

Electric vehicle charging point deployment plan for Spain

How much charging points are needed to reach the target of 5 m EVs by 2030?

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Spain's charging infrastructure coverage needs strengthening to convert electric mobility into a reality.

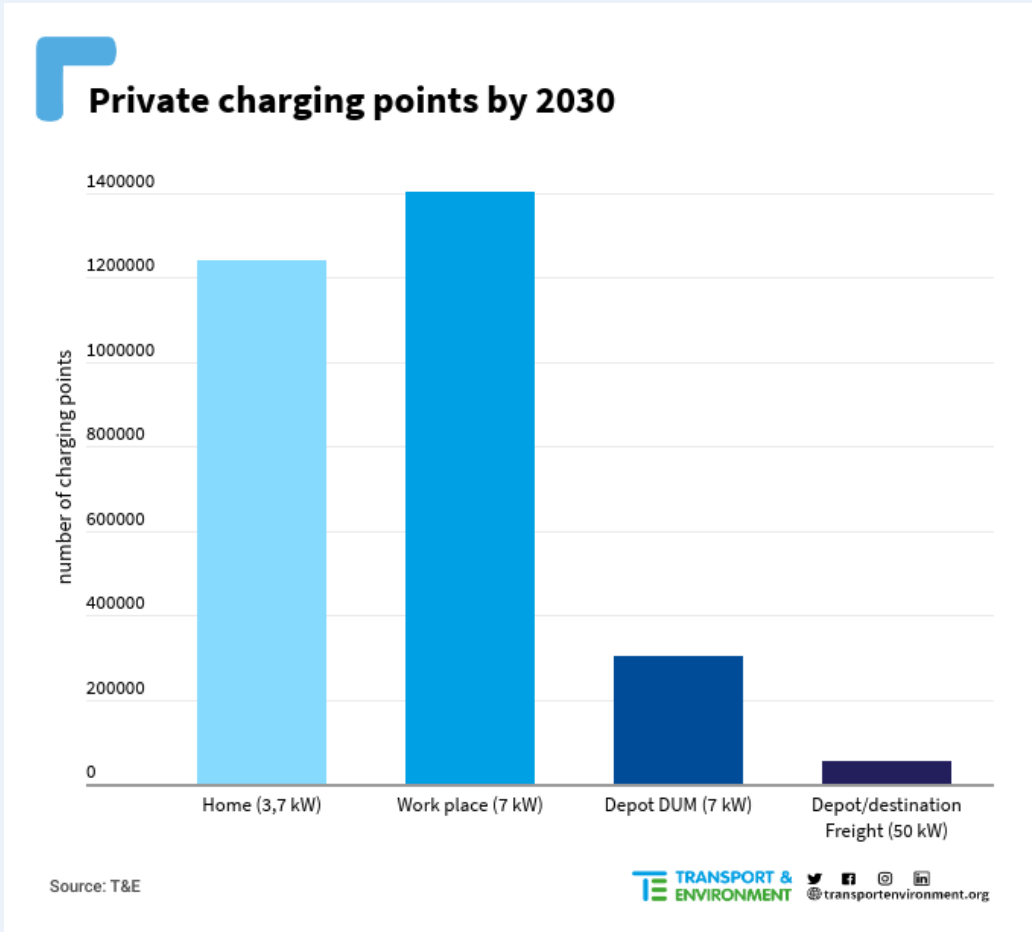
Electric mobility is a key for decarbonisation of transport. Spain's National Energy and Climate Plan 2021-2030 (NECP) established a target of 5 million electric vehicles (EVs) in Spain by 2030, including cars, vans, motorcycles and buses. Undoubtedly, in order to achieve this target, it is vital to have the necessary private and public charging infrastructure where these vehicles can recharge their batteries.

In order to know the exact number of charging points necessary in Spain by 2030 to comply with the objectives of the NECP, two scenarios for public infrastructure have been analysed (studying the needs of each segment of vehicles¹) and one for private (differentiating between chargers located at home, at work, and in depots²).

The study shows that just over 3 million charge points would be needed in the private sphere in 2030 to meet the objective of the NECP. The majority of the needs at the workplace (46,76% of the total number of private chargers) and at home (41,34%), with depot accounting for 11,90%. The following graph shows its distribution in the different locations of use.

