Assessing the need for social support and designing social leasing as part of the transition to electric vehicles in Europe.

Technical Report - Extended version

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Disclaimer: The explorative financial scenarios in Section 3.3 were selected by Oeko-Institut. No direct recommendations for action or positioning can be derived from the level of funding used.

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List of Abbreviations

DE	Germany
ES	Spain
ETS-2	Emissions Trading System 2
EU	European Union
EV	Electric vehicle
FR	France
HBS	Household Budget Survey
ICEV	Internal combustion engine vehicle
IT	Italy
OEM	Original equipment manufacturer
PL	Poland
SCF	Social Climate Fund

Summary

The aim of the study is to analyse (1) the need for support in the transition to electric vehicles (EV) and (2) the potential of social leasing schemes in the five different countries Germany, France, Italy, Spain and Poland. As social leasing has so far only been implemented in France, there is no universal definition of this measure. In this report, social leasing is defined as follows:

Social leasing is a policy instrument whereby assets (such as vehicles) are made available to certain social groups or people with low incomes or special needs at subsidised or reduced rates through government support. The aim is to reduce social inequalities, promote participation in social life and provide sustainable mobility solutions.

We assess the need for social support in the EV transition based on the four vulnerability criteria "Rhythm of electrification", "Car dependency", "Social risk because of rising fuel prices", "Proportion of the population that will face difficulties in switching to an EV", using both published data and our own modelling. While aspects of all four vulnerability criteria are present in all five countries, country-specific challenges can be identified looking at the indicators and data presented in the first section of the report. Germany shows a high level of vulnerability in the EV transition, mainly because of high "car dependency". In Italy there is a high level of vulnerability in the category "Proportion of the population will face difficulties in switching to an EV" and in Poland in the category "Rhythm of electrification". France shows a high level of vulnerability in the EV transition, mainly because of "Social risk because of rising fuel prices". All aspects are of equal importance for Spain.

There is a strong link between the four vulnerability criteria, manifested in the availability of cheap (used) EVs, the availability of transport alternatives to a car, and the financial capacity to respond to rising fuel prices by switching to an EV. **In order to avoid fossil lock-in of lower income groups, EV prices need to come down or suitable transport alternatives need to be made available to those who currently have to rely on a car. Countries therefore need to implement policies to create a multimodal 'portfolio' of transport options, such as active mobility (walking and cycling) or public transport. Social leasing can be part of this portfolio, particularly for those who need to rely on the car for their daily mobility needs but do not have the means to switch to an electric vehicle.** Therefore, the potential of social leasing is assessed in the report.

In the second part of the study, we collect and analyse suitable design options for social leasing and their impacts. We start by discussing possible options for the implementation of social leasing and their respective advantages and disadvantages based on insights and reflections from interviews with transport experts. For example, the income threshold, as well as regional aspects of the availability of transport alternatives, are identified as important factors to consider in the eligibility criteria of a potential scheme. **As the eligibility criteria, the requirements for the vehicles to be included and the governance of a potential scheme depend on a large number of factors, countries should rely on analyses of social needs during the EV transition to find an appropriate design for a social leasing scheme.**

To assess the impact of different possible implementation options for social leasing we construct different scenarios based on a set of eligibility criteria, three different funding options and two different subsidies per contract. Using similar eligibility criteria for social leasing as the French scheme, we find a high number of eligible persons in each of the countries. **Where resources are limited, eligibility criteria should be designed to target the most vulnerable.**

Our modelling results show that the potential number of additional EVs on the market, the potential emission savings, as well as the potential impact of social leasing on the electrification of the national car fleets depend very much on the specific set-up of a potential social leasing scheme, i.e. the

amount of funds used for the scheme and the subsidy per contract, which is responsible for the number of contracts issued. **If a large number of social leasing contracts is issued the resulting emission reduction potential can be as high as several megatons/year and a noticeable impact on the electrification of national car fleets and on the stock of second-hand EVs is expected.**

Finally, we assess the potential role of social leasing for the five countries. **We find that social leasing has the potential to address the different vulnerabilities during the EV transition, but a country-specific design of a social leasing scheme is essential to make the best use of the funds spent and to target those most in need. While the affordability of EVs will be a key issue in the coming years, social leasing has the potential to provide access to the EV transition for low- and middle-income households without large savings or sufficient financial means to purchase an EV, thus reducing the risk of fossil lock-in for the beneficiaries.** At the same time, social leasing of cars only may be the first best option for individuals who do not have the financial means to switch to an EV and have no other viable transport options. For all others, alternatives such as public transport or active mobility are more appropriate, as they are expected to be cheaper and more environmentally friendly. **Countries should therefore implement an appropriate mix of measures to ensure that a multimodal 'portfolio' of transport options is available, providing appropriate transport options for all needs.**

1 Introduction

The European Union (EU) is legally obliged to achieve climate neutrality by 2050 and has an interim target for 2030 of reducing net GHG emissions by 55 % compared to 1990 (European Union 2021). To achieve these targets, the transport sector will have to significantly reduce its CO_2 emissions, as it is responsible for more than a quarter of total emissions in the EU (European Environment Agency 2024). Rapid electrification of road transport is one of the cornerstones for reducing transport emissions – but switching to an electric vehicle (EV) comes with a cost that is not easily manageable by all citizens in the EU. Particularly lower income groups are at the risk of a fossil lock-in in coming years. Targeted policy measures are needed to reduce the risk of social inequalities during the EV transition. One potentially effective measure could be social leasing, which was first introduced in France. The French social leasing scheme offers low-cost, subsidised EV leasing contracts to low and middle-income individuals with long commutes. Demand for the French scheme was high, with the platform receiving 90,000 applications in six weeks - far more than the 25,000 contracts planned to be subsidised. The scheme was therefore extended to 50,000 contracts to be subsidised (Mascaro and Hermine 2024). Based on the success of the French scheme, social leasing will potentially be one of the instruments introduced by Member States to address individuals and households that cannot rely on modes other than the private car to meet their mobility needs and are not financially able to switch to an EV. In addition to reducing the risk of a fossil lock-in for the beneficiaries, the introduction of social leasing could potentially accelerate the second-hand market for EVs and give a positive signal for the production of small and affordable EVs.

The aim of the study is to analyse the need and potential of a social leasing scheme in the five different countries Germany (DE), France (FR), Italy (IT), Spain (ES) and Poland (PL) during the EV transition. The first objective of this study is to identify and quantify the need for social support in the EV transition. As part of the first objective the transport vulnerability structure of the five countries is analysed and the effects of rising fuel prices due to the ETS-2 on different income groups in each of the five countries are estimated (Section 2.1). Additionally, the share of household population in each country that will face difficulties in switching to an EV by 2030 and 2035 due to income constraints is quantified (Section 2.2). Finally, we summarize the need for social support in the EV transition based on four vulnerability criteria (Section 2.3).

The second objective of the study is to collect and analyse suitable design options for social leasing and their impact. As part of the second objective, we analyse different criteria for the set-up of the scheme (Section 3.1). Based on different criteria we quantify the share of population eligible for social leasing (Section 3.2). Based on different cost scenarios we quantify the supply of additional EVs financed by SCF funds (Section 3.3). Additionally, we estimate the emission savings and public costs of a social leasing scheme (Section 3.4) and the impact of social leasing on the electrification of the national car fleets of the five countries using different scenarios (Section 3.5). Finally, we assess the role of social leasing in the five countries (Section 3.6).

2 Assessing the need for social support in the EV transition

Section 2 quantifies the need for social support in the EV transition and identifies country specific vulnerabilities. First, we analyse the transport vulnerability structure of the five countries Germany, France, Italy, Spain and Poland and estimate the effects of rising fuel prices due to the ETS-2 on different income groups in each of the five countries (Section 2.1). Second, we quantify the share of household population in each country that will face difficulties in switching to an EV by 2030 and 2035 due to income constraints (Section 2.2). Third, we summarize the need for social support in the EV transition based on four vulnerability criteria (Section 2.3).

2.1 Transport vulnerability structure across the EU

To gain a better understanding of the challenges in the transition to EVs, we identify a number of relevant data points and indicators that show the structure of transport vulnerability in the five countries. The section highlights differences and similarities between the five countries in terms of a different rhythm of electrification in Europe, car dependency as well as the social risk for the next decade.

Different rhythm of electrification in Europe

A quick electric vehicle transition in the selected Member States is hampered by the fact that passenger cars stay in the national stock for many years. In 2022, the average age of the car fleet was 10 years in Germany, 10.8 years in France, 12.5 years in Italy, 13.9 years in Spain, and 14.9 years in Poland (ACEA 2024d). Moreover, the average age has been increasing since 2015 in all selected Member States (Germany +1.1 years, France +1.8, Italy +1.8, Spain +1.5) except Poland (-2.3 years) (ACEA 2017). The hurdle of passenger car longevity for a quick EV transition becomes especially apparent when their average lifespans, i.e., the duration until cars leave the stock due to export or scrappage, is considered. According to an estimation by Held et al. (2021) using 2016 stock data, the average lifespan of passenger cars is 14.8 years in Germany, 15.2 years in France, 19.4 years in Spain, 19.6 years in Italy, and 35.1 years in Poland.

The particularly long lifespan and, therefore, the high hurdle for a quick EV transition in Poland is due to the high relevance of imported used cars for the country's car stock development. In 2023, the number of imported used cars first registered in Poland (738,439) was much bigger than the number of new car registration in the same year (475,032). Consequently, the development of the Polish car stock depends to a large extent on the structure of these imported used cars. For January until September 2024, only 9 percent of imported used cars were four years old or younger, i.e., were first registered in 2020 or later and, thus, after EVs started to gain relevant market shares in Europe due to CO_2 emission standards for cars and vans. Consequently, the share of imported used all-electric vehicles in Poland is on a low level with 0.6 percent for January until September 2024 (PZPM 2024). Together with the low share of new all-electric vehicles in Poland in the same period (3.1 percent) this illustrates the immense challenge for the country's electric vehicle transition (ACEA 2024c).

In the other selected member states, i.e., France, Germany, Italy, and Spain, electric vehicle transition is less dependent on used vehicle imports. The uptake of all-electric vehicles in the stock is closely linked to increasing new all-electric vehicles' market shares. Italy and Spain showed low new all-electric vehicles shares for 2023 with 4.2 percent and 5.4 percent, respectively. In France and Germany, new all-electric vehicle shares were much higher with 18.4 percent and 16.8 percent, respectively (ACEA 2024b). Consequently, all-electric vehicle stock shares are much lower in Italy (0.5 percent) and Spain (0.6 percent) by the end of 2023 than in France (2.3 percent) and Germany (2.9 percent). In Poland, all-electric cars make up only 0.2 percent of the vehicle stock which makes the country one of the slowest transitioning in the EU (Eurostat 2024b).

Sales of electric vehicles are steadily increasing (Transport & Environment). Nevertheless, sales are still in their infancy in many European countries and are still far from reaching the mass market. While EVs already dominate the market in some European countries, such as Sweden, where EVs have been playing a relevant role in the market for years, driven by early adopters, in other countries EVs are still a marginal phenomenon and will remain so in the coming years, for example in Poland (Möring-Martínez et al. 2024). Initial evaluations of the purchase premium for EVs in Germany have shown that it is mainly higher incomes that have taken advantage of the subsidy when buying an electric car, meaning that it is mainly higher incomes that have direct access to the primary market (Rao et al. 2024). Studies in Spain have shown that EV buyers have above-average incomes, live more frequently in urban areas, drive more than average and are male (Expansion 2024). In Italy, the market penetration of EVs is particularly low compared to Western European countries and at a comparable level to poorer Eastern European countries. There are several reasons for this, but one of them is that demand in Italy is mainly for small vehicles, which have not yet been fully included in the product range of European vehicle manufacturers and prices are still too high (Danielis et al. 2020). It can be said that the first analyses of EV buyers and users show that electric mobility has not yet reached the mass market and is currently being driven by higher incomes and that the available models do not yet cover the entire demand.

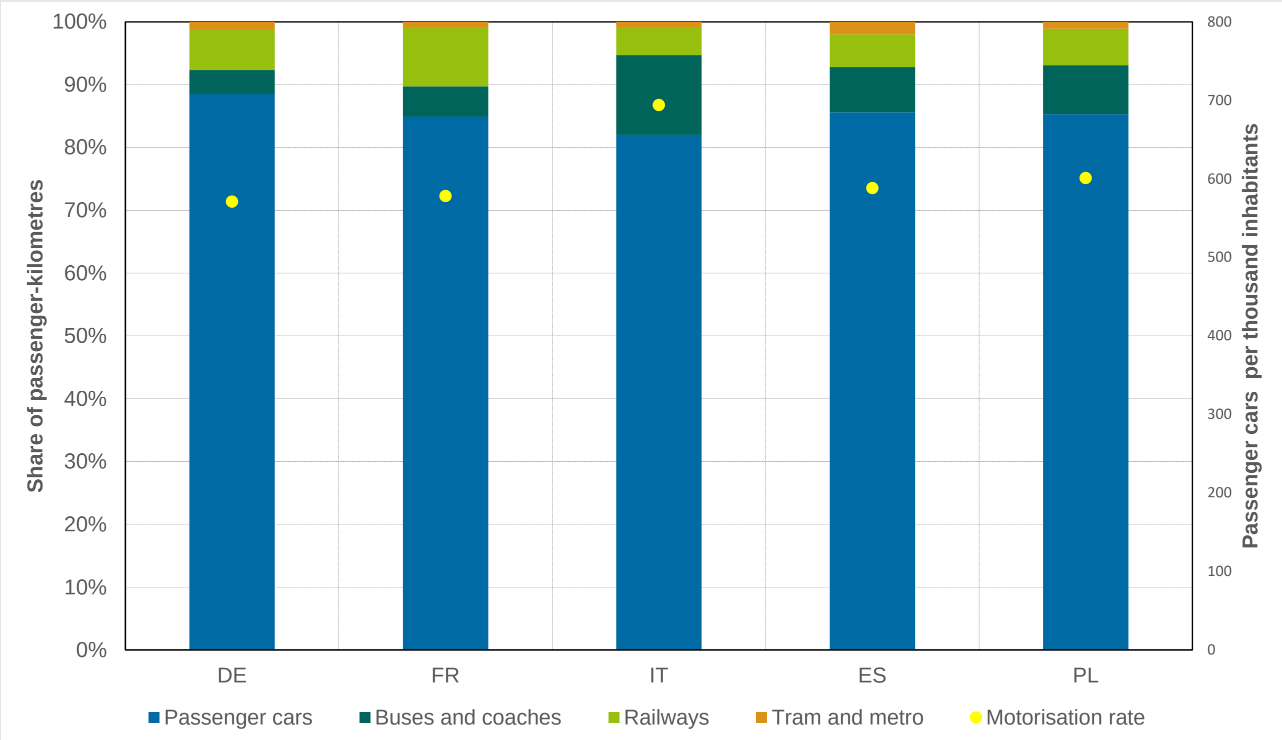
Electrification can also be hampered by the fact that charging infrastructure is not installed quickly enough. In all selected Member States, the number of charging points is increasing with DC charging growing faster than AC charging (EAFO 2024). The number of battery-electric cars per fast charger (>22 kW) varies among the selected Member States. For 2023, this value was about 10 in Spain, between 15 and 20 in Italy and Poland, around 30 in France, and over 40 in Germany (ACEA 2024a). Still, the target output according to the Alternative Fuels Infrastructure Regulation (AFIR) is met today in all selected member states (EAFO 2024). For each Member State, this target output refers to a minimum total power output from publicly accessible charging stations for each battery-electric vehicle (1.3 kW) and plug-in-hybrid electric vehicle (0.8 kW) registered.

Car dependency

High car dependency and a lack of alternatives to the car can be a major driver of high transport vulnerability. This is particularly true in the context of the transition to electric vehicles, as households are expected to switch to an electric vehicle but often lack the means to do so (Section 2.2). When a lack of financial means is combined with a lack of alternatives to car use such as public transport or active mobility, households are likely to either be unable to meet their daily mobility needs or have cut back on other expenses to afford their car dependency.

Data shows that all five countries show a very high dependency on the car in daily life. Figure 2-1 (left axis) shows that in all five countries the share of passenger-kilometres is highest for passenger cars, with more than 80 % in all five countries. Germany has the highest share with 89 %, followed by Spain, Poland and France with around 85 %. Italy has the lowest share, still 82 %. The high use of cars is also reflected in the motorisation rate of the five countries, measured as passenger cars per thousand inhabitants (Figure 2-1, right axis). Italy has the highest motorisation rate with 694 passenger cars per 1,000 inhabitants, followed by Poland (601). All five countries, except Spain, have a higher motorisation rate than the EU average of 571 passenger cars per 1,000 inhabitants.

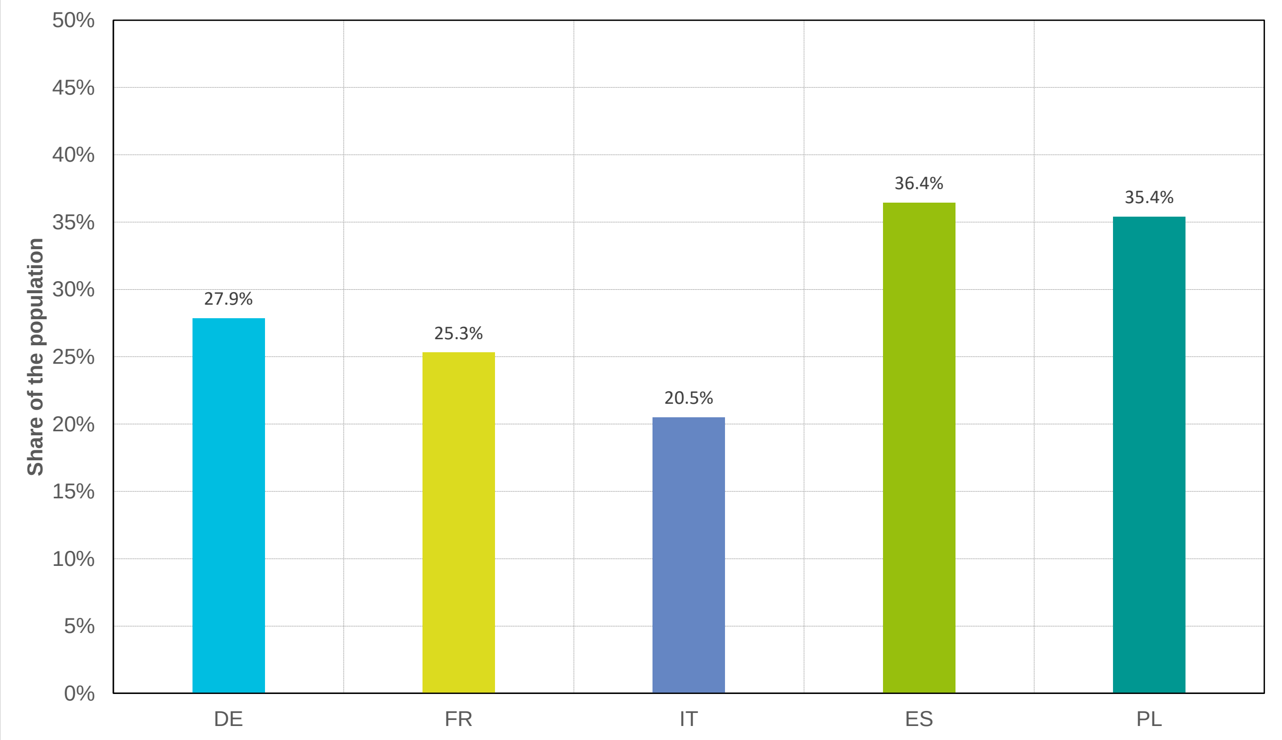
Figure 2-1: Modal split of passenger transport on land and motorisation rate



Source modal split: Oeko-Institut's own compilation based on European Commission. Directorate General for Mobility and Transport. (2023, p. 49). Note: As the data is from 2021, we expect the impact of the pandemic to be present, which is likely to increase the share of cars.
Source motorisation rate: Oeko-Institut's own compilation based in Eurostat 2023 data [road_eqs_carhab].

