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Electric Mobility in Sweden: The geography of BEVs in Sweden

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Executive Summary
Using geographic methods this study examines the geographic distribution of Battery Electric Vehicles (BEVs) in Sweden. This report analyzes the spatial distribution and ownership trends of electric vehicles (EVs) in Sweden. While EVs are now present in every municipality, their uptake varies widely. Higher adoption is found in urban and southern regions, whereas rural inland areas lag behind. Focusing on privately owned vehicles reveals clearer geographic patterns, reducing distortions caused by corporate registrations. By combining spatial data on EV ownership with other demographic data such as average income and type of housing the study examines possible correlations. Furthermore, the study examines the possibility to charge BEVs, either near home or during long distance travel. Thus, exposing potential lack of charging infrastructure as well as revealing a spatial correlation between BEV ownership and charging points.

1 Introduction

In 2024, Transport Analysis (Trafikanalys) received a government mandate to develop a comprehensive knowledge base on the large-scale electrification of the transport sector. This initiative includes an updated analysis of the ownership and regional distribution of electric vehicles (EVs), with insights suggesting significant regional differences in household decisions to lease or purchase electric vehicles. What sets this study apart is its use of new data to examine electric vehicle usage in connection with households' income, geographic locations, and access to charging infrastructure.

By combining spatial data of BEV ownership with spatial data on public charging stations the study examines corelation between charging infrastructure and BEV.

The accessibility to charging stations has been introduced in the following up of transport policy objective on a yearly basis.

2 Data and method

The study employs geographical methods (GIS - Geographic Information Systems) to map, analyze, and contextualize electric vehicle (EV) ownership within a spatial framework. By layering various data elements, including BEV ownership, household type, built-up area classification, and charging station accessibility, the study examines spatial relationships among these factors..

Network analysis enables precise calculations of proximity to the nearest charging stations, both within urban areas and along major highways, providing insights into the relationship between BEV ownership and the accessibility of the nearest charging point. These findings can be further enriched by incorporating data on household income and dwelling type, such as single-family or multi-family residences. Additionally, by integrating road networks with traffic flow and the locations of fast-charging stations, the study assesses the accessibility of fast-charging options for long-distance travel

3 The geography of electric vehicles in Sweden

The introduction of electric vehicles (EVs) in Sweden has occurred unevenly across the country. Initially, EVs were primarily registered in major cities, but over time their presence has expanded significantly nationwide. This essay explores the spatial distribution of electric cars in Sweden at the end of 2023, with a focus on vehicles registered to individuals rather than companies, due to data reliability concerns.

3.1 Electric vehicles in every municipality

While electric vehicles can now be found in every municipality, regional differences in uptake persist. In 2023, EVs accounted for 38% of all newly registered cars, with higher shares in southern Sweden, urban areas, and along the Norrland coast. However, some rural municipalities, such as Dorotea or Bjurholm, registered very few new vehicles overall, making proportions highly sensitive to small numeric changes.

In contrast, nine municipalities—including Mölndal, Danderyd, and Lund—reported EV shares exceeding 50% of new car registrations. Stockholm had the highest number of new EV registrations in absolute terms, representing 23% of the national total, though many of these are likely company-registered and not locally used.

3.2 Geographic distribution of household registered electric vehicles.

This section focuses on electric passenger cars registered to private individuals or sole proprietors, excluding vehicles owned by legal entities. Consequently, there are some differences from the earlier analysis, which included all ownership forms.

Although vehicles owned by legal entities still represent a large share of the EV fleet, their share of the total vehicle fleet is relatively small and expected to decrease as overall electrification progresses. By focusing on vehicles registered to households, we also reduce the issue of vehicles being used in locations other than their registered address.

In 2018, only a small number of electric cars were newly registered to households, and only three municipalities had a household EV share exceeding 5%. Most of these registrations occurred in Sweden’s three metropolitan counties. Since then, both the number and share of EVs among new registrations have increased markedly across all municipalities ..