¹ Cars, distinguishing between pure electric and plug-in hybrids; motorcycles; mopeds; vans; buses; trucks; and micro mobility, consisting of e-bikes and e-scooters.

² Both for the distribution of light and heavy goods as well as for the transport of passengers.

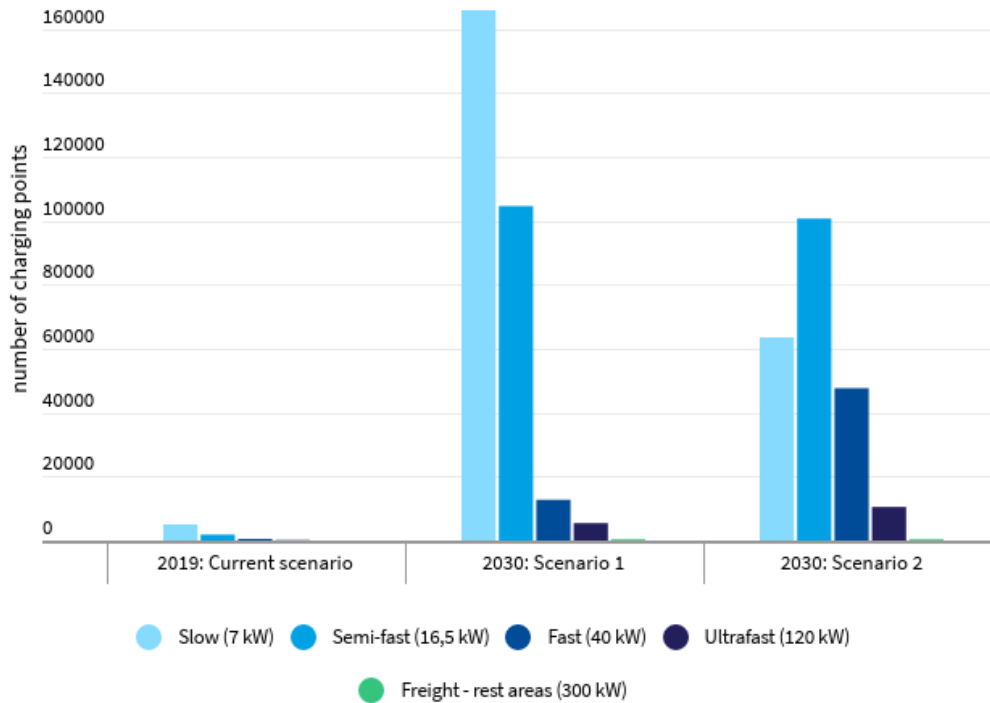


To size the public charging infrastructure, two possible scenarios were developed for 2030, based on different models of use of public charging points. In Scenario 1, slow (7 kW) and semi-fast (16.5 kW) charging assume greater importance compared to higher power capacities, while Scenario 2 focuses on fast (50 kW) and ultra-fast (120 kW) charging.

As can be seen in the following graph, the estimated number of public charging points necessary by 2030 in order to meet the needs for a total of 5 million EVs is as follows: Scenario 1 contemplates the need for at least 289,130 public charging points, while Scenario 2 would require 222,901 charging points.



Public charging infrastructure scenarios from now till 2030



Source: 2019 data from ANFAC. 2030 data from T&E.



The cumulative investment 2021-2030 that has been estimated necessary to achieve these objectives is summarized in the following table:

	Scenario 1	Scenario 2
Public Infrastructure	€2.332 bn	€3.315 bn
Slow	€485 M	€176 M
Semi-fast	€1.089 bn	€1.060 bn
Fast	€332 M	€1.308 bn
Ultra-fast	€387 M	€771 M
Rest areas	€38 M	€38 M

Private Infrastructure	€9.916 bn	
Households	€1.444 bn	
Workplaces	€3.903 bn	
Urban freight distribution depots	€3.175 bn	
Depots (passenger and goods transport)	€1.393 bn	
Total investment	€12.248 bn	€13.231 bn

Table 1

By way of comparison, Spain spent € 43.777,3 billion (bn) in 2019 on importing fossil fuels (€ 35.250,2 bn on oil and derivatives, € 7.532,6 bn on gas and the rest on coal)³. That is, more than three times the cumulative investments needed for charging infrastructure deployment from 2021 to 2030.