Figure 2-2 shows, that the majority of the population in each of the five countries does not use public transport regularly. This underlines a strong dependence on the car. Italy is the country with the lowest share of population using public transport regularly (20.9 %), followed by France (25.3 %) and Germany (27.9 %).

Figure 2-2: Share of the population that uses public transport regularly



Source: Oeko-Institut's own calculation based on EU-SILC 2014 data.

Note: The term 'regularly' is not defined in the data.

When talking about car dependency, a distinction should be made between chosen and forced car dependency. Chosen car dependency is a matter of lifestyle and comfort and therefore an individual choice, while forced car dependency emphasises the fact that other transport options cannot meet the individual's daily mobility needs and is therefore a result of having no other choices. There may be several reasons for this, such as poor availability of public transport or lack of barrier-free public transport.

Therefore, another interesting indicator in the context of rising fuel prices is the share of the population affected by Forced Car Ownership (FCO). Individuals in FCO are socially and materially deprived[1] but live in a household that owns a car (Mattioli 2017). The assumption is that the individual

[1] The new material and social deprivation indicator provide a measure related to the (in)ability of individuals to be able to afford a set of thirteen predefined material items that are considered by most people to be desirable or even necessary to experience an adequate quality of life. The list of thirteen items includes the following (seven related to the household and six related to the individual). At household level: 1) capacity to face unexpected expenses; 2) capacity to afford paying for one week annual holiday away from home; 3) capacity to being confronted with payment arrears (on mortgage or rental payments, utility bills, hire purchase instalments or other loan payments); 4) capacity to afford a meal with meat, chicken, fish or vegetarian equivalent every second day; 5) ability to keep home adequately warm; 6) have access to a car/van for personal use; 7) replacing worn-out furniture. At an individual level: 1) having an internet connection; 2) replacing worn-out clothes by some new ones; 3) having two pairs of properly fitting shoes (including a pair of all-weather shoes); 4) spending a small amount of money each week on oneself; 5) having regular leisure activities; 6) getting together with friends/family for a drink/meal at least once a month.

is cutting back elsewhere in order to afford their car ownership, as there are no other viable transport options. In this case, the car dependency is a source of poverty. This group of individuals is particularly unlikely to be able to afford the transition to an EV. Data for 2022 shows that Spain has the highest proportion affected by FCO (21 %), followed by France (20 %). Italy and Germany have similar proportions (14 % and 13 % respectively) and Poland has the lowest (9 %). Research on this indicator shows that countries with a high share of individuals in FCO are mainly those with limited transport options, in particular those with a less dense public transport network or a lack of active mobility options. This explanation is supported by the fact that the indicator shows higher shares of individuals in FCO in rural areas, where public transport is often less available (Oeko-Institut et al. 2024).

Social risk because of rising fuel prices

As electric mobility has not yet reached the mass market and fossil fuel prices are expected to rise during the coming years, we look at the average fuel expenditure per decile to develop a sense of who is already burdened and could be even more burdened in the future. Oeko-Institut's microsimulation model SEEK-EU[2] is used for the following analyses.

Figure 2-3 shows the share of fuel expenditure in total expenditure differentiated by expenditure deciles[3] for car-owning households in the five selected countries. On average a car-owning household in Germany spends 4.6 % of their total expenditure on fuels, while households in Italy already spend 5.9 %. Polish car-owning households spend 6 % and Spanish households 6,1 %. The highest average share of fuel expenditure in total expenditure have French households with 6.9 %. Households in the lower deciles spend an above-average amount on fuel, while the burden decreases again with increasing income levels. However, this also means that a rising of fossil fuel prices would place a heavy burden on car-owning households in the lower deciles, for example. Above all, households in the bottom four deciles in France stand out in the analysis due to the particularly high proportion of expenditure on fuel. For example, the lowest decile spends an average of 12.7 % of its expenditure on fuel. This proportion is slowly approaching the average expenditure of the other countries as expenditure increases. There may be several explanations for the different shares of fuel expenditure in total expenditure, such as differences in fossil fuel prices, the distribution of total expenditure across deciles, the number of cars in the household, the number of

The material and social deprivation rate is defined as the proportion of the population that is unable to afford five or more of this list of thirteen items.

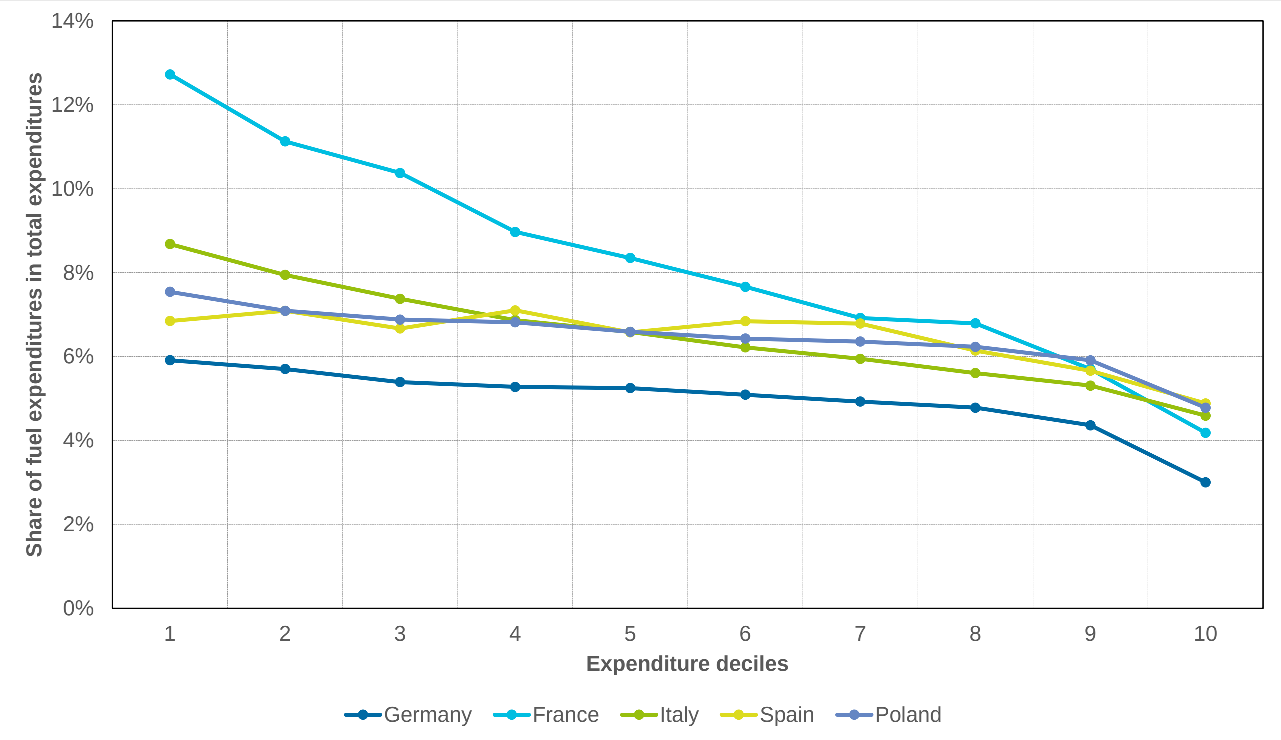
2 SEEK-EU covers the EU-27 and is used to assess the living conditions of different target groups and to estimate the distributional impacts of climate and environmental policies in different sectors. Household microdata from the Eurostat Household Budget Survey (HBS) is used in the model for the analysis. The Eurostat HBS is the only available micro-data source covering all EU Member States with information on household level expenditure. We use the 2015 HBS for our analysis as the 2020 HBS is available but has implausible data points and is affected by the pandemic. More recent national microdata could be used, but these are not easily comparable as they are not harmonised.

3 We use expenditure as a proxy for a household’s available budget in our model and divide households into ten expenditure deciles. For a discussion on consumption as a suitable proxy for long-term resources see e.g. Atkinson et al. 2017. These deciles sort households according to their total expenditure from lowest to highest and take it into account the composition of the household by assigning weights to each household member according to the new OECD scale. The new OECD scale assigns a weight of 1 to the first household member, a weight of 0.5 to each other adult member and a weight of 0.3 to each child in the household. This reflects the “economies of scale” in a household, i.e. all household members share one kitchen and living room, one car, household appliances, and so on.

household members, the efficiency of the car or the mileage driven. Future research should investigate these factors to gain a better understanding of the drivers of these results.

As previously discussed, fuel expenditure is regressive. Assuming rising fossil fuel prices and the associated rising costs for internal combustion engine vehicles (ICEVs), this picture may become even more pronounced in the future, as financially stronger households in particular have the option of switching to a zero-emission vehicle and are therefore no longer affected by any fossil fuel price increases.

Figure 2-3: Share of fuel expenditure in total expenditure broken down by expenditure level and country, car-owning households only



Source: Oeko-Institut's own calculation based on HBS 2015 data.

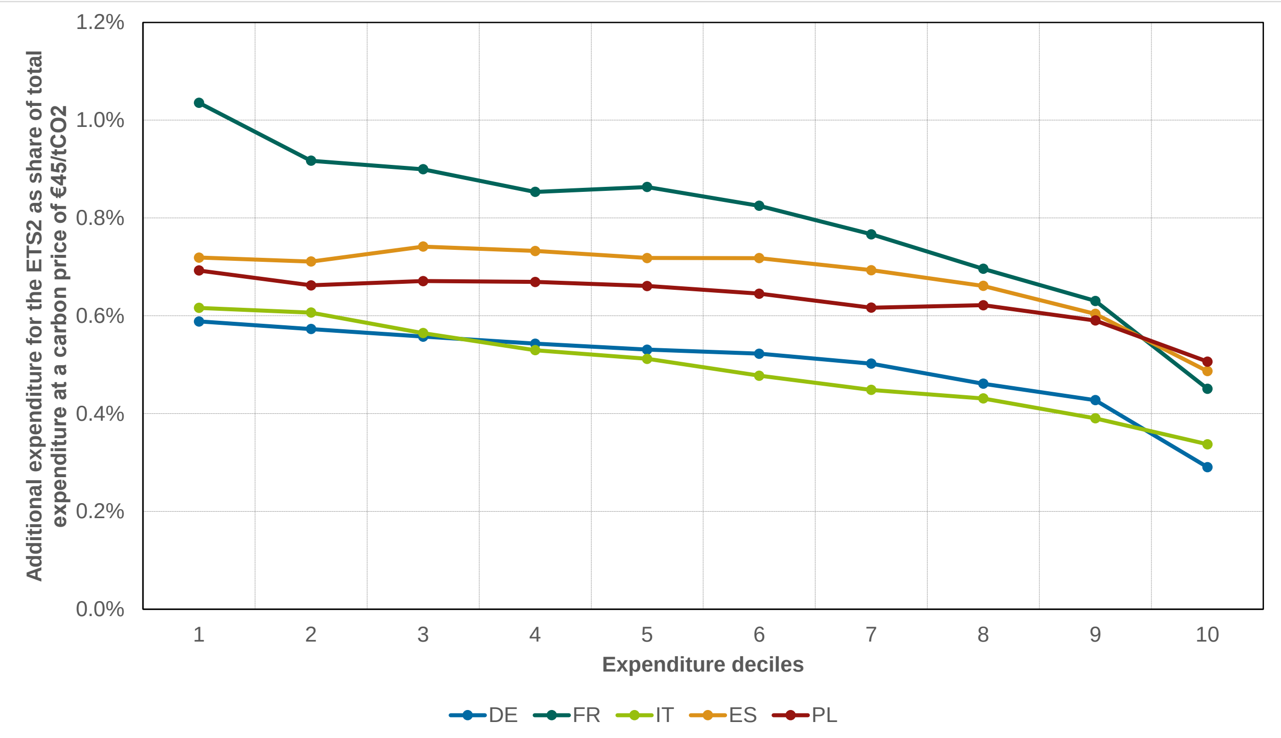
Individuals are particularly vulnerable to high fuel prices if they cannot switch to electric vehicles or other modes of transport, such as public transport, especially in rural areas where in many cases accessibility to public transport is limited. With the start of the ETS-2 in 2027 or 2028, fossil fuel prices will increase due to the CO_2 price. We assess the impact of rising fossil fuel prices using three different CO_2 prices: EUR 45, EUR 100 and EUR 140 per tonne of CO_2.[4] We assume a 100 % pass-through of the CO_2 price in the ETS-2 scenario. To estimate the additional share of total expenditure on petrol and diesel due to the CO_2 price, we perform a ceteris paribus analysis. This means that no change in behaviour is taken into account, i.e. litres and total expenditure are held constant during the analysis. This allows the different price scenarios to be compared. As individuals are expected to switch to fossil-free alternatives or reduce their consumption of fossil fuels, the estimated impact is seen as an upper bound.

The results of the analysis are shown in Figure 2-11 for a CO_2 price of EUR 45, in Figure 4-1 (Annex I) for a CO_2 price of EUR 100, and in Figure 4-2 (Annex I) for a CO_2 price of EUR 140. For each

4 All prices are presented in 2023 EUR.

expenditure decile, the average additional ETS-2 expenditure is calculated and presented as share of total expenditure. The sample is restricted to households with diesel and/or petrol expenditure. The average additional ETS-2 expenditure as a share of total expenditure varies between 0.3 % and 1.0 % at a price of EUR 45/tCO_2, between 0.7 % and 2.3 % at a price of EUR 100/tCO_2 and between 0.9 % and 3.2 % at a price of EUR 140/tCO_2. FR has the largest impact compared to the other four countries, followed by ES and PL. The additional ETS-2 expenditure for each household depends on the number of litres of petrol and diesel consumed per year, which depends on the number of kilometres driven and the energy efficiency of the car. Figure 2-11 shows that compared to the other four countries, households in France have a very high fuel expenditure compared to the total expenditure. Again, there may be several explanations for the differences between countries, such as differences in the number of cars in the household, the number of household members, the efficiency of the car or the mileage driven. In terms of the distribution of impacts across expenditure deciles, France has the largest difference between the top and bottom deciles. The additional expenditure for the ETS-2 as a share of total expenditure with a carbon price is very similar in Germany, Italy and Poland for the first two deciles. All three price scenarios show that, in general, the lower the expenditure decile, the higher the impact in all five countries.

Figure 2-4: Additional expenditure for the ETS-2 as share of total expenditure at a carbon price of EUR 45/t CO_2



Source: Oeko-Institut's own calculation using the microsimulation model SEEK-EU based on HBS 2015 data.

Notes: Ceteris paribus analysis, no behavioural change considered. Sample restricted to households with diesel and/or petrol expenditure. Expenditure deciles are weighted using the modified OECD scale and have the same number of individuals in each decile (not the same number of households).

Looking at the average impacts in each decile, we expect the individual impacts to be even higher for some households within a decile. The more kilometres a household drives and the more litres they consume, the higher the ETS-2 impact will be for them. This impact can be offset by switching to an electric vehicle and using electricity instead of diesel or petrol. The main challenge for low-income car-dependent households will be to afford this transition to EV use. Section 2.3 quantifies the number of households that will face difficulties in switching to an EV.

2.2 What proportion of the population will face difficulties in switching to an EV by 2030 and 2035 due to income constraints?

In view of ever-increasing prices for new cars, it can be assumed that fewer and fewer people will decide to buy a new car in future, as the initial investment costs are too high (ICCT - The International Council on Clean Transportation 2023). The new car market is stagnating, and buyers are getting older on average (Statista 2022). It raises the question if alternative financing models will have to be developed or strengthened in future, vehicles will have to change in general and prices will have to fall to make the vehicle market more attractive again for younger buyers and broad sections of the population. Currently direct vehicle purchase is still the preferred method in most countries, but leasing is becoming increasingly popular (Dataforce 2020) .

The cost of fossil fuels is expected to rise gradually, for example as a result of ETS-2. The technological change in the drive systems of newly registered cars, triggered by the EU CO_2 fleet targets among other things, will lead to a radical change in the passenger car fleet in the future. However, the transformation of the passenger car fleet is a long-term process. The supply of zero-emission vehicles is initially limited almost exclusively to the new car market until a used car market that matches demand is established over the years. Until this is the case, however, some households are excluded from the transformation because they cannot afford a new car and therefore must continue to rely on (used) combustion engines. In the following, we will approximate the proportion of the population in the selected European countries that is dependent on and uses a car at present and will face difficulties in switching in 2030 or 2035 for financial reasons.

Furthermore, based on European microdata on the expenditure and income of households in the selected member states, conclusions are drawn on the financial scope of households as to whether they could afford a zero-emission vehicle in said countries, considering the given supply.

Methodology

This analysis is based on the HBS 2015.[5] As there is only limited data available on car buying behaviour, the focus is on past buying behaviour observable in the data. The first step is to look at how much households have spent on new cars in the past. This expenditure on car purchases is set in relation to the household's total expenditure, e.g. around 50 % of the household's total yearly expenditure is accounted for by a car purchase, assuming that a car has been bought in the observed period. As only some of the households in the dataset bought a car at all during the period under consideration, but we want to make a general statement for all households, we proceed as follows: For each country separately, the median of the ratio of expenditure on car purchases to total household expenditure per year is calculated separately for each expenditure tercile and only includes households which have purchased a car in the observed period[6]. For example, households

[5] As already stated in Section 2.1 HBS 2020 is available but has implausible data points and is affected by the pandemic and can therefore not be used for the analysis.

[6] The terciles were formed in such a way that one third of the resident population (people not households) of each country is in each tercile, categorised based on their total expenditure. Total expenditure was used instead of household income, as Italy has no income data in the HBS. For a discussion on expenditure as a suitable proxy for long-term resources see e.g. Atkinson et al. 2017.

in the first tercile in Germany spend around 63 % of their total expenditure on a new car and households in the third tercile spend 91 %. This tercile-dependent average value is then multiplied by 1.5 to estimate the assumed financial maximum that a household of the tercile is able to spend on a new car purchase. This threshold means that households in the third tercile in Germany in general can or are willing to spend a maximum of 137 % (91 %*1.5) of their total yearly expenditure on a new car purchase.[7] A comparable limit can be calculated separately for used car purchases. If the price of a EV[8], for example, is now lower than the corresponding threshold value, we assume that a household can afford the car.

It should be noted that this approach assumes that behavioural patterns and financial leeway in the future will be similar to those in the past, i.e. business as usual. New financing methods, attractive leasing offers or changed behavioural patterns may of course lead to different results in the future.