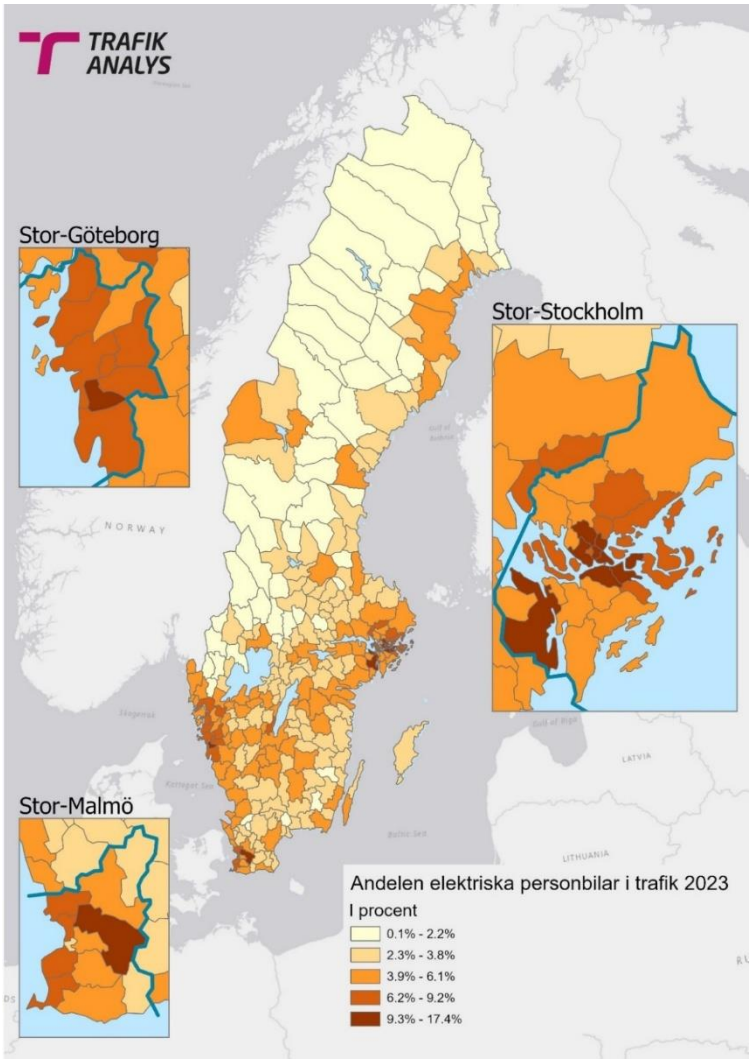


Figure 3.1: Share of BEV in traffic by municipality type, 2023.

However, the most substantial growth has occurred in the metropolitan counties, both in absolute numbers and relative share of new registrations. In 2023, the four northern counties—Jämtland, Västernorrland, Västerbotten, and Norrbotten—saw the highest household EV registration rates, each exceeding 40% of all new cars (Figure 3.1)