With regard to the contribution of the public sector to help the deployment of the aforementioned recharging infrastructure, it has been obtained as a result that it would represent between 23% and 24% of the total investment necessary for the deployment of public infrastructure, and 11 % of total investment required for private infrastructure.

Recommendations

To achieve the objectives of the NECP, regarding the necessary deployment of the charging infrastructure that supports the 5 million electric vehicles planned for 2030, it is essential, firstly, to ensure the involvement of public entities in this work, whose dynamic role is crucial to catalyse the economic effort that the private sector will have to make.

With regard to the charging infrastructure in private environments, it is necessary to promote and facilitate the deployment of points both in the homes of electric vehicle users and in workplaces and in depots intended to recharge vehicles -light and heavy- goods delivery and buses.

It is extremely important, when it comes to charging points in public environments, to create a predictable, reliable and homogeneous administrative environment to facilitate the task for private developers, eliminating unnecessary and inefficient bureaucracy.

³ Ministry of Industry, Commerce and Tourism, Secretary of State for Commerce. Foreign trade of merchandise. Breakdown by economic sectors, Period 1995-2019, Final data.
[https://comercio.gob.es/ImportacionExportacion/Informes_Estadisticas/Datos%20Análisis/An%C3%A1lisis%20anual%20\(1995-2019\)/1_comex_anual_sectores.xls](https://comercio.gob.es/ImportacionExportacion/Informes_Estadisticas/Datos%20Análisis/An%C3%A1lisis%20anual%20(1995-2019)/1_comex_anual_sectores.xls)

Due to the fact that, unfortunately, Spain today occupies a very lagged position in the European context in terms of the penetration of the electric vehicle and the deployment of the associated charging infrastructure, the effort to be made is considerable in order to meet the objectives of the NECP. However, it is a fully achievable goal and, if not undertaken, Spain could miss out on the benefits of electric mobility, with the consequent setback for the national automobile industry.

1. The path to transport electrification

1.1. Current context

Transport is one of the main sectors contributing to emissions of polluting gases in Spain. According to the National Inventory of Greenhouse Gases (GHG) Emissions published by the Spanish Ministry for the Ecological Transition and the Demographic Challenge (MITERD)⁴, the transport sector continues to be the largest contributor, accounting for 29% of total CO₂ equivalent emissions in 2019, followed by industry (20.6%), electricity generation (13.5%), agriculture and livestock (12.5%), fuel consumption in residential, commercial and institutional sectors (8.8%) and waste (4.3%). Road transport is responsible for most of these GHG emissions (it alone accounts for 26.8% of total national emissions), since more than 80% of mobility of both passengers and goods is carried out by road.

In light of this context, there is an urgent need to take adequate measures to meet the climate and environmental commitments assumed by the European Union and the Spanish government. The main targets at the EU level include a 55% reduction in GHG emissions by 2030 compared to 1990 levels^{5 6}, along with the commitments of the Paris Agreement.⁷

In this regard, the NECP seeks to achieve transport decarbonisation by fostering electric mobility, setting an ambitious target of 5 million EVs in Spain by 2030, including cars, vans, motorcycles and buses.

⁴ Government of Spain, <https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/sistema-espanol-de-inventario-sei-/Inventario-GEI.aspx>, December 2020.

⁵ State of the Union: Commission raises climate ambition and proposes 55% cut in emissions by 2030. https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1599

⁶ Council agrees on full general approach on European climate law proposal. <https://www.consilium.europa.eu/en/press/press-releases/2020/12/17/council-agrees-on-full-general-approach-on-european-climate-law-proposal/>

⁷ Measures were adopted under the Paris Agreement in 2015 aimed at maintaining maximum increase of the average temperature below 2°C (B2DS) for 2100.

The aim of this study is to outline the main measures necessary to promote electrification of transport in the coming decade at a national level, focusing on implementation of public and private charging infrastructure that is reliable, efficient and useful in order to fulfil that NEPC's target.

The study takes into account multiple aspects, including the challenges faced by users that do not have their own private parking space, the regulatory schemes and the administrative steps necessary to install charging points. We have therefore identified not only the infrastructure scenarios, but also the adequate context for their due implementation.