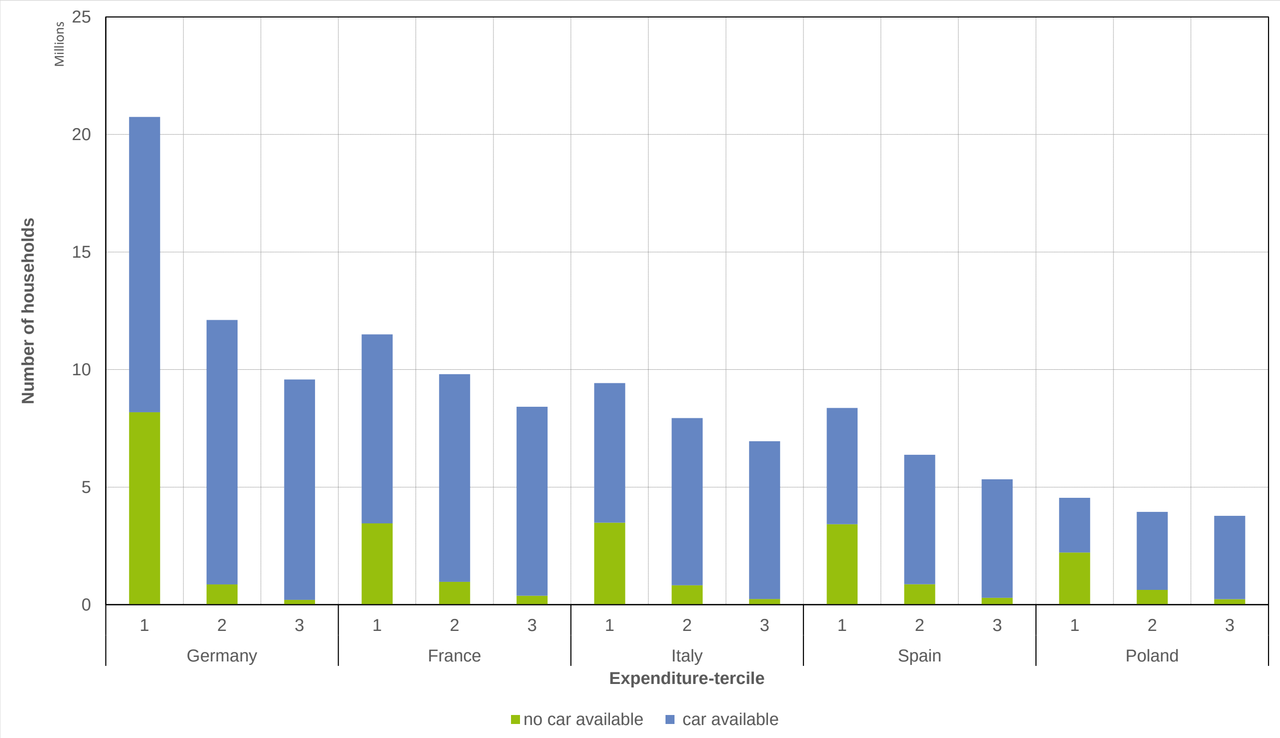
Due to different real wage developments in the countries in the past, the expenditure/income of households is extrapolated on a country-specific basis up to 2030 and 2035 based on the average real wage development of the last 8 years (destatis 2024; OECD 2024b, 2024a; Statistics Poland 2024; Eurostat 2024a; Insee 2024). For Germany and France, this means that there will be no real wage growth in the coming years, while Poland will see a significant increase. A slight decline in real wages is assumed for Spain and Italy. Furthermore, the number of households and the population is extrapolated to the respective target year analysed. It is assumed that the structure of the households will not change (Eurostat 2024c). If a value required for the calculation cannot be determined for a country due to a lack of observations, it is calculated as the average of the other countries.

2030

Figure 2-5 shows the car ownership of households differentiated by expenditure tercile and country in 2030 in the model.[9] In Germany, around 78 % of all households have a car, whereby the ownership rate also correlates with the tercile. in the lowest tercile, for example, a below-average number of households have a car (60 %). The average household size of just above two in Germany is significantly lower than in other countries such as Italy (on average 2.4 persons per household). There are many single-person households in the lowest expenditure tercile, meaning that there are significantly more households in this tercile than in the other terciles.[10] In principle, this correlation can also be observed for all other countries, but to a lesser extent. The number of people does not differ between the terciles of a country. On average, 80 % of households across the five countries have a car.

7 The calculated thresholds are displayed in Table 4-1 (Annex II).
8 Car prices are displayed in Table 4-2, Annex II.
9 Whether a household has a car or not is not answered directly in the HBS and is determined below based on existing expenditure on fuel, tyres, lubricants, and cars. Nevertheless, the number of car-owning households remains below country-specific reference values. The household weighting is therefore adjusted on a country-specific basis so that the ownership rate is equalised to the country-specific comparative values. A possible future increase in car ownership by more households than in the status quo is not considered and is therefore assumed to be fixed.
10 The expenditure terciles are constructed so that they have the same number of individuals and not the same number of households.

Figure 2-5: Car ownership at household level differentiated by expenditure tercile and country in 2030

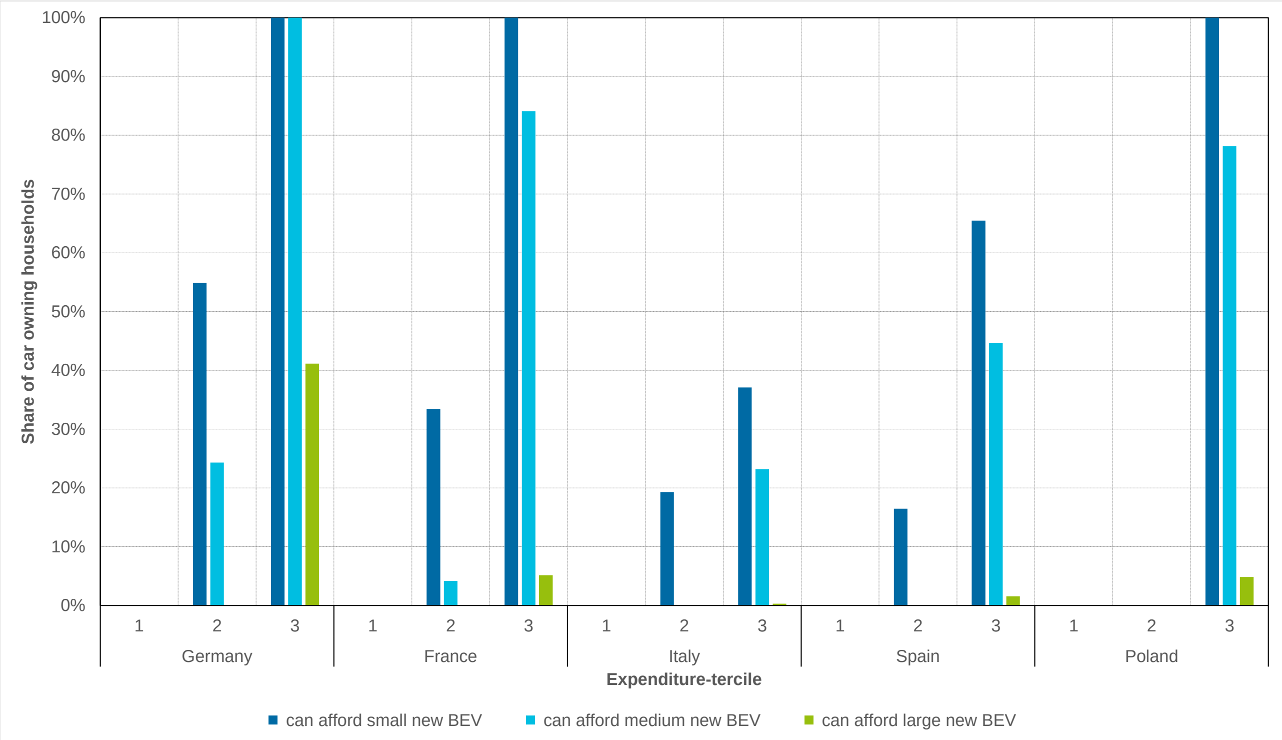


Source: Oeko-Institut's own calculation based on HBS2015 data.

The following Figure 2-6 shows the share of car-owning households that will be able to afford a new EV in 2030 given the made assumptions, broken down by tercile and country. As expected, no household in the first tercile can afford a new car, regardless of the country in question, given the assumptions made about the maximum available budget of households for purchase of a new car derived by previous purchases. All households in the top third in Germany have sufficient capital to buy at least a new small or medium-sized EV. The same applies to France and Poland, at least for small cars among households in the top third. For the latter countries, however, the proportion of households that can afford a new medium-sized EV is still relatively high at around 80 % of the households in the highest tercile. Due to the higher willingness of the top third in Poland to spend on new cars than in Italy and Spain, for example, more households in Poland than in Italy or Spain can or even want to buy new EVs despite lower income per expenditure levels. Looking at the affordability of large new EVs the picture looks quite different, as for the most countries nearly no household can switch to a large new EV despite Germany and too a much smaller extend France. In reality we can assume, that the share of households in the highest expenditure tercile that are able to purchase a new large EV will be higher than zero in the respective countries, but given the made assumptions and the used averages in the analysis this cannot be calculated and displayed. Also, in the second tercile there are clear differences in affordability across countries. In France, the proportion of households with sufficient financial leeway to buy a small new EV fall to a third and for mid-range vehicles even to less than 5 % compared to the third tercile. In Italy, Spain and Poland, households in the middle tercile cannot afford a new mid-range EV under the assumptions made.

Overall, the proportion of households across countries with available funds to afford at least a small new EV in 2030 is around 37 %.

Figure 2-6: New EV affordability at household level differentiated by expenditure level and country in 2030



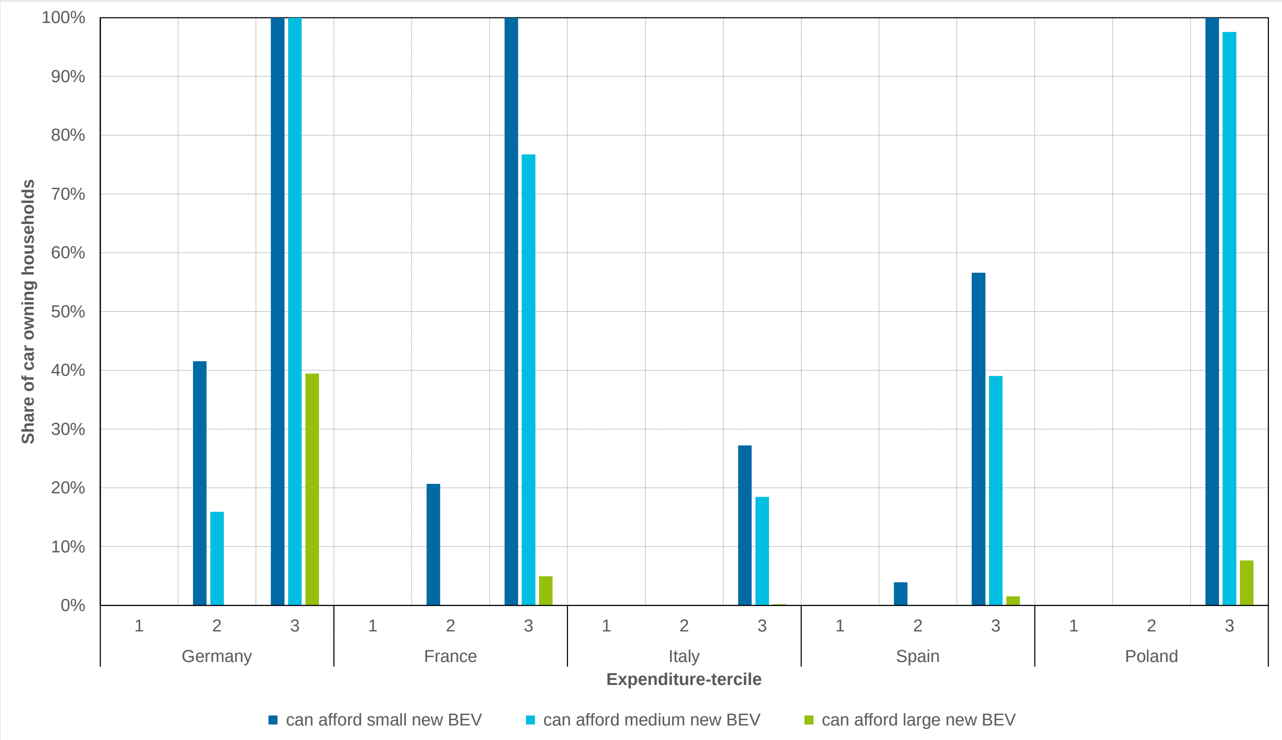
Source: Oeko-Institut's own calculation based on HBS2015 data.

2035

Prices for new and used cars will have changed in 2035 compared to 2030, as will real household spending, which will vary from country to country. While Spain and Italy continue to see a decline in purchasing power, purchasing power in Poland continues to rise. Furthermore, we assume a slight increase in EV prices in 2035 with reference to 2030, due to the fact that OEMs can increase their profit margin again because the cost pressure for EVs lowers due to the de facto ban on emitting vehicles in 2035. These developments are reflected in the affordability of EVs.

Figure 2-7 shows the number of car-owning households that will be able to afford a new EV in 2035, broken down by expenditure tercile and country. There are changes in the ability to afford a new EV compared to 2030. While there are hardly any changes for households living in Germany and most households in the second tercile can still afford at least a small car and all households in the top tercile can afford a small or mid-range EV, there is a significant change in the other countries. In France, at least in the top tercile, all households still have sufficient financial means to buy a small new EV, but in the second tercile this proportion decreases significantly and is now only 20 %. In Italy, only households in the top tercile can now afford new cars and here too the proportion has fallen. A similar trend can be observed in Spain. In Poland, on the other hand, only households in the 3rd tercile can afford new electric cars, but the number of households here continues to rise compared to 2030.

Figure 2-7: New EV affordability at household level differentiated by expenditure level and country in 2035



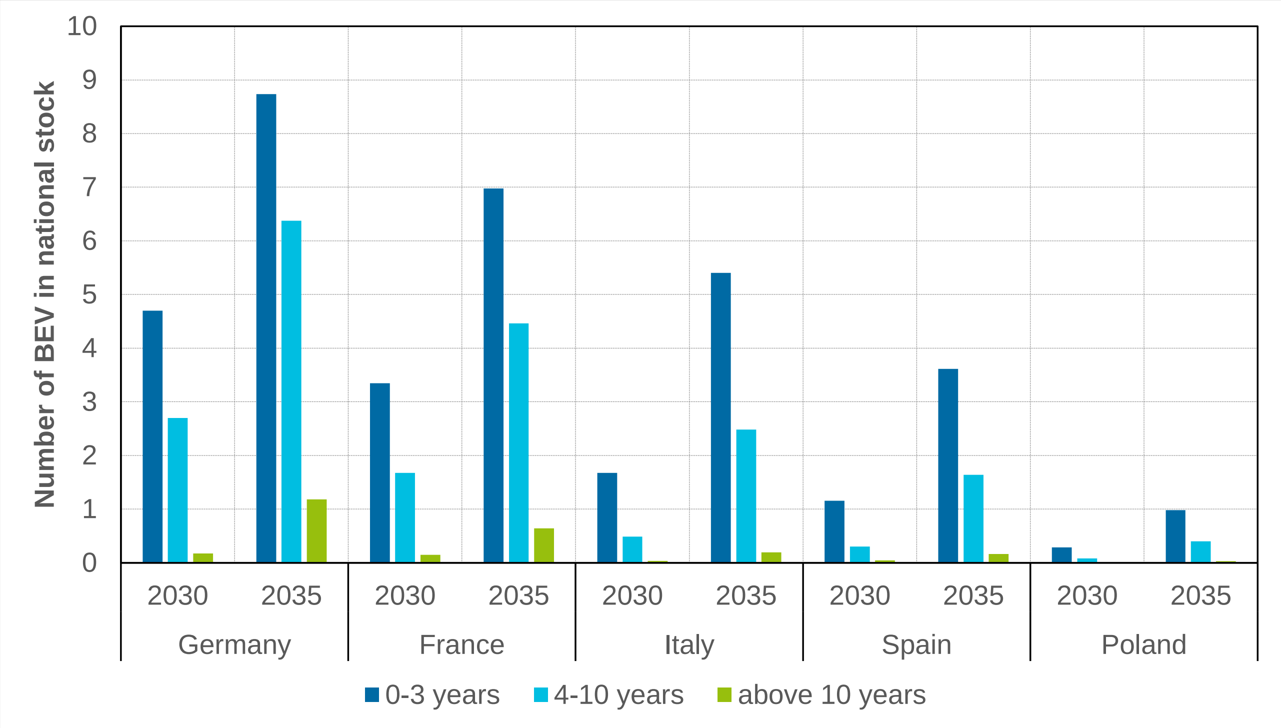
Source: Oeko-Institut's own calculation based on HBS2015 data.

As shown, the majority of households in these countries will not be able to afford a new car in 2030 or 2035 and will therefore have to rely on the second-hand market when it comes to switching to zero-emission vehicles. Based on the payments made by households for used vehicles in the past, which can be observed in the data, it can be concluded that mainly cheap and therefore old vehicles were purchased. However, the stock of older EVs in the countries analysed in 2030 and 2035 is still relatively low.

Figure 2-8 shows the age structure of the stock of EV in the selected countries for the years 2030 and 2035 based on T&E data. In Germany and France in 2030 less than 40 % and in Italy, Spain and Poland even less than a quarter of the stock is older than 3 years. Vehicles that are over 10 years old and have already lost most of their value are almost unavailable or only available in very low numbers. However, these vehicles in particular are interesting and financially affordable for lower income groups of the first and also the second expenditure tercile. In fact, based on the maximum budget that households have spent on used cars in the past, it can be assumed that vehicles aged at least 6 years and older are the ones that are financially affordable. As these vehicles have limited supply, it can be assumed that households will either spend a higher proportion of their income on second-hand vehicle purchases[11] and may even have to resort to new cars, switch to public transport if possible, or stay with their old combustion vehicle and remain exposed to rising CO_2 prices ("fossil lock-in").

[11] Depending on how dependent a household is on the vehicle, this can lead to forced car ownership and households save money elsewhere and forego expenses that are necessary.