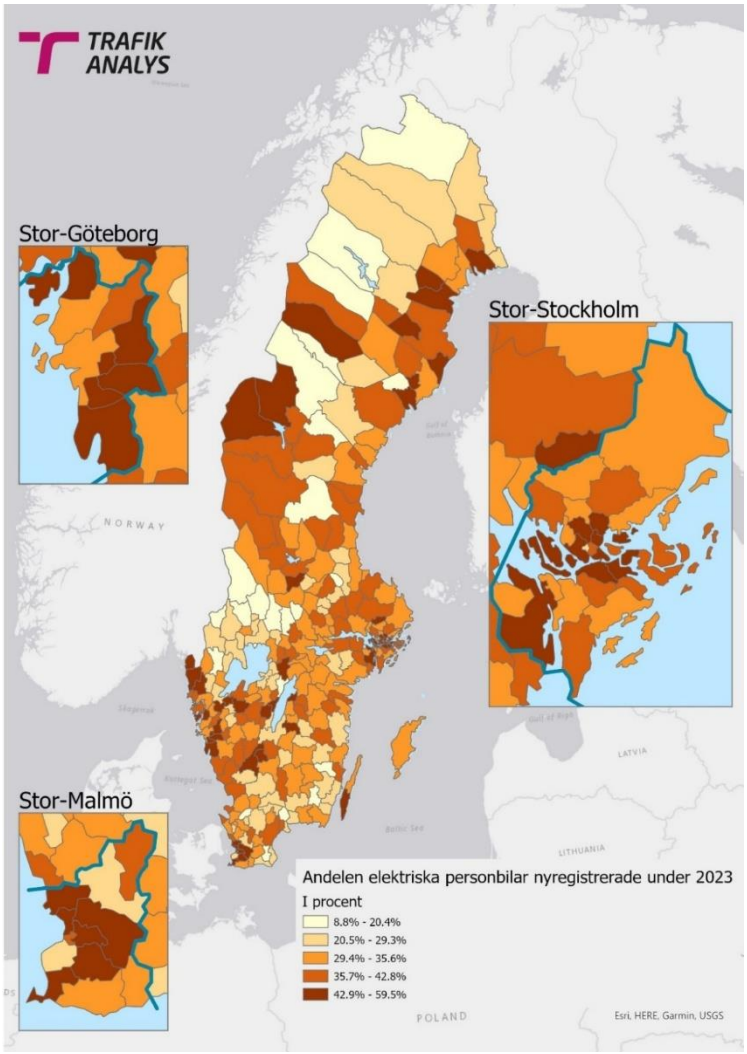


Figure 3.2: BEV sales during 2023 in percentage of all car sales by municipality type

In contrast, uptake remains limited in certain inland municipalities in northern Sweden and in southeastern Sweden. The rapid growth in new registrations is not yet mirrored in the number of EVs in use, due to the slow turnover of older vehicles and the export of some newly registered EVs shortly after registration. By the end of 2023, only Stockholm, Halland, and Västra Götaland counties had more than 4% EVs in traffic. Similar patterns are observed at the municipal level, where 25 municipalities had over 5% EVs in traffic by the end of 2023 (Figure 3.1).