The analysis of the infrastructure has taken into account the impact of new mobility trends, technological improvements to EV batteries and efficiency and the charging habits of each of the segments making up the EV fleet. This has allowed us to identify the combination of charging points that is best adapted to these needs and the likely context in 2030 according to the NECP. In addition, the study presents two charging infrastructure scenarios in which the private infrastructure calculations are constant, but with differentiation of two models of charging habits which will influence the composition of the new public charging infrastructure. Following these calculations, analysis was performed to estimate the necessary investment for massive deployment of the charging infrastructure across Spain.

1.2. Future evolution of the EV fleet in Spain

Electrification of road transport is necessary in EU member states to achieve transport decarbonisation and reduction of GHG emissions, with some countries such as Germany, the leader for EV sales, being further ahead than others in this respect. Outside the EU, Norway has the highest figures for registration of EVs - including BEVs and PHEVs - in Europe. BEVs represented more than 60% of new vehicles registered in Norway in September 2020.

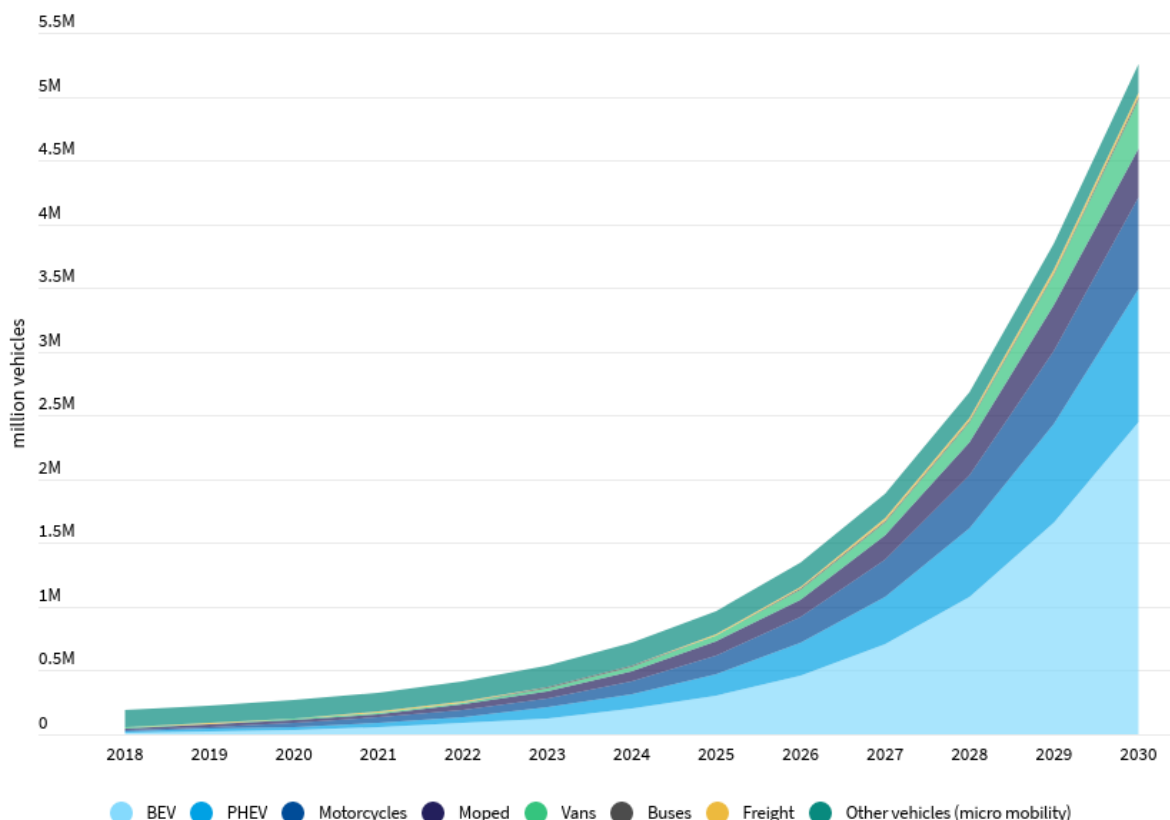
These figures are also improving in Spain. In 2019, there were 24,261 registrations of EVs,⁸ a positive trend which continued in 2020 (especially in January and February), despite the health and economic crisis caused by the COVID-19 pandemic. However, despite this progressive increase, in light of the most recent data gathered for the purpose of this study, Spain is trailing in terms of penetration of EVs compared to other EU member states.