Figure 2-8: Number of EV in the national car stock differentiated by country



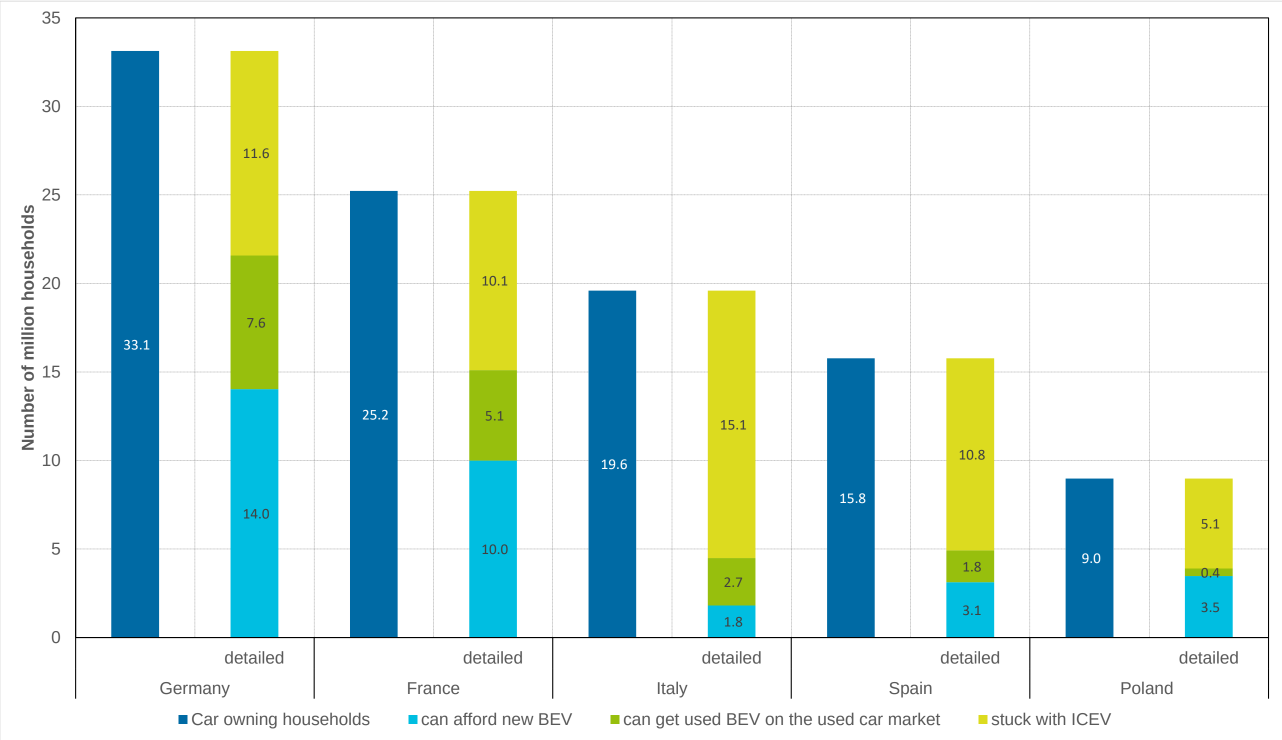
Source: Oeko-Institut's own illustration based on T&E fleet modelling data

If we assume that all vehicles older than 3 years represent the used car market and are available for it, and that households that cannot afford a new EV can purchase them[12], even then a considerable proportion of households will be left without the potential option of switching to EVs as displayed for the year 2035 in Figure 2-9, due to lack of financial means or due to lack of availability of used cars in general and availability of reasonably priced used cars in particular.[13] In Italy and Spain in specific, more than two thirds of households will not be able to switch to an EV in 2035, given that households do not intend to spend more on the purchase of a new EV as they spent in the past. In Germany and France, more than half of all households will be able to switch to a new or used EV in 2035.

[12] This assumption is already quite strong, because it assumes that every new purchased EV is available to the second hand market after 4 years, so the second hand market might be a little overestimated.

[13] Furthermore, it is assumed, that households do not purchase more than one EV. This might also lead to an overestimation of available second-hand cars for households without the ability to buy a new EV, since in reality some households might buy more than one (used) EV and therefore the availability of second-hand cars is lower for all other households.

Figure 2-9: Ability to switch to EV in 2035 differentiated by country



Source: Oeko-Institut's own calculation based on HBS 2015 data.

2.3 Summary of the need for social support in the EV transition across the EU

Table 2-1 summarizes the results of Section 2.1 and Section 2.2 by ranking the different vulnerability criteria from lowest (+) to highest (+ + +) among the five countries.

A rapid transition to EVs in the selected Member States is hampered by the fact that passenger cars remain in the national stock for 10 to 15 years and have a very long average lifetime, ranging from 15 to 20 years in Germany, France, Spain and Italy to 35 years in Poland. The high number in Poland can be explained by the high share of imported used cars, which dominate the car stock in Poland and have a very low share of EVs (0.9 %). The existing stock of EVs and the number of EVs per fast charger varies between the five countries. France and Germany show a share of EVs in the passenger car stock between 2 % and 3 %, while Italy, Spain and Poland show a share of less than 1 % of the vehicle stock. In 2023, the number of EVs per fast charger will be between 10 and 20 in Spain, Italy and Poland, around 30 in France and more than 40 in Germany. Based on this information we conclude that for the criterion **"Rhythm of electrification"** Poland shows the highest vulnerability level, followed by Spain and Italy.

All five countries show a very high dependence on the car, with a modal split of over 80 % in all five countries and a motorisation rate above the EU average in all countries except Spain. In all countries, less than 40 % of the population uses public transport regularly, and in Italy, Germany and France it is even less than 30 %. Looking at FCO, Spain has the highest proportion affected by FCO (21 %), followed by France (20 %). Italy and Germany have similar proportions (14 % and 13 % respectively) and Poland has the lowest (9 %). Therefore, we conclude that for the criterion **“Car dependency”** all countries show a similar level of vulnerability.

First analyses of EV buyers and users show that electric mobility has not yet reached the mass market but is currently driven by higher incomes. In all countries, low-income car-owning households are particularly vulnerable to rising fuel prices, as they have the highest share of fuel expenditure in total expenditure. Above all, households in the bottom four deciles in France stand out in the analysis due to the particularly high proportion of expenditure on fuel. Germany shows the lowest proportion of expenditure on fuel among the five countries. The analysis of the effects of the ETS-2 shows again that in France the additional expenditure for the ETS-2 is expected to be highest and lowest in Germany and Italy. Based on this information we conclude that for the criterion **“Social risk because of rising fuel prices”** France shows the highest vulnerability level and Germany the lowest.

The five countries differ in their used car markets. France and Germany already have a relevant share of new EV registrations today, which is also reflected in the availability of second-hand Evs in 2035, which is still too small to saturate the market, but at least a fraction is available. In Poland, on the other hand, the situation is different, with no relevant supply of used EVs available at all in 2035. The situation for Italy and Spain is somewhere in between. On the one hand, due to the currently still low number of new registrations, there are not many EVs available on the used car market, and on the other hand, many households lack the financial means to buy new EVs, which will continue to increase over time due to falling real wages and lead to a high number of households in Italy in particular that are unable to make the switch. Analyses of all five countries show that a considerable proportion of households do not have the financial means to buy a new EV by 2035. Furthermore, due to limited supply of used EV a lot of households cannot switch to a cheaper option by buying a used EV. In Spain i, more than three quarters of households will not be able to switch to a EV in 2035, given that households do not intend to spend much more on the purchase of new EV as they spent in the past. In Italy, the share of households that will not be able to switch to an EV in 2035 is even higher, at around 77%. In Germany and France, more than half of all households will be able to switch to a new or second-hand EV in 2035. In Poland it’s about 60 % of the households. Based on the analysis, for the last vulnerability criterion **“Proportion of the population will face difficulties in switching to an EV”** we find the highest vulnerability level for Italy, followed by Spain and Poland.

It can be concluded that Germany shows a high level of vulnerability in the EV transition mainly because of high “car dependency”. For Italy and Poland we find a comparably high rating in all four categories. In Italy the rating is particularly high in the category “Proportion of the population will face difficulties in switching to an EV” and in Poland the rating is particularly high in the category “Rhythm of electrification”. France shows a high level of vulnerability in the EV transition mainly because of “Social risk because of rising fuel prices”. All aspects are of equal importance for Spain. It should be noted that the summary of vulnerability criteria is based only on the indicators presented in Section 2.1 and Section 2.2 of this report and that the ranking between countries may change if other indicators are included. Nevertheless, all countries show vulnerability in the context of the EV transition and the various indicators in the report can help countries to focus on country-specific challenges when trying to find solutions to existing or emerging vulnerabilities in the EV transition.

Table 2-1: Summary of vulnerability criteria

Vulnerability Criterion	DE	ES	FR	IT	PL
Rhythm of electrification	+	+ +	+	+ +	+ + +
Car dependency	+ +	+ +	+ +	+ +	+ +
Social risk because of rising fuel prices	+	+ +	+ + +	+ +	+ +
Proportion of the population that will face difficulties in switching to an EV	+	++	+	+++	++

Source: Oeko Institut's own compilation.

3 Designing social leasing for European countries

The analysis in Section 2 has shown that there is a need for social support in the EV transition. Social leasing is one possible measure to provide this support. As social leasing has so far only been implemented in France, there is no universal definition of this measure. In this report, social leasing is defined as follows:

Social leasing is a policy instrument whereby assets (such as vehicles) are made available to certain social groups or people with low incomes or special needs at subsidised or reduced rates through government support. The aim is to reduce social inequalities, promote participation in social life and provide sustainable mobility solutions.

To gain an understanding of how social leasing could be implemented in the different countries, Section 3 collects and analyses appropriate options for the implementation of social leasing and their impacts. First, we analyse different criteria for the set-up of the scheme (Section 3.1). Second, based on different scenarios for eligibility criteria we quantify the potential demand for affordable social leasing compatible EVs (Section 3.2). Third, based on different cost scenarios we quantify the supply of additional EVs potentially financed by SCF funds (Section 3.3). Fourth, we estimate the emission savings and public costs of a social leasing scheme (Section 3.4). Fifth, we estimate the impact of social leasing on the electrification of the national car fleets of the five countries using different scenarios (Section 3.5). Finally, we assess the role of social leasing in the five countries (Section 3.6).

3.1 Searching for suitable criteria for a social leasing scheme

Social, economic, financial and governance criteria need to be considered when setting up social leasing in the various European countries. Section 3.1 focuses on possible options for the implementation of social leasing and their respective advantages and disadvantages. This section contains a wealth of insights and reflections from interviews conducted as part of the project with transport experts from the five countries DE, ES, FR, IT and PL.

Criteria for eligibility for individuals

The eligibility criteria of the social leasing scheme are a political decision. This decision needs to consider the social situation as described in Section 2. Interviews with transport experts in the five countries show that income thresholds, regional aspects, and focusing on specific groups are important aspects to discuss in this context.

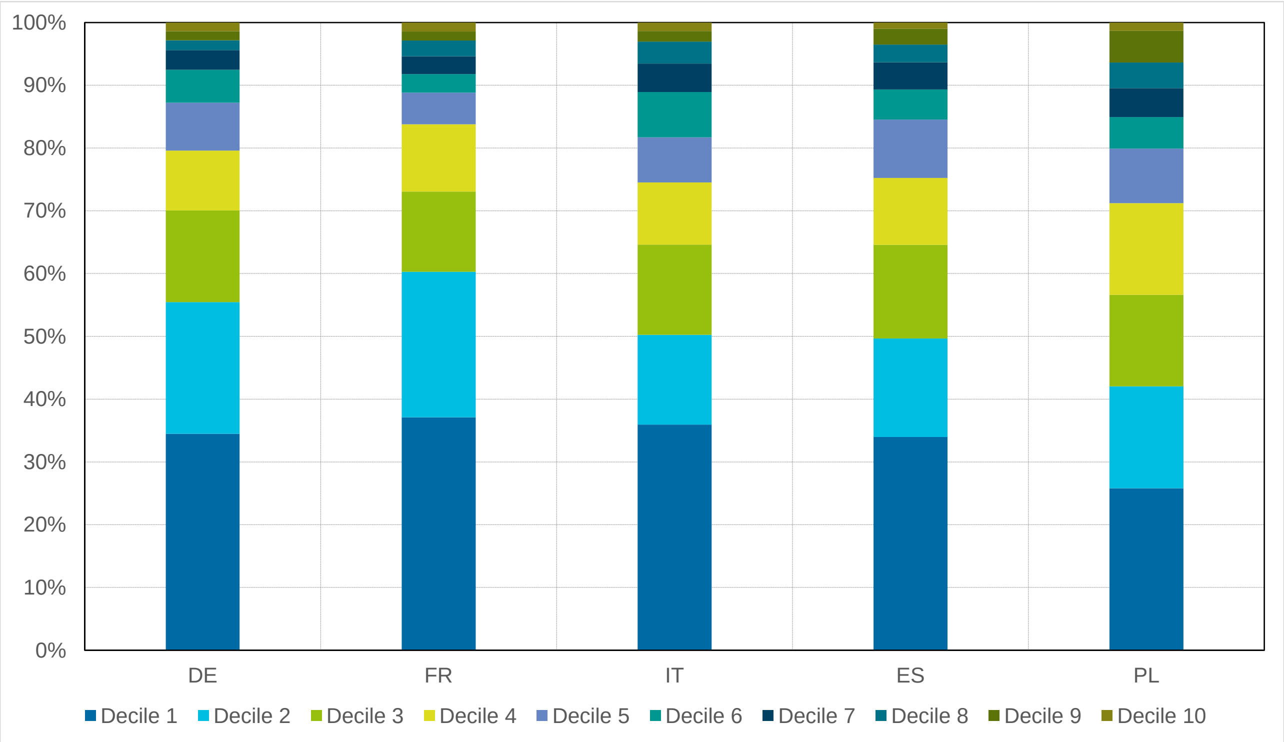
Income threshold

Social leasing is intended to support individuals and households who have difficulties in affording the transition to an electric vehicle and are highly affected by rising fossil fuel prices. Section 2 shows that this particularly applies to low-income groups. In France, the income threshold to be eligible for social leasing is set at a reference tax income [14] per (equivalised) unit of EUR 15,400 (Ministère de la transition écologique et de la cohésion des territoires 2024), which corresponds to the median income in France (Mascaro and Hermine 2024).

As the funds for a social leasing programme will be limited, a programme with a social focus should only include those who are (most) in need. Figure 3-1 shows that households that cannot afford a car belong mainly to the first four income deciles in Germany and France and to the first five income deciles in Spain, Poland and Italy. This indicates that households unable to afford an EV will show higher shares in lower income groups and should therefore be targeted. Initial evaluations in France have shown that 60 % of the beneficiaries belong to the 4th and 5th income deciles, while the remaining 40 % belong to the first three deciles (Chéron and Mathieu 2024). This shows that social leasing can be attractive for lower income groups but if a higher share of lower income groups wants to be reached a lower income threshold should be chosen as an eligibility criterion. If there is no income threshold in place, studies have shown e.g. for the German EV-subsidy, that more or less exclusively higher incomes have applied for the programme (Rao et al. 2024). Another solution could be to provide graduated support according to the income group to which an applicant belongs, or to implement the programme gradually, starting with the lowest income deciles and gradually relaxing the eligibility criteria to include lower-middle income groups.

[14] The reference tax income is made up of the taxable net income, tax-exempt income, income subject to withholding tax, allowances applied to the tax base, expenses deductible from income, taxable capital gains on property (Direction de l'information légale et administrative 2024a.

Figure 3-1: Income distribution of the population living in households that cannot afford a car



Source: Oeko-Institut's own calculation based on EU-SILC 2022 data.

Note: The answer 'No, I cannot afford a car' is self-reported and therefore subjective. This may explain why the data includes people in high income deciles. The response does not differentiate between ICEVs and EVs.

Regional aspects (lack of alternatives)

Regional aspects can be an important factor to consider when looking for appropriate eligibility criteria. When talking about regional aspects, the main focus is on the availability of suitable alternatives to car use to meet the daily mobility needs of the population. Public transport is not the only alternative, but it is probably the most relevant for the majority of the population and should be taken into account when including or excluding regions from the programme. As regions can be very heterogeneous in terms of public transport availability, it is important to use very granular data.

If regions with poor public transport are identified, they could be targeted with a social leasing scheme specifically designed for them. This could be particularly beneficial in regions where there is a high risk of abandonment. In Italy, for example, there are a large number of nearly 2,000 small municipalities with fewer than 1,000 inhabitants (Giancarlo Cotella 2022). Sharing schemes could be a solution to target small communities in an efficient way, supporting a large number of people with comparatively small resources.

A social leasing scheme that takes into account regional issues could focus on specific regions or explicitly target individuals who can demonstrate that they face regional difficulties, without linking the eligibility criteria to a specific region. For example, individuals living in rural or peri-urban areas who have to commute to urban centres by car without sufficient public transport alternatives could be targeted. Instead of making the programme available only to people in certain regions, individuals would have to prove that they don't have sufficient transport alternatives and are dependent on the car for their daily mobility needs.

Focus on specific groups

Criteria such as the available funding, the administrative effort, systemic relevance of groups, labour market support or family support can play a role in the political decision of targeting specific groups with a social leasing scheme. Examples of support for specific target groups are discussed below.

- *Population with a long commuting distance to work*: In France, applicants either have to proof the need to use a private car for commuting more than 15 km from their home to the workplace or the need to travel more than 8,000 km per year by private car as part of the professional activity (Ministère de la transition écologique et de la cohésion des territoires 2024). While these criteria of long commuting distance make sure that the working force is supported in case of high fossil fuel costs, they provide no indication if individuals would be able to use public transport as a possibly cheaper and more environmentally friendly alternative. Thus, the programme creates an incentive for car use among people who could also use public transport as an alternative.
- *Individuals without work:* As sufficient mobility is key to ensuring that everyone has access to essential goods and services, work should not be the only factor to consider when trying to reduce the risk of fossil lock-in among the population.
- *Carers:* As caring for a relative or friend, such as a disabled or elderly person, may involve travelling long distances, this group could also be considered.
- *Individuals with disabilities:* Not everyone can use public transport, even if it is available to them. The Austrian carbon dividend ('Klimabonus') takes this into account by paying the maximum amount to people with disabilities (Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie 2024) and is therefore an example of a climate policy measure that takes into account the specific needs of individuals.

Requirements for the vehicles

In addition to the question of who should be eligible for the scheme in the first place, another question arises: Which vehicles should be eligible? Should there be any restrictions, and if so, which ones and why? There are many factors to consider when setting up a social leasing scheme and selecting eligible vehicles that have a direct impact on, for example, the acceptance of the measure, the climate protection effect or the used car market.

Individual needs

In order to ensure the acceptance and attractiveness of the social leasing scheme, the vehicles that can be selected under the scheme should reflect the needs of the eligible group. For example, while in Italy the demand for small and compact cars may be particularly high due to the lack of space in cities, in other countries other criteria or vehicle sizes may be particularly in demand. There can be many reasons why households and individuals may need a car larger than a segment A car to meet their mobility needs. Examples include families with many members or people with disabilities who need to transport special equipment such as a wheelchair. As individual needs are heterogeneous and highly subjective, it is not easy to define a threshold that adequately reflects needs.

Price of vehicles

Another point is and remains the question of price ceilings for eligible vehicles. Based on limited financial resources on the part of the state, it makes sense to set individual price caps for certain vehicle classes depending on the mobility needs of the applicant in order to keep the costs per subsidised vehicle lower than the commercial price. If the subsidy per contract is hold constant, cheaper vehicles should also lead to lower leasing rates. It should be noted that the maximum leasing price per month is essential as an accessibility criterion for the scheme and that there is a risk that the minimum price could lead to market distortions.

Environmental criteria

Furthermore, the question remains as to whether the eligible vehicles must comply with further environmental and climate protection standards, particularly in the European debate on Fit for 55 and national climate protection ambitions. In the French scheme, the vehicle must achieve the minimum environmental rating set by Ademe (Direction de l'information légale et administrative 2024b). These environmental criteria lead to an exclusion of models produced outside of the EU.

New cars vs. used cars

The question of whether used cars should be eligible for social leasing remains open from an industrial policy and social perspective. In addition to arguments in favour of including used cars in a scheme, there are also arguments against it. A major pro-argument would be the lower costs, especially for financially disadvantaged households, as the acquisition costs and therefore also the leasing rates for used vehicles are significantly lower. Depending on the structure of social leasing and the question of whether used cars are also included in the leasing scheme, the expected price effect on the used car market varies. If used EVs are also included in the scheme, it can be assumed that there will be increased demand on the used car market, which in turn will have an impact on used car prices. Due to the increased demand, it can be assumed that the residual value of used EVs will stabilise. This in turn makes the purchase and leasing of new EVs more attractive and an increase in the number of new registrations can be assumed. The expansion of social leasing to the used car market will result in a reduction in new registrations. Furthermore, it can be assumed that the stabilisation of used car prices will also make vehicles on the used car market less attractive to price-conscious buyers. The net effect of expanding the social leasing scheme on the overall demand for EVs is therefore uncertain.