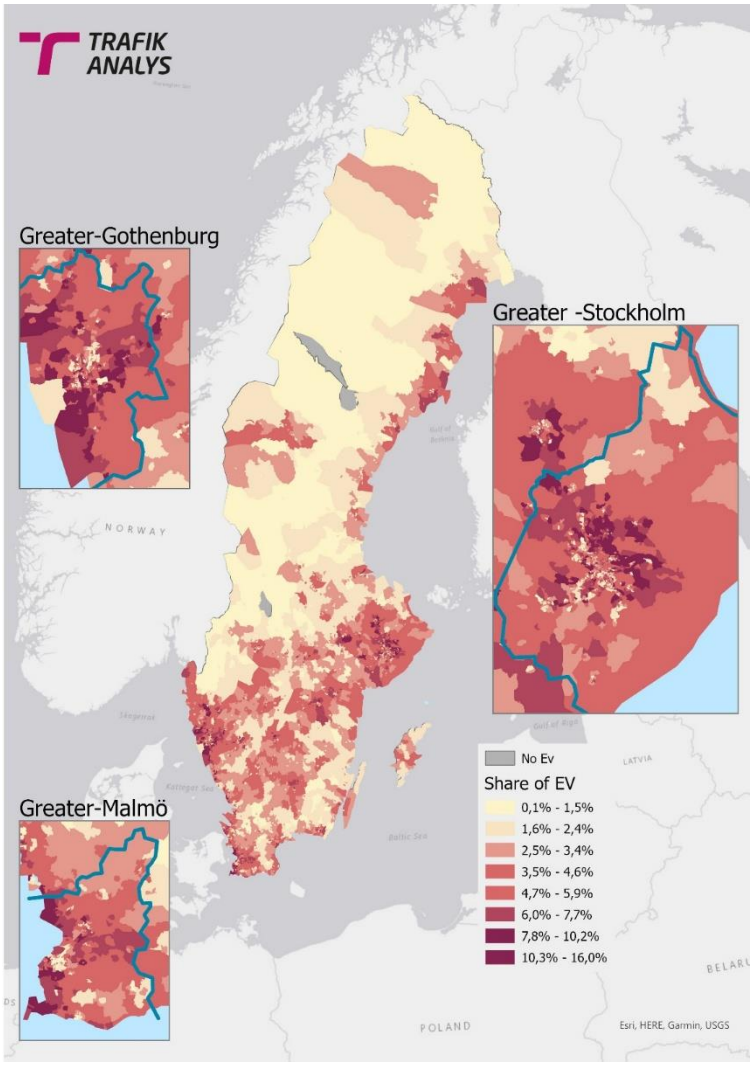


Figure 3.3: Share of BEV in traffic by Demographic Statistical Area (DeSO), 2023

This sharp increase in household EV registrations is also evident at the DeSO (Demographic Statistical Area) level (Figure 3.3). In 2018, fewer than 20 out of nearly 6,000 areas had an EV share above 20%. By 2023, this number had risen dramatically: 32 areas had over 80% EVs among new registrations, and only about 1,200 areas remained below 20%.

These findings indicate that while new registrations have spread across more areas, the actual stock of EVs in use is growing primarily in regions that experienced early adoption. Large regional disparities remain, with significantly higher concentrations in metropolitan areas. Interestingly, central districts in large municipalities tend to have lower EV shares than surrounding areas, both in new registrations and active fleets.

3.3 What spatial patterns emerge when combining demographic data with EV ownership?.

By comparing spatial data on EV ownership with other demographic data, such as it is possible to see if any patterns emerge. Previous studies show that higher income tends to correlate positively with increased car ownership in general, and with ownership of rechargeable vehicles in particular. The results are hardly surprising. Purchasing a new car at all is correlated with a higher income (Figure 3.4).

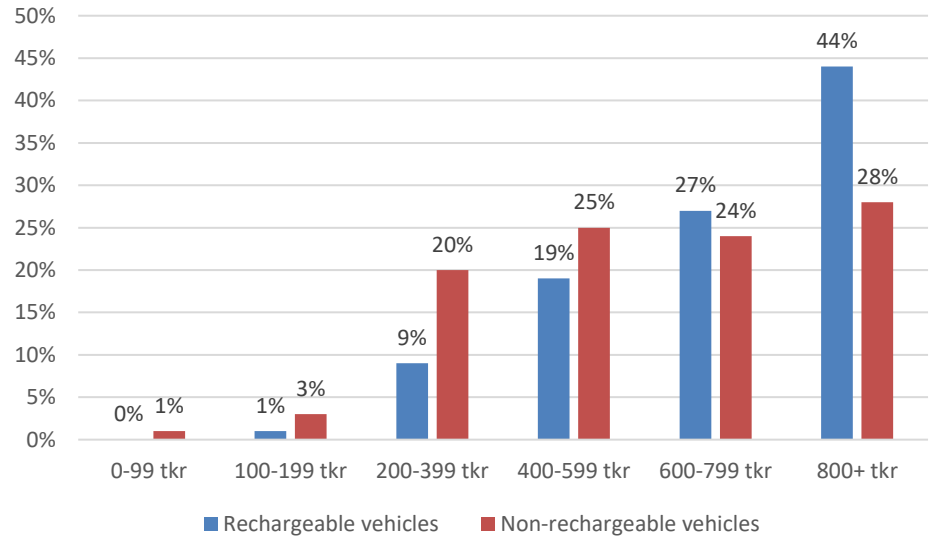


Figure 3.4: Distribution of newly registered passenger cars, rechargeable and non-rechargeable vehicles by household income. Year 2020.

By combining spatial data on EV ownership with data on income in the higher geographic resolution that DeSO provides, we can study the geographic distribution of EVs driven by income. This provides vital information when determining new incentives for EVs in areas and income groups where there is a low percentage of EV ownership. Figure 3.2 displays the ownership of EVs by DeSO.

By selecting DeSO where the share of EV's exceeds more than 5 percent (Figure 3.5 map to the left) we can see higher concentration to larger urban areas such as Malmö, Gothenburg and Stockholm as well as along the coastal cities in northern Sweden. The map to the right in Figure 3.5 shows the income group in the upper quartile with and annual income exceeding an annual income over 392 thousand kroners.

