lower than in the Netherlands (12.2 %), but still the second highest value of all EMEurope countries. For light commercial vehicles, the ratio of 1.01 % is comparable to France (0.95 %) and Germany (0.90 %), the highest values in the country comparison. With 18.9 xEVs per public charging point, Sweden has the least favourable ratio of all countries. However, there is a very low number of publicly-owned charging points in Sweden due to a deregulated market with private and public market actors/CPO (charge point operator).

Sweden is well on the way in terms of electrification of transport. In the M1 and M3 categories, the share of PHEVs in the total stock is the highest of all countries. Sweden's unusual approach where any actor may become a CPO due to the design of the electricity market, in combination with the investment program, seems to be leading to a resilient infrastructure that benefits from interactions between private and public efforts. To achieve the long-term goal the share of BEVs must increase significantly. This can be done through stronger regulatory directives, e.g. EU-Directive (EU) 2019/631, setting clear emission targets and measures.

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.2.11 Turkey

Number of public charging points	
Normal charging	Fast charging
1,235	118
Vehicles (M1&N1) per public charging point	
Normal and Fast charging	
2.9	

Type of measure	SV	PT	LF	
Category	Small & light (M1)	Buses (M2, M3)	Light com. (N1)	Trucks (N2, N3)
Number of vehicles (fleet share)				
BEV	2,899 (0.02 %)	10 (-)	-	-
PHEV	1,026 (0.01 %)	-	-	-

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Turkey: Electrification is not priority in the transport sector

According to the Eleventh Development Plan (2019-2023), which sets out Turkey's development vision, research will be conducted to build an effective infrastructure for vehicles with alternative propulsion systems. In addition, with the 2023 Industrial and Technological Strategic targets on “Mobility and Technology Roadmap” are prepared.

Currently, no incentives are offered in Turkey for the purchase and use of electric vehicles. R&I measures are financially supported for all transport categories. According to TUBITAK, Turkey has initiated several studies on the benefits of measures to foster electric mobility in the country, which might be implemented in the near future.

There was a significant increase in the numbers of electric vehicles in Turkey in 2020. The number of BEVs increased by 120 % up to 2,899 vehicles and the number of PHEVs increased by 90 % up to 1,016 vehicles. According to TUBITAK, if the grey market data is added, these numbers reaches 1,500 for BEV and 22,272 for PHEV. Nonetheless, with 2 BEV and 1 PHEV per 10,000 light vehicles, Turkey has the lowest stock of electrified vehicles of all EMEurope countries. The same is true for public transport with a total of 10 electrified buses. No electrified vehicles can be found in the remaining categories.

In 2030 the total stock of vehicles is expected to reach 22 million. In addition, it is foreseen that 1.65 million vehicles will be sold annually and 35 % will be electric in 2030. According to this projection, electric heavy vehicles (buses and trucks) will be 18,400 in 2030.

In 2020, the number of public charging points in Turkey increased more than sixfold compared to the previous year. But with 1,235 AC and 118 DC charging points, it is still the country with the fewest charging points of all EMEurope countries in absolute terms. As a result, no other country can claim such a low number of electric vehicles per charging point, but this must be seen against the background of the very low overall absolute figures. Projection studies are continuing to make investment plans for charging points according to provincial needs and if these are implemented, the situation can change fast.

In 2018, TOGG, a Turkish joint venture, was established with the aim of producing domestic electric vehicles The first eTurkey's prototype was completed in 2019 and mass production is planned to start at the end of 2022.[59] Furthermore, urban and interurban electric buses are produced in Turkey, of which urban electric buses are also destined for export.

The electrification of transport is not yet far advanced in Turkey, which is particularly surprising in the bus sector, as Turkey already has a strong industry in this area. Recent investments in the national brand, TOGG, might change the situation in future. As noted in the Eleventh Development Plan, the charging infrastructure has recently been expanded significantly. Continuing the expansion and introducing incentives to purchase or use of small as well as light commercial electric vehicles could certainly boost the electrification of transport. It is possible that this will happen with the market launch of the first vehicle to be produced entirely in Turkey - an electrically powered SUV.