The data on the total vehicle fleet and the EV fleet at the end of 2019 were obtained from the Spanish Traffic Department (DGT). This analysis takes into account both BEVs and PHEVs. A distinction has only been drawn between these two types in the case of cars.

⁸ Taking into account cars, two-wheeled vehicles and commercial and industrial vehicles.

Based on the data of the DGT and taking into account the target scenario of 5 million vehicles established by the NECP, the evolution of each of the segments has been calculated for 2030 to reach an estimate of the weight of each vehicle type in order to reach this target. Two new segments have also been incorporated in our analysis that were not considered in the NCEP figures: heavy electric trucks and micromobility (e-bikes and e-scooters).

Evolution of electric vehicle fleet in Spain by 2030



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After determining the EV fleet for 2030, its daily and annual equivalent energy consumption was calculated. This was broken down by segment based on the average battery capacity, energy consumption (kWh/km), range and journeys made on an annual basis, along with the average daily kilometres travelled.⁹ This study also takes into account an increase in battery capacity by 2030 and a

⁹ The daily calculation is based on estimated vehicle use with an average of 261 days per year.

consequent increase in average range, along with an improvement in efficiency.¹⁰ Taking the parameters described above as the input variables, the total energy consumption of the EV fleet was calculated year by year until 2030. An average daily energy consumption of the electric vehicle park of 42,970 MWh was obtained, which is equivalent to a total annual consumption of 11,215 GWh.¹¹

2. Estimation of the necessary investment at a national level

Given the current context, in order to determine the necessary investment in charging infrastructure for 2030, three types of costs have been identified which must be assumed by agents wishing to install charging points: firstly, the cost of the charging equipment; secondly, the installation cost; and finally, the cost of registering the supply point including the costs for the power term. The first two costs are inevitable, but the third cost is especially relevant for charging points over 50 kW (fast and ultra-fast charging points). In the case of the other charging points, the same infrastructure installed for existing consumption (shopping centres, restaurants, etc.) is used, while fast and ultra-fast charging points require an exclusive supply point or need to contract a higher power term.

The calculation of the aforementioned costs has been carried out for each type of charging point, given that the power capacity influences the estimated cost of both the installation and the equipment. An annual correction factor has been applied to the total cost to account for an expected 20% decrease in the total implementation cost of a charging point by 2030 compared to current prices, along with a reduction in the cost of the equipment. Accordingly, the total investment to install, e.g., an ultra-fast charging point in 2030 would be €78,975, nearly 19% less than the total cost in 2020.

According to the two scenarios defined for the charging infrastructure, which both established a total of approximately 3 million private charging points (home/work charging), the first of these scenarios envisaged 289,130 public charging points, while the second scenario involved installation of 222,901 charging points. The total investment required for the deployment of the recharging infrastructure estimated in this study would be between 12.2 billion euros (Scenario 1) and 13.2 billion euros (Scenario 2). Although this last scenario contemplates a smaller number of charging points, given that the percentage of fast and ultra-fast charging points is higher than in Scenario 1, their total economic amount is higher (as can be seen in Table 1).

¹⁰ BEV efficiency has been estimated at 0.18 kWh/km in 2019, with a progressive improvement until reaching 0.16 kWh/km in 2030.

¹¹ EV use has been estimated at 261 days per year.

2.1. Distribution of public and private investment

Based on the different financial aid plans offered by the Spanish Government to date, it has been determined that the public contribution will be in the form of subsidies for the installation of charging infrastructure, for both private and public charging points. In order to determine the contribution by the Spanish Government to the deployment of the infrastructure, different degrees of financial aid have been defined, applying the principle that the main investment will be for the development of public infrastructure and the percentage of the subsidy will be higher for charging points with higher charging capacities. This is due to the fact that fast and ultra-fast charging points require a higher investment and this is one of the areas where Spain's charging infrastructure suffers a deficit.