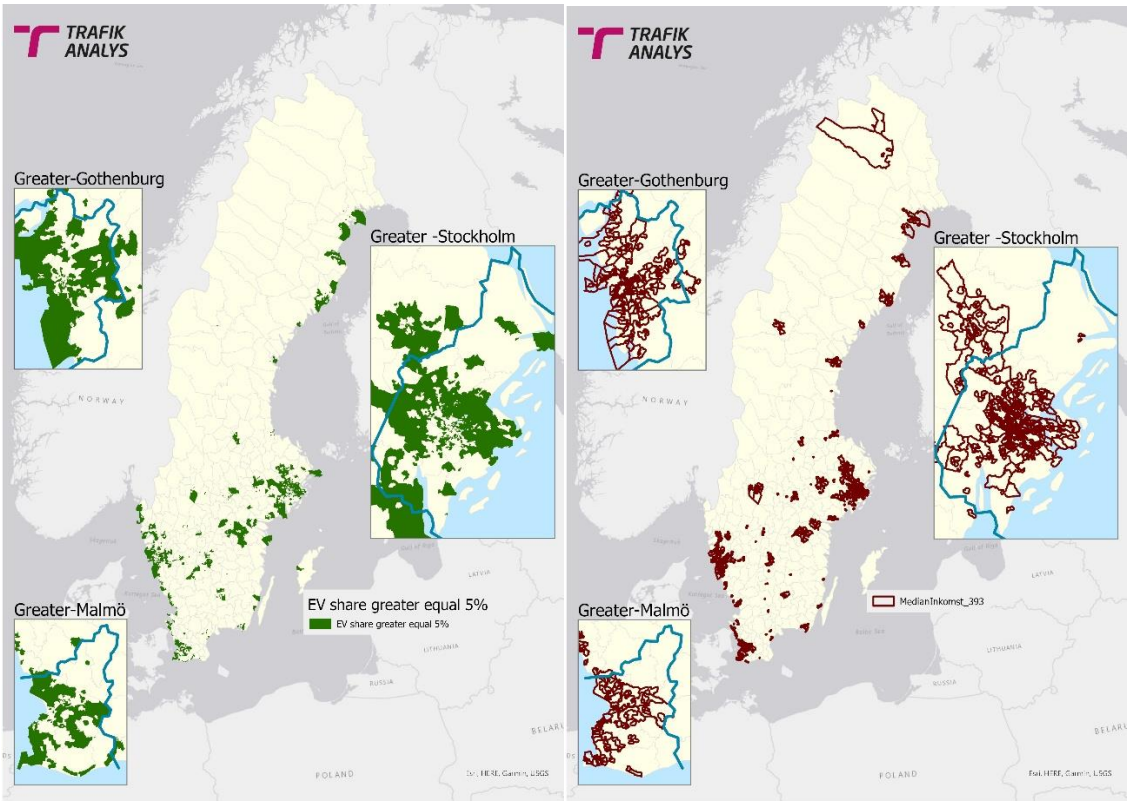


Figure 3.5. Share of EV greater or equal to 5 percent (on the left hand side) and median income greater or equal to 392 thousand kroners (on the right hand side)

By visually comparing the two maps one can easily see a strong correlation between income and EV ownership. Furthermore, the data can be combined into one map showing all DeSO with an EV share higher than 5 percent as well as an annual income above 392 thousand kroner (Figure 3.6)