Including other types of vehicles and sharing concepts

In addition to the promotion of cars, the promotion of bicycles, for example, is also conceivable. The advantage of including bicycles or, more precisely, cargo bikes would be the possibility of also promoting the mobility of people who do not have a car and or want to get rid of their car and at the same time tend to travel short distances in their everyday lives. This is particularly conceivable in urban centres where the distance to essential services is often shorter. In Poland, there are already plans to promote electric mobility in the country as part of the EU national recovery plan.

In order to make the limited means available to as many people as possible and to make optimum use of resources, it is also possible to integrate car sharing as part of a social leasing scheme, so that several people share a vehicle, or it is allocated to a community. The types of vehicles and concepts included in the scheme should be appropriate to the target populations and areas, which may vary considerably from one country to another.

Design and governance of the scheme

When discussing the potential design and governance of a social leasing scheme with transport experts, a wide range of issues were raised. A summary of the discussion points is presented below. The variety of aspects highlights the fact that the discussion on social leasing has only just begun.

Combine with scrappage scheme

To ensure that social leasing is not used to purchase a second car and the number of vehicles does not increase directly because of the introduction of social leasing, social leasing could be combined with a scrappage scheme to remove the highly polluting vehicles from the roads. This would mean that only households that already have a car are eligible for social leasing. Only including households with a car will not target those in transport poverty without access to public transport and without a car. Instead, it would target households with an ICEV that are affected by rising fossil fuel prices.

Charging infrastructure

Another important point to fully exploit the economic advantage of low operating costs and to ensure the usability of EVs is the availability of affordable and fast charging infrastructure. Public charging is often more expensive compared to private charging points. The set-up of private charging points is particularly challenging for tenants in multi-family homes, as the homeowner is the one deciding on setting up a charging point. As discussed in Section 2.1, the number of battery-electric cars per fast charger varies among the selected Member States. In Poland, for example, the electricity grid is severely underdeveloped or inadequately expanded in many regions, meaning that fast charging will continue to be the exception rather than the rule in the coming years. In addition, fast charging in Poland is often still very expensive today and those who cannot charge at home (overnight) can hardly benefit from the efficiency advantage of EVs in monetary terms, since public charging is somewhat more expensive. So at least today, EVs are largely more attractive in single-family homes where it is possible to charge slowly overnight. The latter also applies to other countries in most cases, although the expansion of the public charging infrastructure is already better developed there, and prices are more competitive compared to Poland. Sufficient charging infrastructure is the first step in enabling the switch to EVs and must be taken into account when setting up the social leasing scheme.

Administration

In addition to the design of the scheme, it is also important to consider the administrative burden and cost of its implementation. For example, the effort required to determine the eligibility of the applicant can be considerable. In many countries it is not directly possible for authorities to share existing data, for example on the applicant's income, due t’ data protection guidelines, e.g. in Germany. Another example is the establishment of cooperation with leasing companies and banks. In one of the expert interviews, it was mentioned that in Poland, when a similar scheme was set up, most banks were not interested in cooperating because the administrative burden was too high compared to the small grants.

Acceptance

The acceptance of social leasing depends not only on the design of the scheme but also to a large extent on people's basic attitude’ towards EVs and leasing offers in general. In many countries, including Italy and Poland, for example, information from the expert interviews suggest that leasing is not a widespread concept and that people generally prefer to own their cars. In this respect, the social leasing scheme is an innovation in vehicle use and the advantages may need to be emphasized and explained as part of a transparent political communication when implementing the measure.

Production

However, the best scheme and the most precise design can only work as well as cars can be produced to meet demand. For this reason, any production capacities and model developments in the near future should also be taken into account when designing the scheme. In Germany in particular, it should be noted that the largest German car manufacturer does not yet have a fully comprehensive and affordable small EV on offer. On the other hand, the introduction of social leasing could potentially accelerate the production of small and affordable EVs.

3.2 Quantifying the share of population eligible for social leasing

Section 3.1 has shown that there is a large number of possible eligibility criteria that can be combined for the implementation of a social leasing scheme and should be chosen according to the country specific context. To gain a better understanding of the potential demand for affordable EVs suitable for social leasing, we quantify the number of eligible citizens based on following criteria as an example:

(1) individual belongs to the bottom five income deciles

(2) individual lives in a rural area[15]

(3) individual lives in a household that owns a car

(4) individual is aged 18 or older.

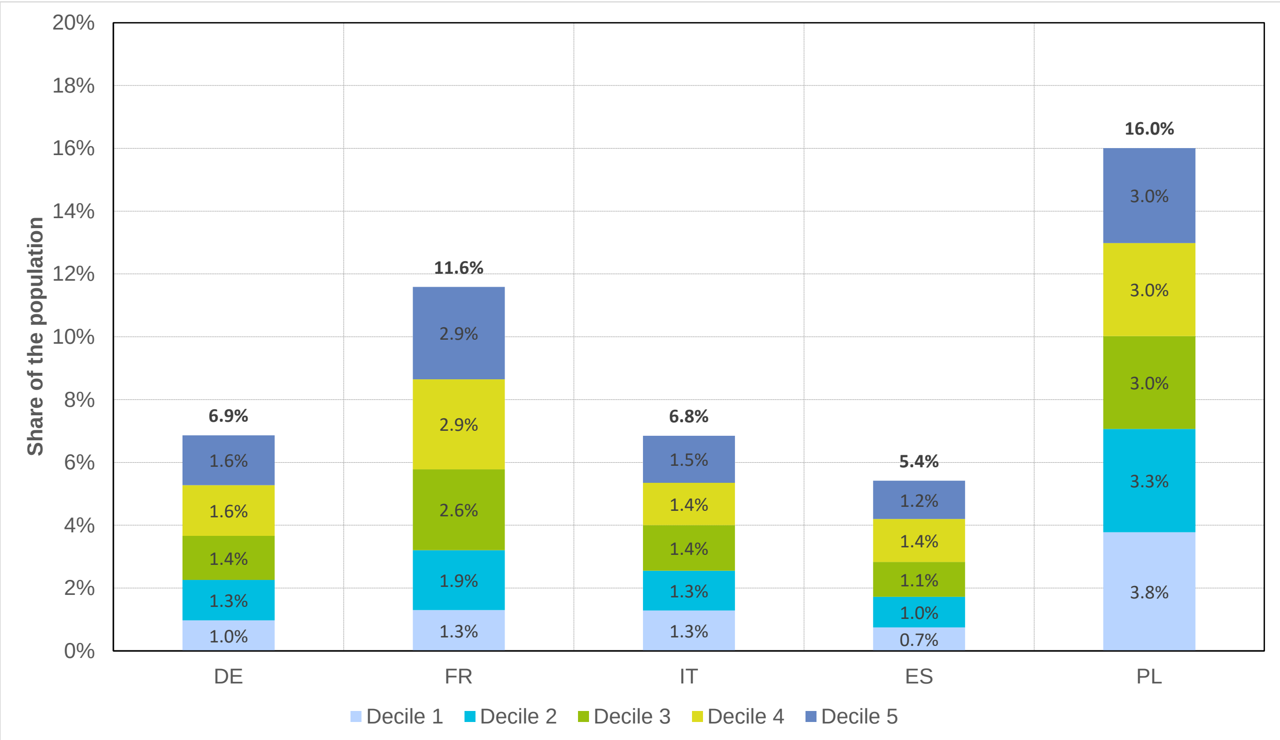
We have chosen these four criteria as an example for the following reasons. The analysis in Section 2 has shown that income is an important determinant of vulnerability, and particularly important in the context of the affordability of switching to an EV. We have chosen to look at income deciles rather than a specific income threshold for all countries, as the level and distribution of income varies between countries. Figure 3-1 shows that households that cannot afford a car mainly belong to the first four income deciles in Germany and France and to the first five income deciles in Spain, Poland and Italy. This highlights the fact that the income deciles to be taken into account differ between countries. We account for that by presenting different combinations of income deciles included in the calculation of the demand for affordable social leasing compatible EVs. The criterion 'individual lives in a rural area' is a proxy for long commuting distances and poor public transport availability. We expect some form of regional or commuting distance criterion to be included in the schemes, as this can be used to identify those most affected by high fossil fuel prices without the option of switching to cheaper and more environmentally friendly alternatives such as public transport. Of course, as described in Section 3.1, the criterion used for the actual scheme should be based on more detailed data on commuting distance or public transport availability. The criterion 'individual lives in a household that owns a car' takes into account that social leasing should not lead to more cars on the road. Already owning a car in some way reflects the need for a car among low-income households, since if cheaper options such as public transport were available, they would most likely switch to them. The criterion does not take into account the individuals that are in transport poverty, but do not own a car. Finally, we restrict the eligible group to individuals aged 18 and over, as this is the

[15] The term ‘rural area’ is defined as ‘thinly populated areas where more than 50 % of the population live in rural grid cells. This classification is based on a combination of criteria of geographical contiguity and minimum population threshold applied to 1 km^2 population grid cells.’ (Eurostat 2023, p. 114).

age at which individuals in the five countries gain full legal capacity (European Union Agency for Fundamental Rights 2017) and are therefore able to sign a leasing contract.

Figure 3-2 shows the share of the total population eligible for social leasing based on the four criteria. The highest share of the population is found in Poland (16 %), followed by France (11.6 %). Spain has the lowest share (5.4 %), while Italy and Germany have very similar shares (6.8 % and 6.9 % respectively).

Figure 3-2: Share of the population eligible for social leasing (proxy)



Source: Oeko-Institut's own calculation based on EU-SILC 2022 data.

Table 3-1 shows the share and number of eligible persons based on different combinations of income deciles included in the calculation. The number of eligible persons ranges from 5.9 to 7.9 million for France, 4.8 to 5.9 million for Poland, 4.4 to 5.7 million for Germany, 3.2 to 4 million for Italy and 2 to 2.6 million for Spain, depending on whether individuals from deciles 1 to 4 or 1 to 5 are included. Assuming that the eligibility criteria are targeted at those in need, the number of eligible persons should give an indication of the demand for affordable EVs suitable for social leasing. Of course, there are several factors that could reduce the actual demand, such as individuals sharing a car, low uptake of the scheme or investment in public transport infrastructure. Therefore, the numbers presented can be rather understood as a potential for the interest in social leasing instead of an actual demand.

Table 3-1: Share and number of eligible persons based on different criteria combinations

		DE	FR	IT	ES	PL
Decile 1 - 5	Share of the–population	6.9 %	11.6 %	6.8 %	5.4 %	16.0 %
	Number of persons in millions	5.7	7.9	4.0	2.6	5.9
Decile 1 - 4	Share of the–population	5.3 %	8.6 %	5.4 %	4.2 %	13.0 %
	Number of persons in millions	4.4	5.9	3.2	2.0	4.8

Source: Oeko-Institut's own calculation based on EU-SILC 2022 data and Eurostat population data for 2023 [tps00001].

3.3 Quantifying the number of additional EVs on the market based on different financial scenarios

To gain a better understanding of how many EVs could enter the market because of social leasing, we look at different financial scenarios. Since social leasing is often discussed in the context of the Social Climate Fund (SCF), we use the funds available from the SCF as an example to construct the different scenarios. In reality, the SCF will need to be split between different measures, and additional funding streams could be used to finance social leasing, such as unspent Recovery and Resilience Facility money.

The SCF is intended to fund measures in the transport and buildings sector targeting individuals and households in transport and energy poverty, as well as vulnerable households, transport users and micro-enterprises that are severely affected by the introduction of the ETS-2 (Publications Office of the European Union 2023). The European Commission lists social leasing as a good practice for Social Climate Plans (European Commission. Directorate General for Climate Action et al. 2024).

Figure 4-3 (Annex III) shows the total funds available from the SCF including the mandatory national co-financing (25 %) over the period 2026-2032, assuming that the ETS-2 starts in 2027. The total budget is EUR 86.6 billion. The funds available per Member State vary from EUR 15.3 billion in Poland to EUR 0.1 billion in Malta (Publications Office of the European Union 2023). The five countries used as examples in this study are among the six countries with the largest available funds.

As the funds available from the SCF should be used for measures in both the transport and buildings sectors (Publications Office of the European Union 2023), we construct three scenarios for the distribution of funds in the two sectors[16]:

[16] The decision on the distribution of funds will be a political one, not based on fixed shares, and will differ between Member States.

- Scenario 1: Share for transport sector = Share of CO_2 emissions from private transport compared to the sum of CO_2 emissions from private transport, heating and cooling[17]
- Scenario 2: Share for the transport sector = 50 % of SCF Funds
- Scenario 3: Share for the transport sector = 25 % of SCF Funds.

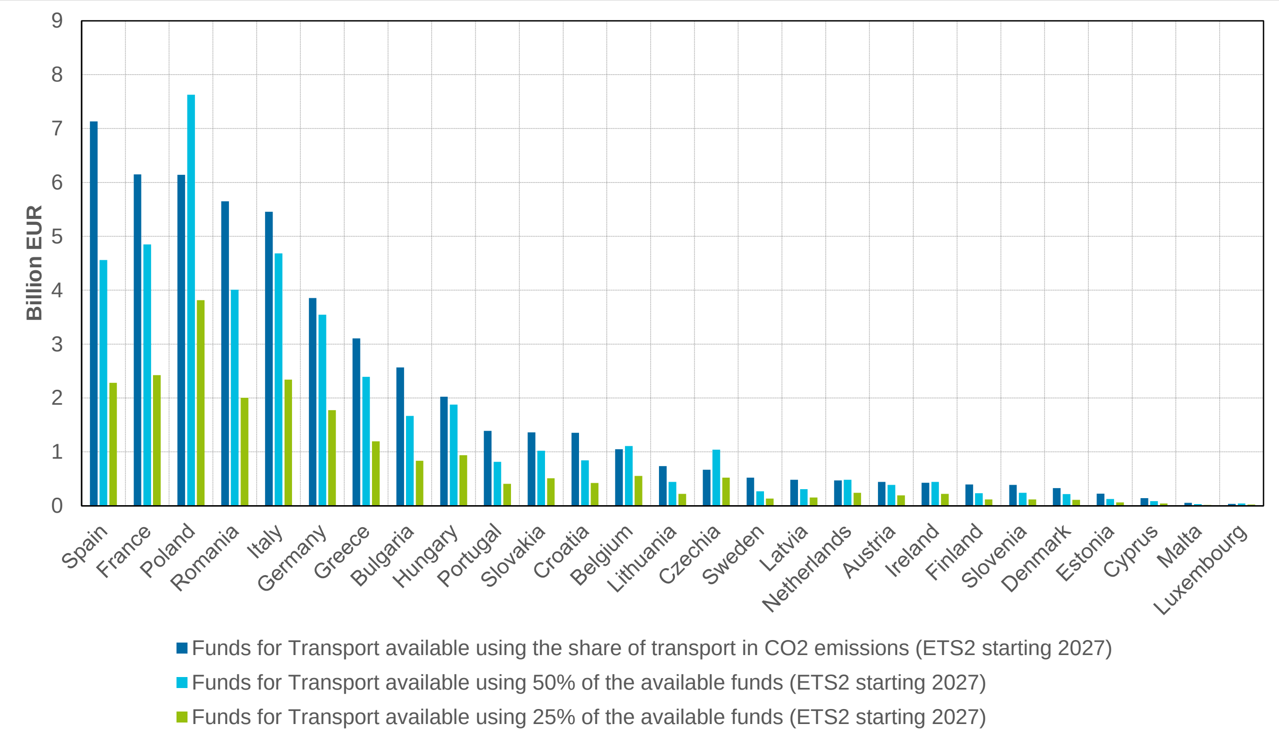
Figure 4-4 (Annex III) shows the share of CO_2 emissions from private transport compared to the sum of CO_2 emissions from private transport, heating and cooling.[18] The shares vary from 89 % in Sweden to 32 % in the Czech Republic. Most countries have a share of more than 50 %. This is also true for Germany, Spain, Italy and France, but not for Poland, which has a share of 40 %. The results indicate that the transition to environmentally friendly transport options is at least as important as the transition in the buildings sector.

Figure 3-3 shows the funds available for transport measures under the three different scenarios. Almost two thirds of the Member States have less than EUR 1.5 billion available in all three scenarios, i.e. around EUR 200 million per year. The five countries Germany, Spain, Italy, France and Poland do not belong to this group. The resources available to them vary between EUR 1.77 billion (Germany - scenario 3) and EUR 7.63 billion (Poland - scenario 2). With the exception of Poland, all these countries have the most available funds in scenario 1 because their share of CO_2 emissions from private transport is higher than 50 %.

[17] As the SCF covers not only households but also micro-enterprises, it should be noted that the share of CO_2 emissions from private transport compared to the sum of CO_2 emissions from private transport, heating and cooling is only a proxy for the emissions in these two sectors caused by the recipients of the SCF money. In addition, data on emissions from private transport include not only road transport but also other modes of transport.

[18] Eden et al. 2023 use a similar approach to compare emissions from the two sectors in the context of the ETS-2.

Figure 3-3: Funds for transport measures available using different scenarios



Source: Oeko-Institut's own calculation based on Eurostat 2019 data [env_ac_ainah_r2] and the Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May 2023.

Note that the presented scenarios do not propose for countries to spend their entire investment budget available for transport on social leasing. They should instead opt for a mix of measures that promote a multimodal 'portfolio' of alternative transport options, such as active mobility (walking and cycling), public transport, mobility on demand, shared mobility services and mobility hubs or mobility credits. Below we assess the potential of a large-scale social leasing scheme in the five countries, knowing that for a scheme of that size additional resources beyond the SCF could be required.

We base our calculation of the number of additional EVs through social leasing financed by SCF funds on two different cost estimates of each social leasing contract for the state. We use EUR 8,000 as an upper limit and EUR 5,000 as a lower limit. The exact price of each contract is difficult to predict as it depends on a variety of factors such as car sizes offered, length of contract, number of selected and available used cars, special contracts with original equipment manufacturers (OEMs) offering cars at cheaper conditions or general changes in EV prices. The higher the subsidy per contract the fewer contracts can be financed with a fixed total budget for the scheme. Therefore, the number of contracts in the scenarios would be reduced accordingly if a higher subsidy is chosen. It should be noted that the subsidy should be chosen so that the monthly lease payment is low enough to be suitable for low-income groups (see Section 3.1).

Table 4-3 (Annex III) shows that the number of contracts available for the period 2027 – 2032 varies considerably under the different funding scenarios and the different contract costs. This is due to the fact that countries' funding through the SCF varies considerably. Spain, France, Poland, Italy and Germany are among the countries with the highest number of contracts offered when comparing the different proportions of the SCF money used, as they have large funds available. Of the five countries, the number of contracts that could be financed varies from 1.5 million (Poland - scenario 2, contract cost EUR 5,000) to 222 thousand (Germany - scenario 3, contract cost EUR 8,000).