Amount of public subsidies

Private Infrastructure			Public Infrastructure			
					Scenario 1	Scenario 2
Households	10%	€1.131 bn	Slow	20%	€542 M	€872 M
Workplaces	10%		Semi-fast	20%		
Urban freight distribution depots	10%		Fast	30%		
Depots (passenger and goods transport)	20%		Ultra-fast	30%		
			Rest areas – heavy transport			

Based on the percentages in the above table, the public sector would need to subsidise a total of €1.673 billion in Scenario 1 and €2.003 billion in Scenario 2, representing 14% of the total investment required for deployment of the infrastructure. The public contribution would account for between 23% and 24% of the total investment necessary for deployment of the public infrastructure and 11% of the total investment for the private infrastructure. It should be noted that this amount would not be paid out lineally. Even if the percentage of the total investment does not vary, the most effective approach to encourage private participation is for public authorities to make larger initial payments.

3. Administrative procedures for installation of charging points

Currently, deployment of the charging infrastructure in Spain is hampered by excessive bureaucracy due to the disparate nature of the administrative procedures applied by different agencies and territories. Organisations such as the Business Association for the Development and Promotion of Electric Vehicles (AEDIVE), which represents in Spain the interests of EV charging operators, have called for a common administrative framework to resolve this problem. A one-stop counter for authorities, standardisation of procedures for permits and licences and tenders for public land that prioritise the

quality of projects are some of the features of these proposals,¹² which are seen as essential to favour the deployment of the charging infrastructure, achieve penetration of EVs and stimulate business activity.

Apart from the obstacles encountered when processing permits and licences with public authorities, charging operators developing this infrastructure in Spain are also faced with the high investment and operating costs associated with charging points due to current market regulations.

Some permits for deployment of charging points are issued by the General Directorate for Roads (Ministry for Transport, Mobility and Urban Agenda), while other permits and certain criteria are managed by local councils.

In the former case, the requirements are very strict and restrictive, and, although they have recently been updated, the procedures required by the General Directorate for Roads are still complicated to tackle. In addition, it can take as long as six months to process applications and in some cases no reply is even received.

As regards the conditions applied by local councils, there is no consensus among the different localities. In other words, local councils and autonomous communities may have wholly different regulations and/or criteria to authorise installation of charging points, which further complicates and slows down applications by charging operators.

In order to break down these barriers, a call has been made to group the proposals of the parties involved in developing the infrastructure with the aim of creating a common framework. Some of these proposals include:

- Establishment of a national framework for common action to promote standardised procedures and help to foster deployment of the charging infrastructure in Spain.
- Creation of a one-stop counter for authorities, in order to centralise processing of charging infrastructure projects and resolve queries regarding permits, licences, subsidies and procedures.
- Acceptance of presentation by the promoter of a Statement of Compliance. This would obviate the need to apply for the corresponding building and activity permits and the environmental authorisations for installation of electric charging points.
- Tenders for installations on public land should be standardised, with priority being given to the quality and technical aspects of the project as opposed to the economic tax to be paid, with a long-term agreement ensuring public access for all users.

¹² AEDIVE, <https://aedive.es/operadores-carga-vehiculo-electrico-100-000-puntos-recarga-eliminarian-trabas-administrativas/>, October 2020.

- Declaration of national strategic interest of the charging infrastructure on the basis that it is essential in order to achieve the Energy Transition targets established in the NECP. This would allow flexibility of certain criteria and streamline administrative procedures, resulting in shorter completion times and simplification of projects.

4. Conclusions

It is necessary to foster implementation of a reliable, useful and high-quality charging infrastructure in order to cater to EV recharging needs, with the aim of achieving a total of 5 million EVs in Spain by 2030 as a means of contributing to transport decarbonisation.

We wish to make the following recommendations to promote electric mobility in Spain with an emphasis on the charging infrastructure:

- **Private sphere:** facilitate home/work charging, not only in the homes of EV owners, but also by promoting installation of charging points in workplaces and parking areas/depots both to charge vehicles used for urban freight distribution and heavy passenger transport vehicles, such as buses, and heavy goods transport vehicles.
- **Public sphere:** review the administrative procedures and systems for charging operators and private entities investing in the charging infrastructure to achieve a predictable, reliable and standardised administrative environment.
- **Involvement by public authorities:** Transport decarbonisation is a global responsibility and all the stakeholders involved must play their part to jointly achieve the targets set. Public authorities need to work together to deploy charging infrastructure that provides the necessary support for EVs.

In light of all the above, this study is intended as a guide to achieve the charging infrastructure required in Spain to ensure that electric mobility and all its associated advantages will become a reality for everyone.

Further information

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