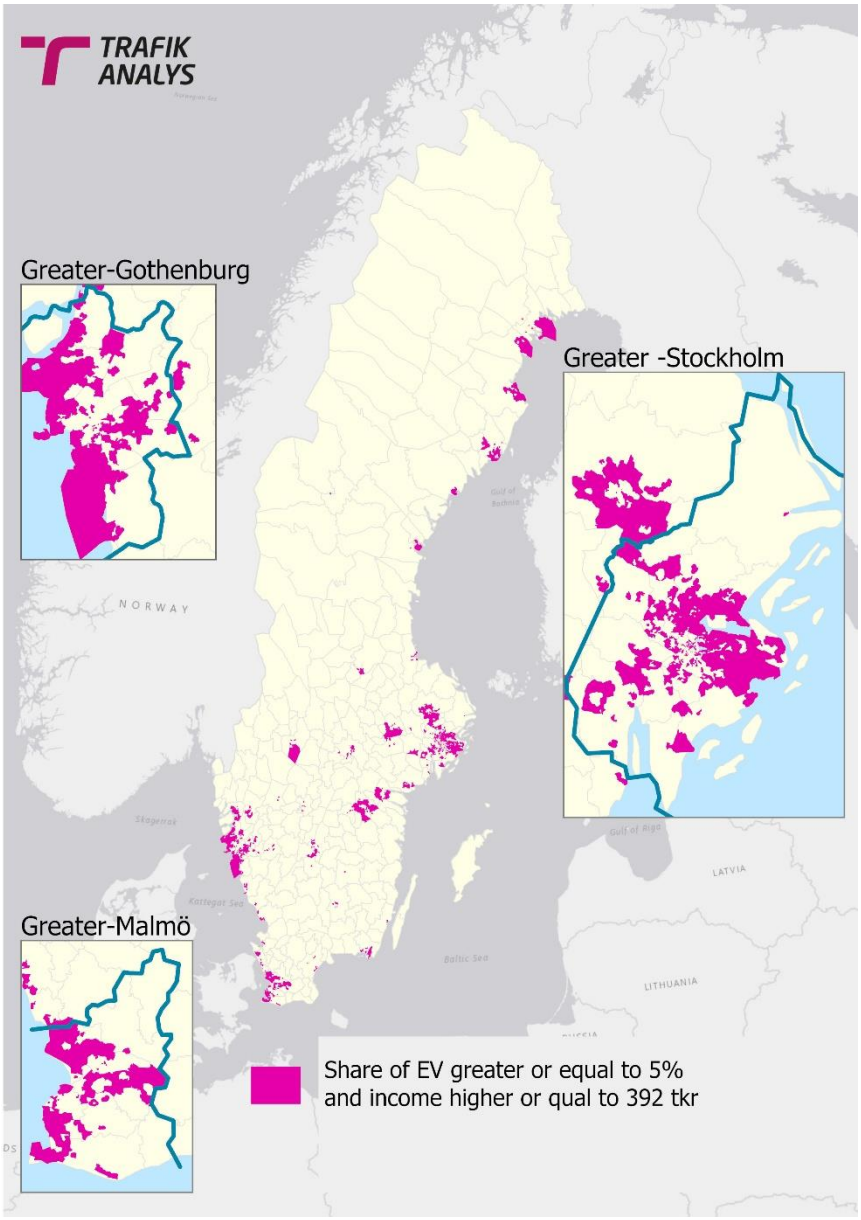
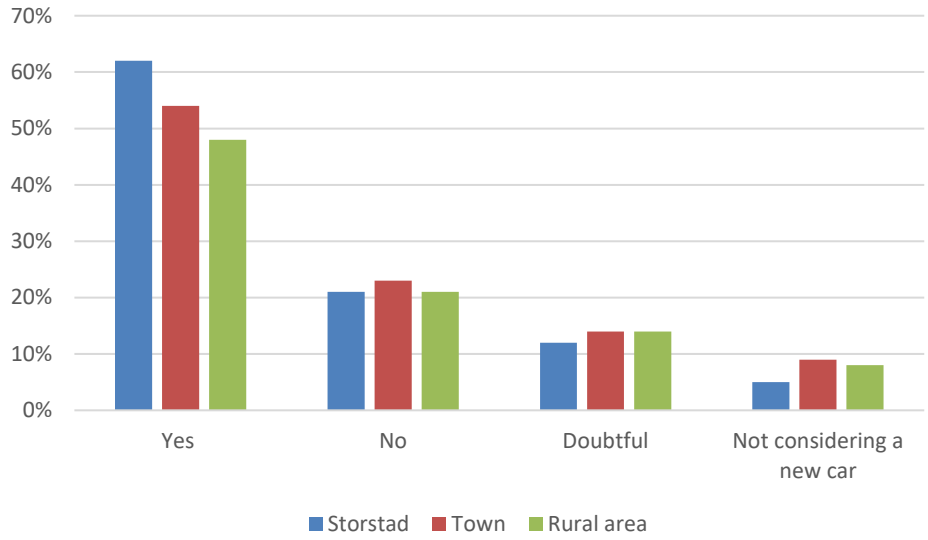