Some countries, such as Cyprus, Malta and Luxembourg, could only finance a much smaller number of contracts under these scenarios, ranging from 1.9 to 28.2 thousand. Given that SCF transport resources will also be required for other mobility modes, it may therefore be necessary to access additional funding or to consider other social leasing settings, such as car-sharing options as discussed in Section 3.1, which can serve a larger number of individuals at the same time. The administrative burden of setting up the scheme should be weighed against the benefits, if only a small number of contracts is financed.

Table 3-2 compares the potential number of eligible persons for social leasing with the number of contracts available, based on six different scenarios presented in Table 4-3 (Annex III). The number of eligible persons is based on the four criteria outlined in Section 0: living in a rural area, owning a car, being 18 years or older and belonging to the first 4 (DE and FR) / 5 (ES, IT, PL) income deciles. Based on the different scenarios, the number of eligible persons in the five countries that could be covered varies a lot, depending on the resources used and the subsidy per contract. The lowest scenario result for the number of contracts available is Scenario 3 combined with a subsidy of EUR 8,000 per contract for all countries. In this scenario between 5 % (Germany) and 11 % (Spain) of eligible persons could be covered. The highest scenario result for the number of contracts available is Scenario 1 combined with a subsidy of EUR 5,000 per contract for all countries except for Poland. For Poland it is Scenario 2 combined with a subsidy of EUR 5,000 per contract. In this scenario between 17.5 % (Germany) and 54.9 % (Spain) of eligible persons could be covered. It should be noted that several factors could reduce the actual demand, such as individuals sharing a car, low uptake of the scheme or investment in public transport infrastructure. Therefore, the share of eligible persons with an actual demand for social leasing covered by the scheme could be higher than the share of eligible persons covered shown in Table 3-2. The results in Section 3.3 underline once again that the number of people reached by the scheme depends very much on these specific factors: the amount of funds used for the scheme, the subsidy per contract, the definition of the eligibility criteria and simultaneous developments in the transport sector, e.g. the interplay between social leasing and other policy measures.

Table 3-2: Comparison of supply and demand for social leasing compatible EVs

Country	Eligible persons in million (proxy)	Lowest scenario result for the number of contracts available	Highest scenario result for the number of contracts available	Share of eligible persons covered by contracts available
DE	4.4	221,574	770,981	5.0 % -17.5 %
FR	5.9	303,178	1,229,399	5.1 % - 20.8 %
IT	4.0	292,665	1,091,023	7.3 % - 27.3 %
ES	2.6	284,908	1,426,362	11.0 % - 54.9 %
PL	5.9	476,626	1,525,204	8.1 % - 25.9 %

Source: Oeko-Institut's own calculation based on Eurostat 2019 data [env_ac_ainah_r2] and the Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May 2023.

3.4 Estimating the emission savings and public cost of the social leasing scheme for the countries studied

To gain a better understanding of the potential emission savings and public expenditure, we use the scenarios from the sections above and estimate their impact.

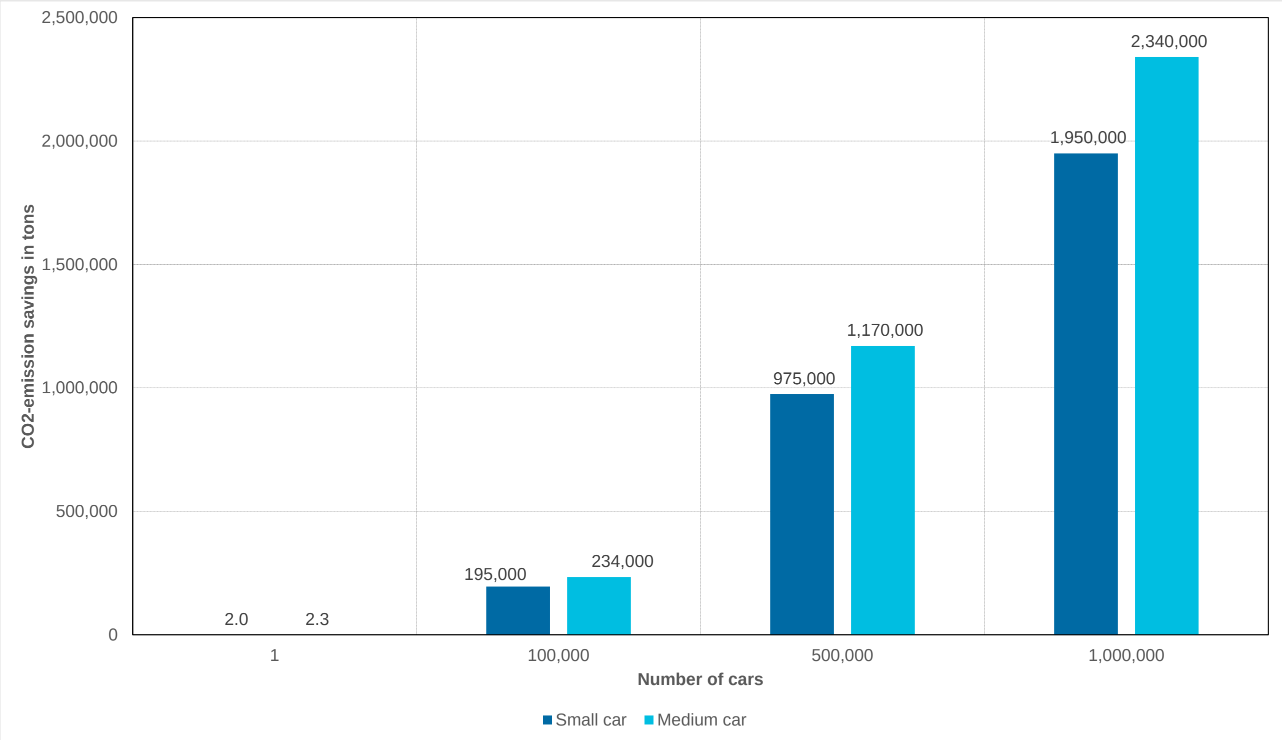
Potential emission savings

In order to calculate the climate mitigation effect, the emissions saved by replacing an internal combustion car with an electric vehicle are taken into account. If the sector logic is retained, electric vehicles are accounted for with zero emissions, also known as the “tank-to-wheel” approach, as the emissions generated during electricity production are attributed to the energy sector. Following this logic, the emissions generated by combustion cars would then be completely offset by the replacement. We do not have any dedicated data sets for determining the average emissions of the vehicle stock in the individual countries. These are dependent on age, average size or the predominant fuels used. We therefore assume average emissions per kilometre of 180 g/km for a medium size car and 150 g/km for a small car for the following rough calculation. These are significantly higher than the emissions documented in recent years for new registrations, as it can be assumed that older and therefore less efficient and cheaper vehicles in particular will be replaced as part of social leasing. For the sake of comparability, a uniform average mileage of 13,000 kilometres[19] per year and exchanged vehicle is also assumed for all countries. Figure 3-4 show the potential emission savings for the number of replaced ICEVs differentiated by size. For each EV that replaces a small size ICEV 2 tons of CO_2 and for each medium size ICEV 2.3 tons of CO_2 (“Tank-to-wheel”) are mitigated each year. Consequently, with 500.000 replaced ICEVs, around 1 to 1.2 megatons of CO_2 would be saved each year based on the “tank-to-wheel” approach[20], depending on the size class.

[19] The mileage driven by private owners has been decreasing for years, at least in Germany, and is currently around 13,000 kilometres.

[20] Further emissions are generated during the production of the vehicles. Electricity emissions also depend on the electricity mix of the respective country. However, according to the “tank-to-wheel” approach and the sector logic, both sources of emissions do not occur in the transport sector and are therefore not considered in this estimation.

Figure 3-4: Potential emission savings per replaced ICEV Car



Source: Oeko-Institut's own calculation based on Eurostat 2019 data [env_ac_ainah_r2] and the Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May 2023.

In order to estimate a potential maximum of emission savings of social leasing in the selected countries, we assume average emissions per kilometre of 170 g/km (mix of small and medium size cars) for the replaced cars. Based on the set mileage and the assumed average emissions of the vehicle fleet to be replaced, the following emission savings per year are shown in Table 3-3, assuming that one vehicle per eligible[21] person is replaced. The results are to be considered as maximum values per year, as the full potential of the eligible persons is utilized. For example, the mitigation effects range from 5.7 megatons of CO_2 for Spain to 13 megatons for France and Poland.

Table 3-3: Maximum emission mitigation potential of social leasing in the selected countries per year

Country	Eligible persons in million (proxy)	Total reduction of emissions ("Tank-to-wheel") in million tons CO_2
DE	4.4	9.7
FR	5.9	13.0
IT	4.0	8.9
ES	2.6	5.7
PL	5.9	13.0

[21] For a detailed derivation of eligibility see Section 3.2.

Source: Oeko-Institut's own calculation based on Eurostat 2019 data [env_ac_ainah_r2] and EU-SILC 2022 data.

Based on the calculations in Section 3.3 and the funds available in the Social Climate Fund, this results in significantly lower emission savings, which are shown in the following Table 3-4 for two different subsidy levels for each country. The calculation shows estimates for the year 2030 and is based on scenario 1, which assumes that the Social Climate Fund resources are split between transport and housing sector based on their present share of CO_2-emissions. Based on EUR 5,000 state leasing subsidy per contract, this results in 0.5 to 1 million combustion vehicles being replaced by an EV in the timeframe from 2026 to 2030, which in turn leads to an emissions reduction of 1.2 to 2.1 megatons in 2030. Assuming the significantly higher subsidy of EUR 8,000 per contract, the number of vehicles replaced and thus the emissions saved is significantly reduced. This shows that the potential emissions savings depend heavily on the actual implementation design of the social leasing scheme.

Table 3-4: Emission mitigation potential of social leasing in the selected countries in 2030

Country	I: Number of replaced vehicles with EUR 5,000 subsidy in millions	I: Total reduction of emissions ("Tank-to-wheel") in million tons CO_2	II: Number of replaced vehicles with EUR 8,000 subsidy in millions	II: Total reduction of emissions ("Tank-to-wheel") in million tons CO_2
DE	0.53	1.17	0.33	0.73
FR	0.84	1.86	0.53	1.16
IT	0.75	1.65	0.47	1.03
ES	0.98	2.16	0.61	1.34
PL	0.84	1.86	0.53	1.16

Source: Oeko-Institut's own calculation.

Public expenditure

In addition to utilising the Social Climate Fund, the countries are free to introduce a social leasing scheme or expand an existing one and feed it with additional money. Based on the subsidised amount per contract in the social leasing scheme and the number of eligible persons, this results in costs to be borne by the state. Table 3-5 shows the maximum public expenditure for two given maximum amounts per social leasing contract calculated according to the eligible persons per country from Section 3.2. If the state subsidises EUR 8,000 per contract, the total costs for the public sector based on the eligible persons per country range from EUR 20.8 billion (Spain) to EUR 47.2 billion (Poland & France). If the state reduces the subsidy to EUR 5,000 per contract, costs of EUR 13 to 29.5 billion are still incurred, depending on the country. It should be emphasised once again that these figures are heavily dependent on the eligibility criteria and the actual demand may be lower due to e.g. individuals sharing a car, low uptake of the scheme or investment in public transport infrastructure. The figures emphasise that a scheme aimed at reaching all eligible persons would require a very large amount of financial resources to be activated. Countries should therefore consider complementing the development of a social leasing scheme with other transport measures, such as investment in public transport, to provide a cost-effective solution to the transport needs of the target group.

Table 3-5: Maximum of public expenditure for social leasing for selected countries based on eligibility criteria

Country	Eligible persons in million (proxy)	Total state subsidy at a rate of EUR 8,000 per contract in billion	Total state subsidy at a rate of EUR 5,000 per contract in billion
DE	4.4	35.2	22.0
FR	5.9	47.2	29.5
IT	4.0	32.0	20.0
ES	2.6	20.8	13.0
PL	5.9	47.2	29.5

Source: Oeko-Institut's own calculation.

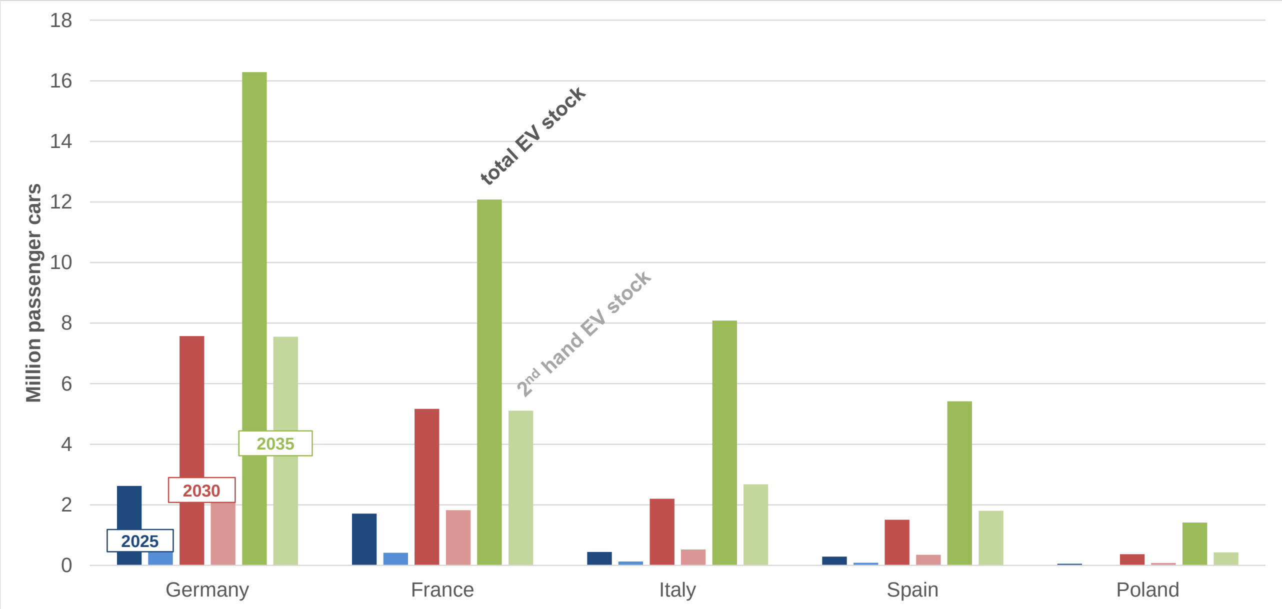
3.5 The impact of social leasing on electrification of the national car fleets

Development of the EV stock in a scenario without social leasing

In the scenario without social leasing, the number of EVs increases steadily in the selected Member States. This steady increase is mainly due to the EU CO_2 emission performance standards for cars and vans that secure a certain supply of EVs on new vehicle market in the EU. As these standards refer to the new vehicle market in the entire EU, the ramp-up of EVs in the respective national new vehicle markets can differ depending on the respective national conditions. By 2030, Transport & Environment estimates the number of EVs to reach 7.6 million in Germany, 5.2 million in France, 2.2 million in Italy, 1.5 million in Spain, and 0.4 million in Poland. Against the background of the respective national vehicle fleet profiles (see Section 2.1) these numbers reflect the considerably different speed of electrification of the passenger car fleet among the selected Member States.

Increasing EV market shares on the new vehicle market mean that the supply of second-hand vehicles increases accordingly, still with a lag of a few years. At the end of the holding period of the first owner (private household or company/public institution) these vehicles enter the second-hand vehicle market. On the second-hand market, they make up the supply of cheaper EVs and constitute a viable alternative to rising costs of fossil fuels for lower- and medium-income households that typically purchase a used rather than a new one. In Member States without many used vehicle imports, the supply of second-hand vehicles is largely determined through the country's new vehicle market. Among the selected Member States, this is the case for Germany, France, Italy, and Spain. For Member States with many used vehicle imports, the supply of second-hand vehicles is determined by both the new vehicle market and the used vehicle imports. Among the selected Member States, this is the case for Poland (Held et al. 2021). As described in Section 2.1, of the around 1.2 million cars that entered the Polish vehicle stock in 2023 around 60 percent were used vehicle imports and 40 percent were new vehicle registrations. Since these imported used vehicles are rather old the supply of second-hand EVs for lower- and medium-income households in Poland is likely to lag several years behind the supply in the other selected Member States. Figure 3-5 shows the development of the total and second-hand EV stock in the selected Member States for the scenario years 2025, 2030, and 2035. To simplify matters and based on Element Energy (2021), EVs aged four or older are assumed second-hand vehicles in the remainder of the report.[22] Table 4-4 in Annex IV provides the respective stock data.

Figure 3-5: Development of the total and second-hand EV stock in the selected Member States (without social leasing)



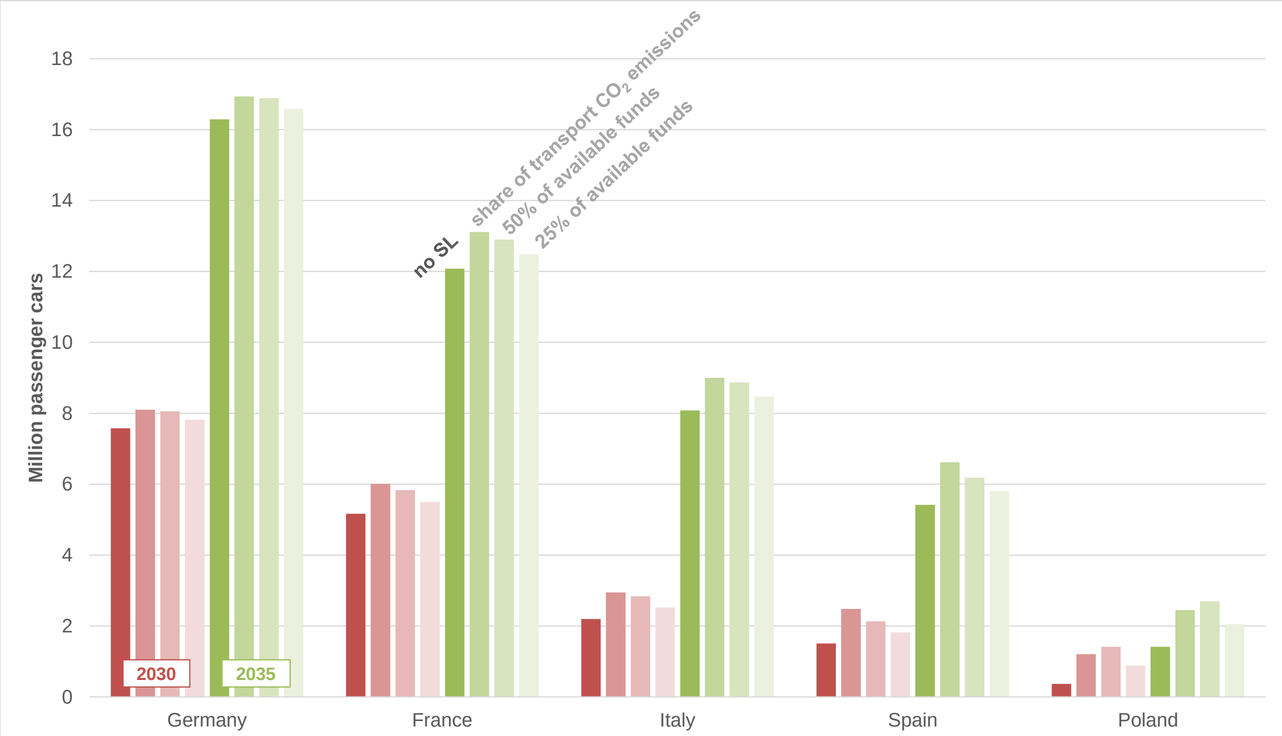
Source: Oeko-Institut's own illustration based on T&E fleet modelling data

<u>Additional EVs because of social leasing</u>

In the following, social leasing is assumed to be implemented in the selected Member States for the years 2026 to 2032. Based on the three scenarios for the distribution of SCF funds presented in Section 3.3 the number of contracts that can be supported are taken directly as the number of additional new registrations in the respective new vehicle markets. For each year during the period from 2026 to 2032, social leasing is assumed to increase the number of new EV registrations evenly. By means of assumed vehicle survival rates of these additional new EVs the impact of social leasing on the EV stock for the scenario years 2030 and 2035 is estimated. Figure 3-6 shows this impact of social leasing on the total EV stock in the selected Member States given a contract price of EUR 5,000.