[59] (only in German) EnBW Energie Baden-Württemberg AG, Artikel: TOGG: Das erste türkische Elektroauto I EnBW, 23 December 2020

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

3.3 Resulting development

Looking at 2020 results, **the EU passenger car market contracted by 23.7 %** to 9.9 million units (- 3 million new car registrations) as a direct result of the COVID-19 pandemic. Indeed, containment measures – including full-scale lockdowns and other restrictions throughout the year – had an unprecedented impact on car sales across the European Union. All 27 EU markets recorded double-digit declines throughout 2020. Among the union's biggest car markets, Spain posted the sharpest drop (- 32.3 %), followed closely by Italy (- 27.9 %) and France (- 25.5 %), while full-year losses were significant but less pronounced in Germany (- 19.1 %).[60] Despite the COVID-19 crisis, **the total number of electric cars sold in Europe has more than doubled** from about half a million in 2019 to more than 1.3 million in 2020 (more than a million in the EU27), surpassing the Chinese EV market for the first time.[61,62]

Comparing the progress of electrification of transport in EMEurope countries and regions, a **correlation between the status quo of transport electrification and the respective support measures** offered can be clearly identified. In countries where above-average incentives for electric mobility (purchase of vehicles, expansion of infrastructure, etc.) have been offered over a longer period the share of electrically powered vehicles in the total vehicle stock is also above average and vice versa. This applies to all vehicle categories, although each category has its own particularities.

In the category of **light and small vehicles** above-average numbers of measures are offered in France, Austria, Spain and the Netherlands. The Netherlands, Sweden and Austria, have the highest share of BEVs. The share of PHEVs is also high in the Netherlands, but even higher in Sweden and Finland. In both categories, Spain is not among the countries with the highest shares of electrified vehicles. On the other hand, in Turkey, where no measures are offered to support the electrification of light and small vehicles, there are very few BEVs or PHEVs in the vehicle stock. Accordingly, France, Austria, the Netherlands and Turkey confirm the correlation whereas Spain is an exception and Sweden and Finland are peculiarities.

Moreover, Austria is an example of targeted promotion of BEVs. There, many measures are offered, but the financial support for BEVs is much higher than for PHEVs (purchase subsidies are twice as high and tax benefits are only offered for BEVs).

The numerous measures in Spain have not yet had the desired effect on the electrification of transport, probably because the initial financial support was not attractive enough for the users. The significant increase in the budget for the support measures seems to have had an effect on the registration figures - the number of BEVs increased by 68 % and that of PHEVs by 120 % in 2020.

While the high electrification level in Sweden can be attributed to the bonus-malus system in combination with tax benefits for private electric company car use (electric company cars

[60] Passenger car registrations: -23.7% in 2020; -3.3% in December | ACEA - European Automobile Manufacturers' Association, link: www.enbw.com/blog/elektromobilitaet/togg-das-erste-auto-aus-der-tuerkei-soll-rein-elektrisch-fahren/

[61] T&E (2020): CO_2 targets propel Europe to 1st place in emobility race, link: www.transportenvironment.org/sites/te/files/publications/2020%20EV%20sales%20briefing.pdf

[62] T&E (2020): Mission (almost) accomplished! Carmakers' race to meet the 2020/21 CO_2 targets, and the EU electric cars market, link: www.transportenvironment.org/sites/te/files/publications/2020_10_TE_Car_CO_2_report_final.pdf

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

account for 75 % of all small and light EVs in Sweden), Finland reports the highest growth rates in the number of BEVs and PHEVs, although only few measures are offered there (third lowest number of measures). While the share of BEVs in the vehicle stock is still comparatively low, the value for PHEVs is very high (2nd highest number of PHEVs per 10,000 vehicles). The financial support offered in Finland does not differentiate between BEVs and PHEVs, and Finland also has a very low density of charging points (15 xEVs per charging point). The latter might be a possible reason for the high share of PHEVs, but not for the generally high increases.

In the EMEurope countries, there are very positive developments in the light vehicle sector, both in terms of support measures and stock development of BEVs and PHEVs. Depending on the degree of electrification of transport in the individual countries, new measures were introduced, existing measures were expanded or provided with more funding, or the focus was placed on those areas that should be pushed even further. As a result, recent stock increases of 40 to 190 % show that the measures are having a positive effect - a clear trend is emerging.