Figure 3.6. Combining share of EV greater or equal 5 precent with income higher or equal to 392 thousand kroners.

As shown in Figure 3.6, there is a strong correlation between income and abundance of EV in DeSO. 76 percent of all DeSO with a share of EV's with 5 percent or more are high income areas (upper quartile of median income). However, there are a few exceptions notably, two such DeSO are located in the north of Sweden. These two DeSO with a high median income (see right-hand map on Figure 3.5), are located in the mining municipality of Kiruna. A possible explanation for the deviation could be the colder climate which affects the range of EV, as well as a low accessibility to charging stations and the remoteness which results in long distances to larger cities and mountain resorts

A survey from 2021 shows that the attitude towards EV varies when comparing larger cities with towns and rural areas. The survey shows, among Swedes aged 18 to 79, that the current attitude toward acquiring an electric car aligns with the distribution of electric cars. A significantly higher proportion of people living in large cities can imagine getting an electric car within the next five years, compared to those living in medium-sized towns and smaller communities (Figure 3.6).



4 Geographic distribution of charging stations

The number of charging stations nationwide has grown significantly, rising from approximately 2,350 public stations in 2020 to around 5,690 by mid-2024. However, reports of long queues at certain stations persist during high-traffic periods, such as public and skiing holidays. The colder climate, particularly in northern Sweden, affects the range of most BEVs, and combined with the limited number of charging stations in these areas, it presents additional challenges for long-distance travel.