[22] Average holding durations of the first owner typically differ between owner type, i.e. private household or company/public institution.

Figure 3-6: Impact of social leasing on the development of the total EV stock in the selected Member States (EUR 5,000 contract)

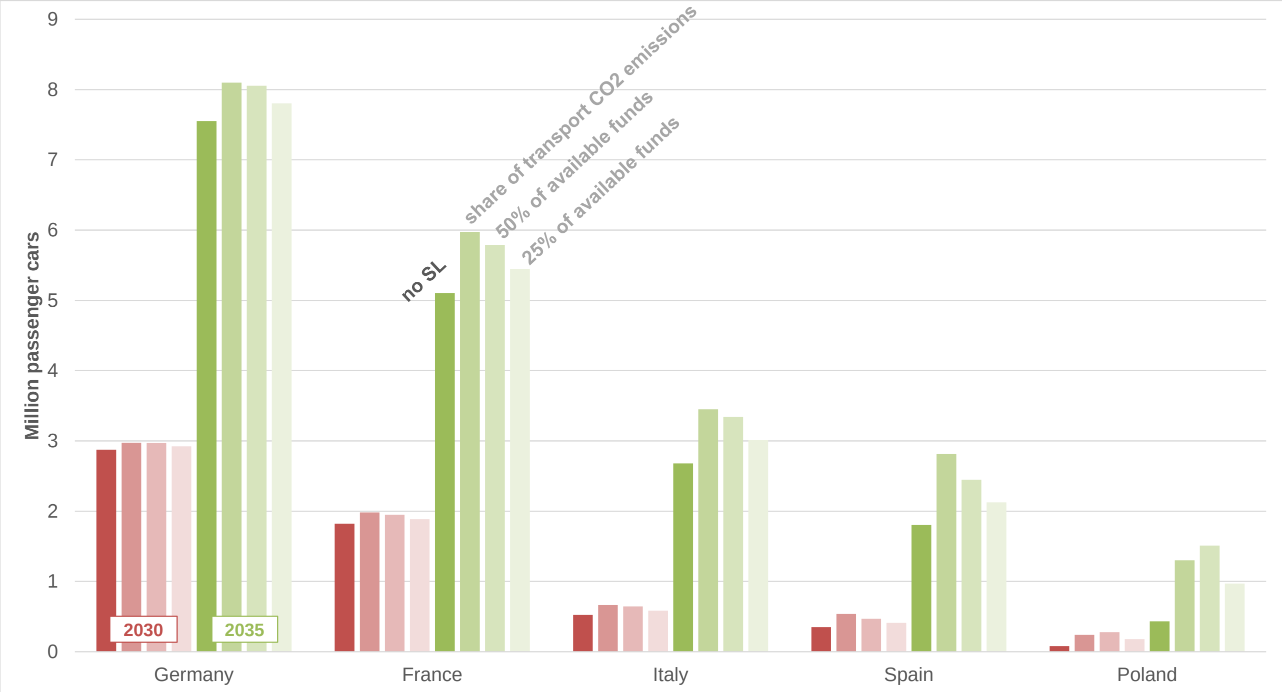


Source: Oeko-Institut's own illustration and calculation based on T&E fleet modelling data

The impact of social leasing differs considerably among the selected Member States. In Germany, the number of contracts that can be supported and, thus, the number of additional new EVs is the lowest in all three funding scenarios. Consequently, the number of additional EVs in the German car stock due to social leasing is the lowest for the scenario years 2030 and 2035. In Germany, the impact of social leasing on the EV stock in 2030 ranges from 0.2 million (25 percent of available funds) to 0.5 million (share of transport CO_2 emissions). In 2035, the impact of social leasing ranges from 0.3 million (25 percent of available funds) to 0.6 million (share of transport CO_2 emissions). In Poland, on the other hand, the impact of social leasing is the largest for two funding scenarios. In 2030, this impact amounts to 0.5 million (25 percent of available funds) and 1.0 million (50 percent of available funds). In 2035, social leasing results in 0.6 million (25 percent of available funds) and 1.3 million additional EVs in the Polish vehicle fleet (50 percent of available funds). For the share of transport CO_2 emissions scenario, the impact of social leasing is the largest in Spain with 1.0 million in 2030 and 1.2 million in 2035. For all impacts for the selected Member States, years, and funding schemes see Table 4-5 in Annex IV.

The number of additional new EVs due to social leasing in the period from 2026 to 2032 translates into an increasing number of used EVs in the respective national fleets a few years later. Again, by means of assumed vehicle survival rates of these additional new EVs the impact of social leasing on the used EV stock for the scenario years 2030 and 2035 is estimated. Figure 3-7 shows this impact of social leasing on the used EV stock in the selected Member States given a contract price of EUR 5,000.

Figure 3-7: Impact of social leasing on the development of the second-hand EV stock in the selected Member States (EUR 5,000 contract)



Source: Oeko-Institut's own illustration and calculation based on T&E fleet modelling data

For 2030, the impact of social leasing on the second-hand EV stock is small in all selected Member States. As mentioned above, this is because EVs aged four or older are assumed second-hand vehicles in this report. Consequently, only the vehicles that were first registered in 2026 due to social leasing will have transferred to the second-hand EV stock by 2030. The impact ranges from 0.05 million in Germany (25 percent of available funds) to 0.2 million in Poland (50 percent of available funds). By 2035, all EVs that entered the vehicle fleets between 2026-2031 will have transferred to the second-hand EV stock. Consequently, the impact of social leasing on the second-hand EV stock is larger in 2035 compared to 2030. The impact ranges from 0.3 million in Germany (25 percent of available funds) to 1.1 million in Poland (50 percent of available funds). Compared to the Polish second-hand EV stock without social leasing this impact constitutes a considerable increase. For all impacts for the selected Member States, years, and funding schemes see Table 4-6 in Annex IV.

Varying the price of the social leasing contracts changes the impacts on the total and second-hand EV stocks in 2030 and 2035 accordingly. Increasing the contract price from EUR 5,000 to EUR 8,000 reduces the number of contracts available under the different funding scenarios. Consequently, the number of additional EVs due to social leasing reduces in the same way. The relation of the impacts of social leasing between the Member States remains the same. The impact is smallest in Germany and largest in Poland. For all impacts for the selected Member States, years, and funding schemes see Annex IV.

3.6 The role of social leasing in the five countries

The results in Section 3 indicate that the identified need for support based on four vulnerability criteria

- Rhythm of electrification
- Car dependency
- Social risk because of rising fuel prices
- Proportion of the population that will face difficulties in switching to an EV

in Section 2.3 could be addressed by a social leasing scheme.

In **Germany**, the high level of car dependency is identified as one major issue leading to a high risk of vulnerability during the transition to EVs. This risk may not necessarily manifest itself if other transport options are available and accessible. For people who do not have other transport options available and accessible, and who do not have the means to afford the transition to EVs, social leasing can help to cope with high fossil fuel prices, enable participation in social life and provide sustainable mobility solutions. To ensure that social leasing does not accelerate car use, the availability of public transport is one important eligibility criterion to consider (Section 3.1).

In **France**, social risk due to rising fuel prices is the highest ranked vulnerability criterion. Vulnerability due to high fossil fuel prices is even more directly linked to lack of financial resources than vulnerability due to car dependency, although the two criteria are closely linked. Section 2 shows that low-income groups are at the highest risk of being negatively affected by high fuel prices and at the same time face the greatest difficulties in affording a switch to an electric vehicle. Social leasing can be a solution to avoid fossil lock-in for this group. Evaluations of the current social leasing scheme show that in order to effectively target low-income groups, a lower income threshold should be adapted as an eligibility criterion (Section 3.1).

In **Italy** all four vulnerability criteria show a high need for support during the EV transition. As **Italy** has a particularly large proportion of the population that will have difficulties in switching to an EV due to financial constraints, a large social leasing scheme combined with additional policy measures to accelerate the availability of transport alternatives could be of interest. Also, social leasing sharing schemes could be a solution to target small communities in an efficient way, supporting a large number of people with comparatively small resources (Section 3.1) In addition, a purchase option could be guaranteed so that individuals benefit from the subsidy in the longer term. For the purchase option to be feasible for a large proportion of the eligible group, it would be particularly beneficial in Italy to focus on smaller, cheaper EVs to be included in the scheme.

In **Spain** all vulnerability aspects show a ranking of equal importance. As none of the selected indicators presented in this study stand out in Spain, and therefore there is no clear focus on a challenge of existing or emerging vulnerabilities in the EV transition, it is particularly important for Spain to find a comprehensive policy strategy that addresses several challenges at once. Social leasing can be one measure to address the four vulnerability aspects raised but should be supported by measures to create a multimodal 'portfolio' of alternative transport options, such as active mobility (walking and cycling) or public transport. This also applies to the other countries, of course.

Also in **Poland**, we find high values in all four vulnerability criteria, but the rating is particularly high in the category “Rhythm of electrification”. Data shows that especially for Poland, social leasing could play an important role in fleet electrification and accelerate the second-hand market for EVs (Section 3.5). When more second-hand EVs are available on the market the share of the population that will have difficulties in switching to an EV due to financial constraints is expected to decrease (Section 2.2). The effects of social leasing on the fleet electrification and the second-hand EV market will be greatest if large funds are available to implement the measure, such as money from the SCF or the Recovery and Resilience Facility (Section 3.3).

In all five countries, the inclusion of other types of vehicles in the scheme, such as bicycles or cargo bikes, could be beneficial to address different vulnerability risks and provide alternatives to car use. In addition, a sufficient mix of other measures to promote other modes of transport, such as public transport or active mobility, should be implemented to create alternatives. Social leasing of cars only may be the first best option for individuals who do not have the financial means to switch to an EV and have no other viable transport options. For all others, alternatives such as public transport or active mobility are more appropriate as they are expected to be cheaper and more environmentally friendly.

4 Conclusion and Outlook

The aim of the study is to analyse (1) the need for support in the EV transition and (2) the potential of social leasing schemes in the five different countries Germany, France, Italy, Spain and Poland.

We assess the need for social support in the EV transition based on four vulnerability criteria, using both published data and our own modelling. The main findings for each of the vulnerability criterium can be summarised as follows:

1. Rhythm of electrification (Section 2.1)
   We find that a rapid EV transition in the five selected Member States Germany, Spain, France, Italy and Poland is hampered by the fact that passenger cars have a long average lifetime. Consequently, we find a low share of EVs in the passenger car stock in these countries, even though the sales of electric vehicles are growing slowly but steadily. As a result, there is currently no sufficient second-hand market in place to offer cheap EVs.

2. Car dependency (Section 2.1)
   High car dependency combined with a low share of the population using public transport regularly is a problem in all five countries. More importantly, we observe high levels of forced car ownership, suggesting that a large proportion of the population may be cutting back elsewhere in order to afford their car ownership, as there are no other viable transport options.

3. Social risk because of rising fuel prices (Section 2.1)
   In all five countries, low-income car-owning households are the most vulnerable to rising fossil fuel prices, as they have the highest share of fuel expenditure in total expenditure and at the same time lack the means to switch to an EV.

4. Proportion of the population that will face difficulties in switching to an EV (Section 2.2)
   Due to the high price of EVs, a large proportion of the population will find it difficult to afford an EV by 2030 and 2035. This is particularly true for households in the lowest third of the income distribution as our modelling results indicate that they will face large difficulties in switching to a used or new EV in 2030 and 2035 without support.

While aspects of all four vulnerability criteria are present in all five countries, country-specific challenges can be identified looking at the indicators and data presented in the first section of the report. Germany shows a high level of vulnerability in the EV transition, mainly because of high “car dependency”. In Italy there is a high level of vulnerability in the category “Proportion of the population will face difficulties in switching to an EV” and in Poland in the category “Rhythm of electrification”. France shows a high level of vulnerability in the EV transition, mainly because of “Social risk because of rising fuel prices”. All aspects are of equal importance for Spain (Section 2.3).

There is a strong link between the four vulnerability criteria, manifested in the availability of cheap (used) EVs, the availability of transport alternatives to a car, and the financial capacity to respond to rising fuel prices by switching to an EV. In order to avoid fossil lock-in of lower income groups, EV prices need to come down or suitable transport alternatives need to be made available to those who currently have to rely on a car. Countries therefore need to implement policies to create a multimodal 'portfolio' of transport options, such as active mobility (walking and cycling) or public transport. Social leasing can be part of this portfolio, particularly for those who need to rely on the car for their daily mobility needs but do not have the means to switch to an electric vehicle. Therefore, the potential of social leasing is assessed in the report.

In the second part of the study, we collect and analyse suitable design options for social leasing and their impacts. We start by discussing possible options for the implementation of social leasing and their respective advantages and disadvantages based on insights and reflections from interviews with transport experts. The income threshold, as well as regional aspects of the availability of transport alternatives, are identified as important factors to consider in the eligibility criteria of a potential scheme. The types of vehicles to be included in a social leasing scheme depend on several factors, such as the needs of the target population, the price of the vehicles or environmental criteria. The decision on the design and the governance of a potential scheme will depend on factors, such as implementation effort and cost, available charging infrastructure, public acceptance and industrial policy. Countries should rely on analyses of social needs during the EV transition to find an appropriate design for a social leasing scheme (Section 3.1).

To assess the impact of different possible implementation options for social leasing we construct different scenarios based on a set of eligibility criteria, three different funding options and two different subsidies per contract. Based on these scenarios we calculate the potential demand for social leasing (Section 3.2), the potential number of additional EVs on the market (Section 3.3), the potential emission savings and public costs (Section 3.4) as well as the potential impact of social leasing on the electrification of the national car fleets (Section 3.5).

Using similar eligibility criteria for social leasing as the French scheme, we find a high number of eligible persons in each of the countries, respectively 4.4 million persons in Germany, 2.6 million in Spain, 5.9 million in France, 4 million in Italy and 5.9 million in Poland. Of course, the actual demand for the scheme may be reduced by several factors, such as individuals sharing a car or investment in public transport infrastructure (Section 3.2). If countries want to meet the potential demand on the basis of eligibility criteria similar to the French social leasing scheme, the public cost is likely to be high (Section 3.4). Countries will therefore need to consider how best to use the available resources to target those most in need.

The potential number of additional EVs on the market (Section 3.3), the potential emission savings (Section 3.4), as well as the potential impact of social leasing on the electrification of the national car fleets (Section 3.5) depend very much on the specific set-up of a potential social leasing scheme, i.e. the amount of funds used for the scheme and the subsidy per contract, which is responsible for the number of contracts issued. The resulting emission reduction potential can be as high as several megatons/year, if large funds are used and the programme is not used to finance an additional car. In addition, issuing a large number of social leasing contracts can have a noticeable impact on the electrification of national car fleets and on the stock of second-hand EVs. In countries like Poland, where the development of the (second-hand) EV stock is largely dependent on imports and is therefore likely to lag several years behind the supply in the other selected Member States, social leasing can be a relevant measure to accelerate the increase of the (second-hand) EV stock.

Finally, we assess the potential role of social leasing for the five countries. We find that social leasing has the potential to address the different vulnerabilities during the EV transition, but a country-specific design of a social leasing scheme is essential to make the best use of the funds spent and to target those most in need. While the affordability of EVs will be a key issue in the coming years, social leasing has the potential to provide access to the EV transition for low- and middle-income households without large savings or sufficient financial means to purchase an EV, thus reducing the risk of fossil lock-in for the beneficiaries. At the same time, social leasing of cars only may be the first best option for individuals who do not have the financial means to switch to an EV and have no other viable transport options. For all others, alternatives such as public transport or active mobility are more appropriate, as they are expected to be cheaper and more environmentally friendly. Countries should therefore implement an appropriate mix of measures to ensure that a multimodal 'portfolio' of transport options is available, providing appropriate transport options for all needs.

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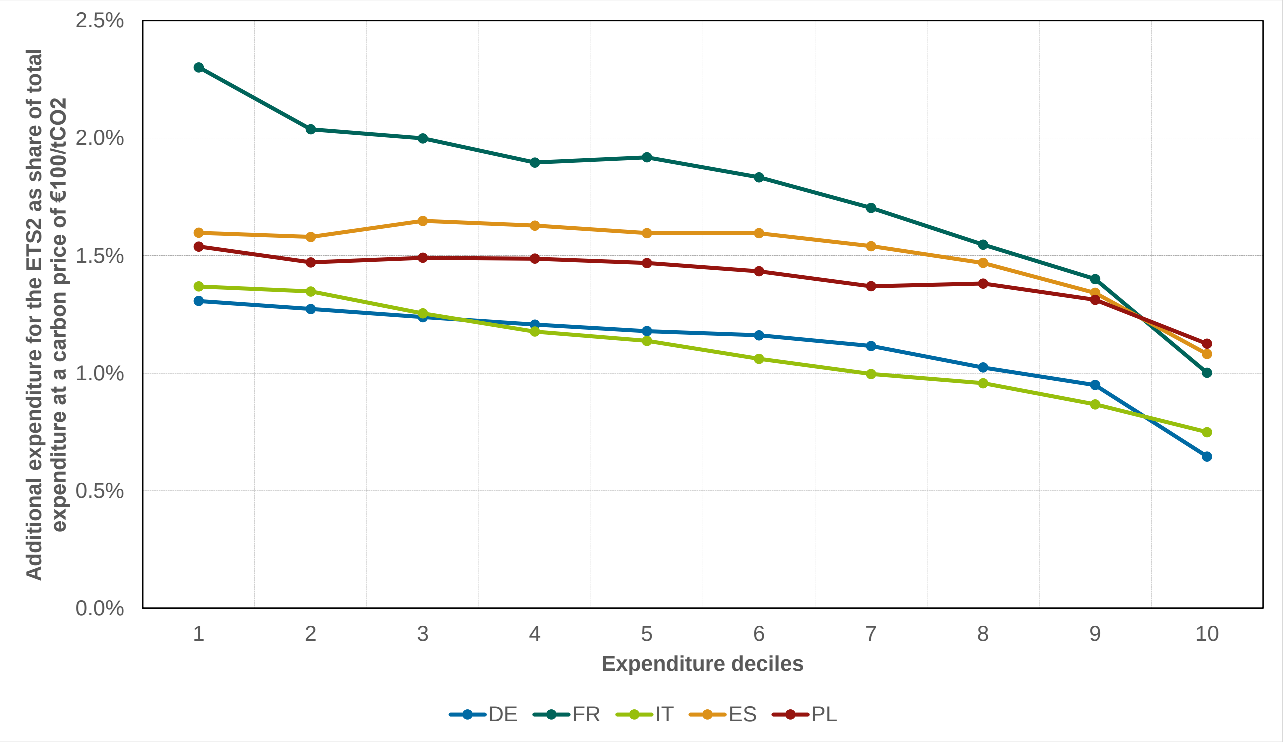
Annex

Annex I.