In **public transport**, above-average number of measures are offered in Austria, Belarus, France and Germany. The highest degree of electrification of a bus fleet can be seen in the Netherlands, Austria and Sweden. In the Netherlands, no financial incentives are offered, but there are very concrete and very ambitious targets with the administrative agreement to reach zero-emission public transport by 2030. In Austria and Sweden, financial purchase incentives are offered and there are also ambitious emission reduction targets for public transport. In France and Germany, the purchase of electric buses is also financially supported, but the emission reduction targets are less specific for public transport and less ambitious. Consequently, the electrification of the bus fleet seems to correlate not only with the level of support but also with the issuance of concrete emission reduction targets for public transport.

Around 692,207 buses are in operation throughout the European Union, almost half of which can be found in three countries alone: Poland, Italy and France. Diesel buses still account for 94.5 % the EU fleet, with only 0.6 % being battery electric.[63] The **introduction of clear and binding emission reduction targets for public transport**, as adopted in the Netherlands, could be an effective approach to drive the electrification of EU bus fleets

The electrification of **light commercial vehicles** is supported with an above-average number of measures in Austria, France and Germany - in particular in the form of financial incentives (purchase subsidies and tax benefits). These three countries, together with Sweden, have the highest levels of electrification among light commercial vehicles. No support measures are offered in Turkey and Finland. In these countries, there are no or hardly any electrified light commercial vehicles in the stock. In countries such as Austria, France, Germany or Hungary, subsidy measures are also being implemented in the **heavy-duty vehicle** sector, which, in addition to BEVs or PHEVs, are primarily and in some cases exclusively aimed at promoting FCEVs. The generally very low number of BEVs and PHEVs in this vehicle category can be attributed to the fact that fuel cell technology for heavy-duty vehicles offers several advantages over battery technology, e.g. space requirement, weight, and range.

[63] Zero-emission trucks: 100-fold increase needed in EU fleet, new data shows | ACEA - European Automobile Manufacturers' Association, link: www.acea.be/press-releases/article/zero-emission-trucks-100-fold-increase-needed-in-eu-fleet-new-data-shows

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

According to the results, great influence can be exerted on the development of vehicle numbers for BEVs and PHEVs by grading the measures in terms of technology. Significantly stronger financial support for BEVs, such as in Austria, can lead to a greater increase in the number of vehicles using this technology. In the case of uniform funding intensity, such as in Finland, other factors are decisive for the development of vehicle numbers. Furthermore, clear and binding targets are a potent means of driving forward the electrification of transport. As the example of the Netherlands shows, comprehensive and intensive measures are not necessary under such conditions to achieve a very high degree of vehicle electrification. European truck makers estimate that around 200,000 zero-emission trucks will have to be in operation by 2030 in order to meet the CO_2 targets for heavy-duty trucks. Based on ACEA's new data, this would require a staggering 100-fold increase in the space of under 10 years.[64]

[64] Zero-emission trucks: 100-fold increase needed in EU fleet, new data shows | ACEA - European Automobile Manufacturers' Association, link: www.acea.be/press-releases/article/zero-emission-trucks-100-fold-increase-needed-in-eu-fleet-new-data-shows

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977

Publisher
ERA-NET COFUND ELECTRIC MOBILITY EUROPE (EMEurope)

Picture Credits
Cover © Shutterstock | chombosan (title page)

Design and Production
ERA-NET COFUND ELECTRIC MOBILITY EUROPE (EMEurope)

Date of Publication
February 2021

This document is published as part of the communication activities
of the ERA-NET Cofund Initiative Electric Mobility Europe (EMEurope).
It is distributed free of charge and is not intended for sale.
EMEurope is co-funded by the European Commission
within the research and innovation framework programme
Horizon 2020 (Project No. 723977).

**For further information on the EMEurope project
please contact**
TÜV Rheinland Consulting GmbH
Research Management
Dr. Marcia Giacomini (Coordinator)
Dr. Frederik Vorholt
Am Grauen Stein
D-51105 Köln
Phone +49 221 806 4142
Fax +49 221 806 3496

For more information visit

www.electricmobilityeurope.eu

This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement no. 723977