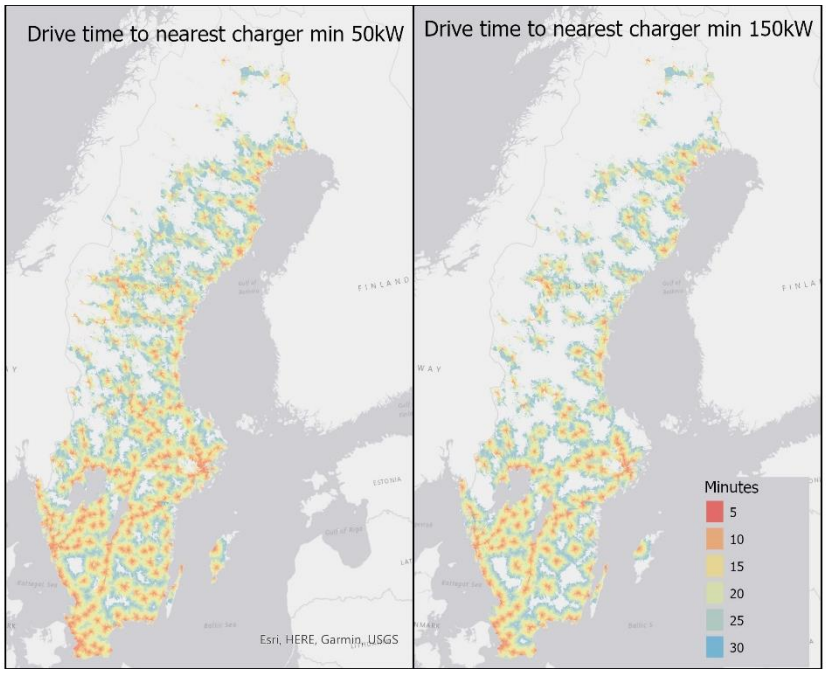
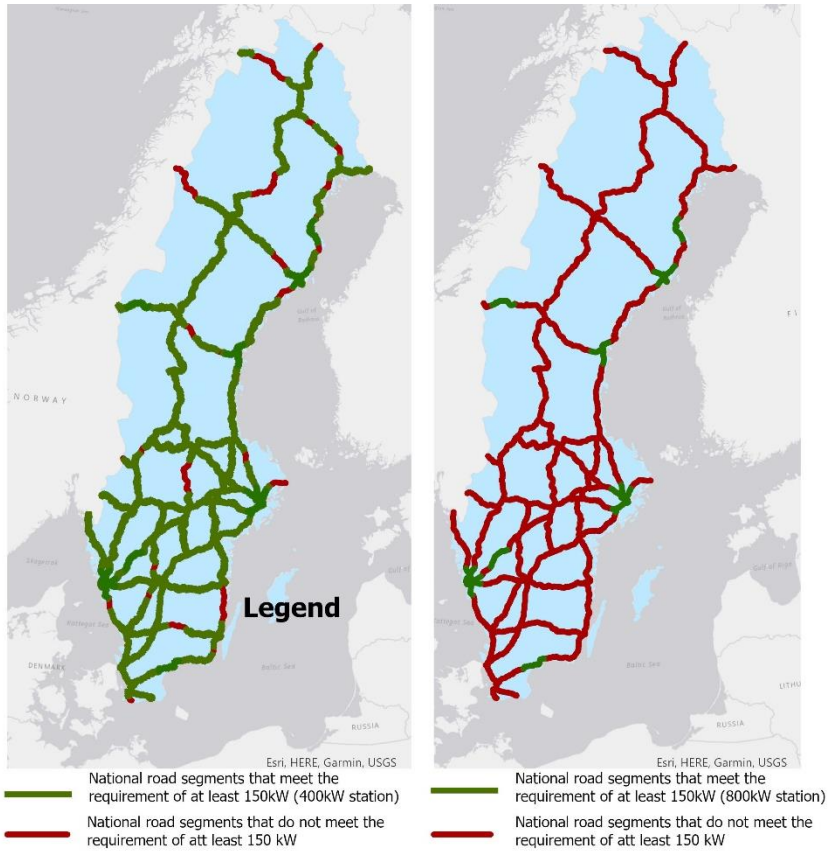


Figure 4.1: Drive time to the nearest charger station with a minimum capacity of 50 kWh (left map) or 15 kWh (right map)

On the 13th of April the European Union's regulation for Alternative Fuels Infrastructure (Directive 2023/1804) is applicable and sets out mandatory targets for the charging infrastructure for light duty vehicles. The regulation stipulates the type (minimum capacity) and distribution along the Trans-European Transport Network (TEN-T).



5 Results

The electric vehicle is no longer just an urban phenomenon; in recent years, the share of electric cars among newly registered vehicles has increased even faster in some municipalities outside metropolitan areas. However, the analysis reveals significant geographical differences in both newly registered electric cars and electric cars in active use. The proportion of electric vehicles is highest in major cities and densely populated municipalities (see Figure 1). The progress is slower in sparsely populated municipalities, where the distance between towns and fast-charging stations is greater.

The analysis also identifies deficiencies in charging infrastructure accessibility, particularly concerning the proximity of the nearest charging point for residents of multi-family housing. Many BEV owners in multi-family dwellings are dependent on public charging stations. Public charging stations are still scarce in some densely populated areas which could influence the decision on purchasing a BEV. However, since all parking spaces are scarce in densely populated areas, available public charging could also have a positive impact for the decision to purchase a BEV providing there are available charging stations nearby. In terms of housing type, the proportion of households owning an electric car and living in multi-family housing is highest in cities and lowest in rural municipalities. Additionally, it highlights the availability of fast-charging stations for longer journeys along major highways and other heavily trafficked roads.

References

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Presenter Biography

Florian Stamm works as an Adviser at the governmental agency Transport Analysis in Sweden. Stamm is the agencies expert on geographical data analysis. Stamm has a bachelor's degree in Geographic Information Systems.

Anette Myhr works as a Statistician at Transport Analysis. She works with data on vehicles in official statistics, analyses, and forecasts. Studied mathematical statistics at Umeå University.