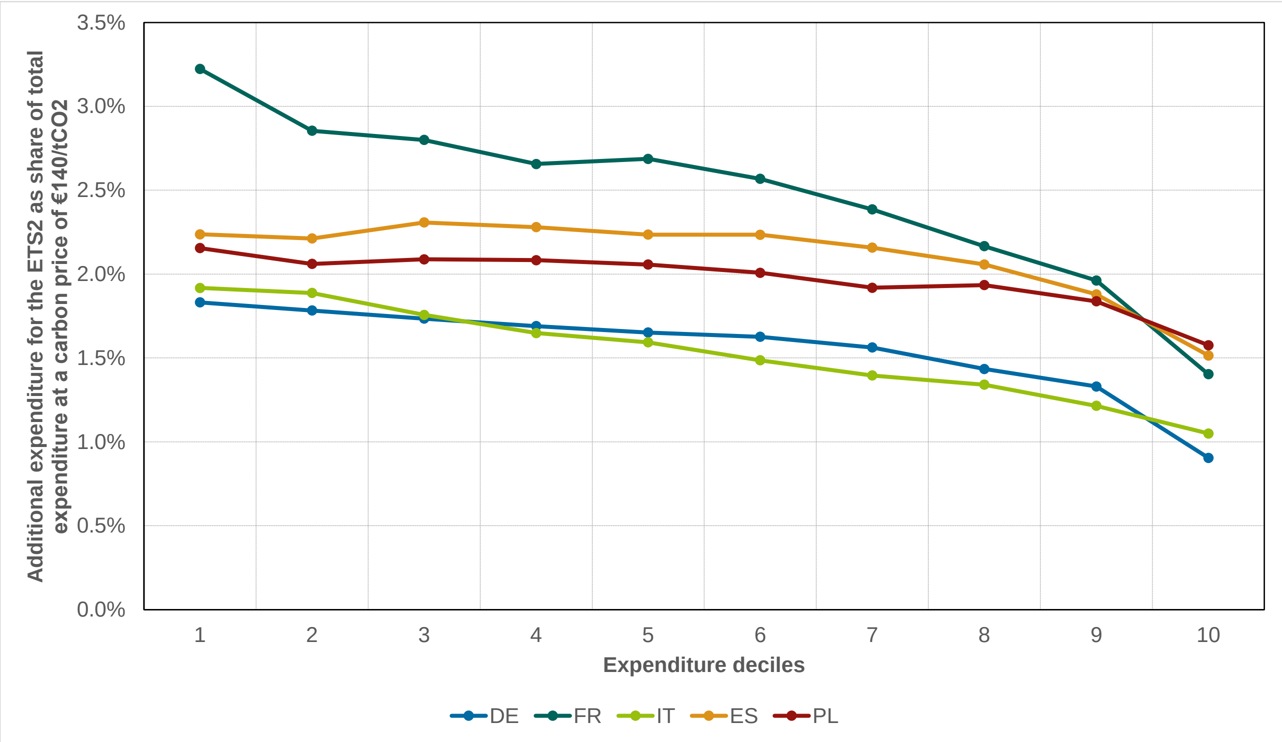
Figure 4-1: Additional expenditure for the ETS-2 as share of total expenditure at a carbon price of EUR 100/t CO_2



Source: Oeko-Institut's own calculation using the microsimulation model SEEK-EU based on HBS 2015 data.

Notes: Ceteris paribus analysis, no behavioural change considered. Sample restricted to households with diesel and/or petrol expenditure. Expenditure deciles are weighted using the modified OECD scale and have the same number of individuals in each decile (not the same number of households).

Figure 4-2: Additional expenditure for the ETS-2 as share of total expenditure at a carbon price of EUR 140/t CO_2



Source: Oeko-Institut's own calculation using the microsimulation model SEEK-EU based on HBS 2015 data.

Notes: Ceteris paribus analysis, no behavioural change considered. Sample restricted to households with diesel and/or petrol expenditure. Expenditure deciles are weighted using the modified OECD scale and have the same number of individuals in each decile (not the same number of households).

Annex II.

Table 4-1: Thresholds used in the calculation of 2.2.

Country	Threshold					
	1.Tercile		2. Tercile		3.Tercile	
	Used	New	Used	New	Used	New
Germany	0.15	-	0.13	0.63	0.49	0.91
France	0.26	-	0.29	0.57	0.32	0.51
Italy	0.23	-	0.22	0.62	0.21	0.40
Spain	0.21	-	0.21	0.62	0.21	0.49
Poland	0.22	-	0.21	0.61	0.66	1.11

Source: Oeko-Institut's own calculation based on HBS2015 data.

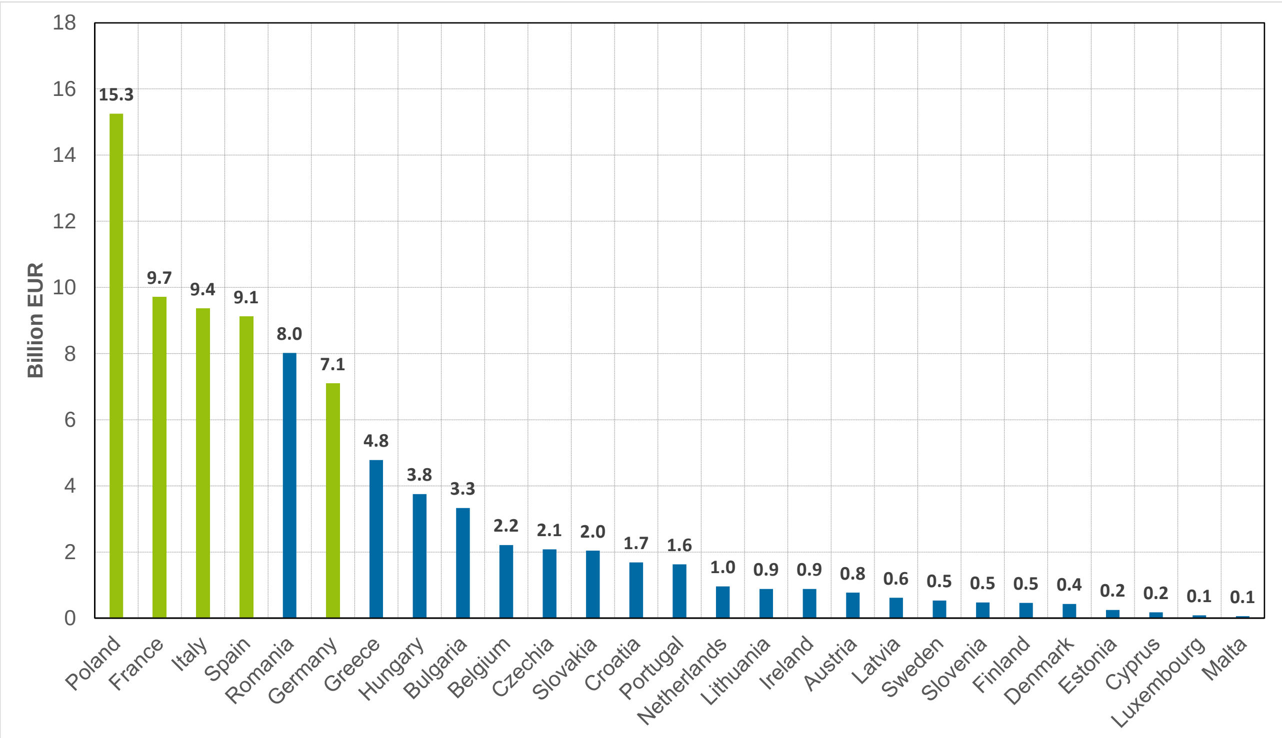
Table 4-2: Car prices used in the calculation of 2.2.

Prices in Euro2023	Car size		
	Small	Medium	Large
Used			
2030	9,700	11,200	25,100
2035	10,300	11,600	25,500
New			
2030	24,300	28,000	62,800
2035	25,820	29,100	63,500

Source: Oeko-Institut's own calculation based on TEMPS Model Output for new cars. Used car prices are calculated as 40 % of the price for respective new car.

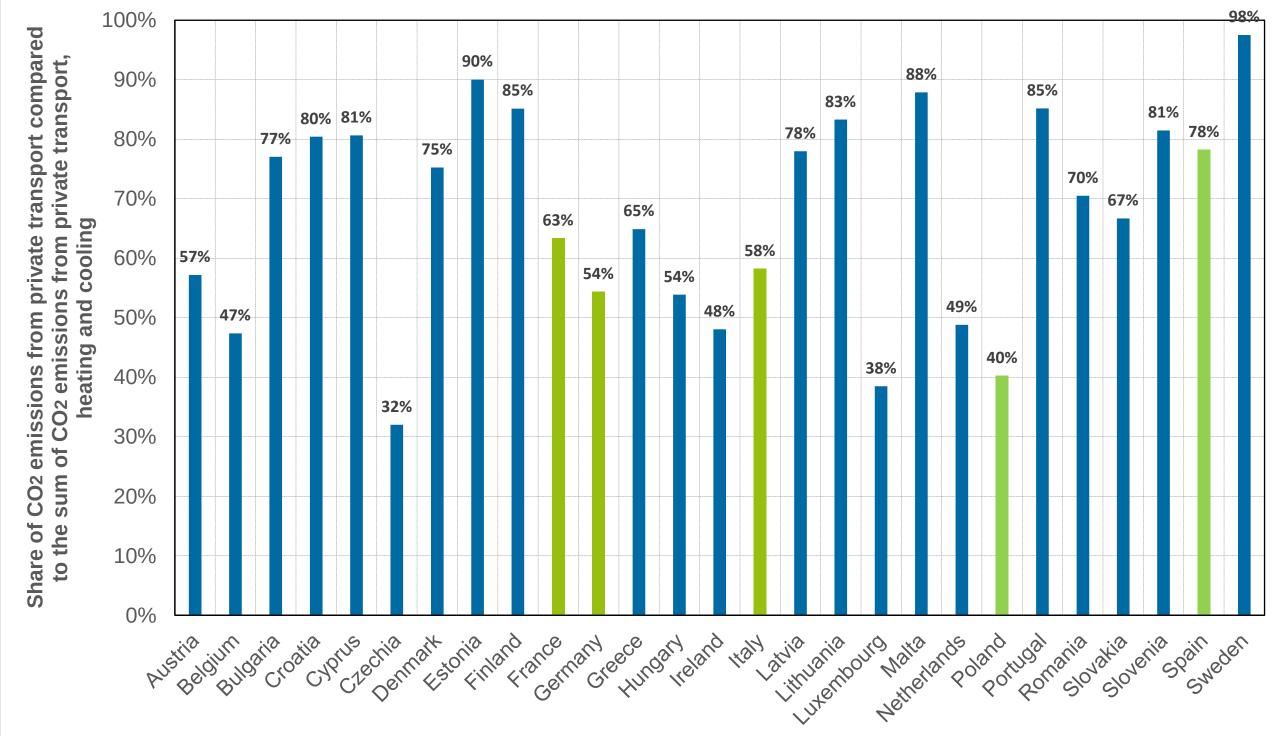
Annex III.

Figure 4-3: Total funds available from the SCF including national co-financing (25 %) 2026-2032 (ETS-2 starting 2027)



Source: Oeko-Institut's own compilation based on the Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May 2023.

Figure 4-4: Share of CO_2 emissions from private transport compared to the sum of CO_2 emissions from private transport, heating and cooling



Source: Oeko-Institut's own calculation based on Eurostat 2019 data [env_ac_ainah_r2].

Table 4-3: Number of contracts available using different SCF funding scenarios

Country	Assumption: each contract costs EUR 8,000			Assumption: each contract costs EUR 5,000		
	Number of contracts (Scenario 1)	Number of contracts (Scenario 2)	Number of contracts (Scenario 3)	Number of contracts (Scenario 1)	Number of contracts (Scenario 2)	Number of contracts (Scenario 3)
Austria	55,172	48,245	24,122	88,275	77,191	38,596
Belgium	130,991	138,301	69,150	209,585	221,281	110,640
Bulgaria	320,890	208,291	104,145	513,424	333,265	166,633
Croatia	169,297	105,256	52,628	270,876	168,410	84,205
Cyprus	17,634	10,934	5,467	28,215	17,494	8,747
Czechia	83,377	130,218	65,109	133,403	208,349	104,175
Denmark	40,746	27,083	13,541	65,193	43,332	21,666
Estonia	27,938	15,520	7,760	44,701	24,833	12,416
Finland	49,393	29,011	14,506	79,030	46,418	23,209

Country	Assumption: each contract costs EUR 8,000			Assumption: each contract costs EUR 5,000		
	Number of contracts (Scenario 1)	Number of contracts (Scenario 2)	Number of contracts (Scenario 3)	Number of contracts (Scenario 1)	Number of contracts (Scenario 2)	Number of contracts (Scenario 3)
France	768,374	606,357	303,178	1,229,399	970,171	485,086
Germany	481,863	443,148	221,574	770,981	709,037	354,519
Greece	387,937	298,904	149,452	620,699	478,246	239,123
Hungary	252,888	234,664	117,332	404,621	375,462	187,731
Ireland	53,135	55,283	27,641	85,016	88,452	44,226
Italy	681,889	585,331	292,665	1,091,023	936,529	468,265
Latvia	60,264	38,640	19,320	96,422	61,824	30,912
Lithuania	92,187	55,348	27,674	147,499	88,556	44,278
Luxembourg	4,240	5,509	2,754	6,784	8,814	4,407
Malta	6,663	3,792	1,896	10,661	6,067	3,033
Netherlands	58,629	60,039	30,019	93,806	96,062	48,031
Poland	767,741	953,252	476,626	1,228,386	1,525,204	762,602
Portugal	173,594	101,930	50,965	277,750	163,087	81,544
Romania	706,404	501,056	250,528	1,130,246	801,690	400,845
Slovakia	170,058	127,546	63,773	272,092	204,074	102,037
Slovenia	48,605	29,831	14,915	77,767	47,730	23,865
Spain	891,476	569,815	284,908	1,426,362	911,705	455,852
Sweden	65,065	33,366	16,683	104,104	53,385	26,692

Source: Oeko-Institut’s own calculation based on Eurostat 2019 data [env_ac_ainah_r2] and the Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May 2023.

Annex IV.

Table 4-4: Development of the total and second-hand EV stock in the selected Member States (without social leasing) (in million)

Country	2025		2030		2035	
	Total EVs	2nd hand EVs	Total EVs	2nd hand EVs	Total EVs	2nd hand EVs
Germany	2.6	0.6	7.6	2.9	16.3	7.6
France	1.7	0.4	5.2	1.8	12.1	5.1
Italy	0.4	0.1	2.2	0.5	8.1	2.7
Spain	0.3	0.1	1.5	0.4	5.4	1.8
Poland	0.1	0.01	0.4	0.1	1.4	0.4

Source: T&E fleet modelling data.

Table 4-5: Additional EVs in the passenger car stock due to social leasing (EUR 5,000 contract) (in million)

Country	2030			2035		
	Transport Share	50 % of funds	25 % of funds	Transport Share	50 % of funds	25 % of funds
Germany	0.5	0.5	0.2	0.6	0.6	0.3
France	0.8	0.7	0.3	1.0	0.8	0.4
Italy	0.7	0.6	0.3	0.9	0.8	0.4
Spain	1.0	0.6	0.3	1.2	0.8	0.4
Poland	0.8	1.0	0.5	1.0	1.3	0.6

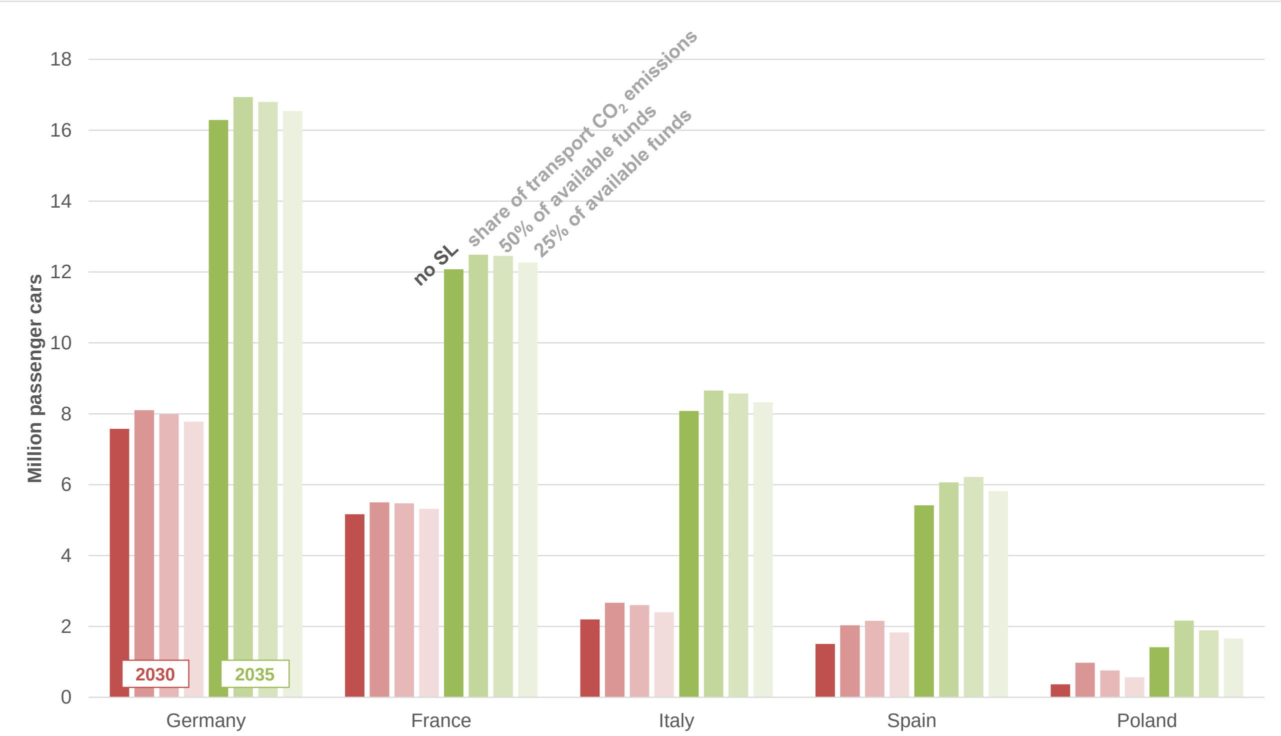
Source: Oeko-Institut's own calculation.

Table 4-6: Additional second-hand EVs in the passenger car stock due to social leasing (EUR 5,000 contract) (in million)

Country	2030			2035		
	Transport Share	50 % of funds	25 % of funds	Transport Share	50 % of funds	25 % of funds
Germany	0.10	0.09	0.05	0.5	0.5	0.3
France	0.16	0.13	0.06	0.9	0.7	0.3
Italy	0.14	0.12	0.06	0.8	0.7	0.3
Spain	0.19	0.12	0.06	1.0	0.6	0.3
Poland	0.16	0.20	0.10	0.9	1.1	0.5

Source: Oeko-Institut's own calculation.

Figure 4-5: Impact of social leasing on the development of the total EV stock in the selected Member States (EUR 8,000 contract)



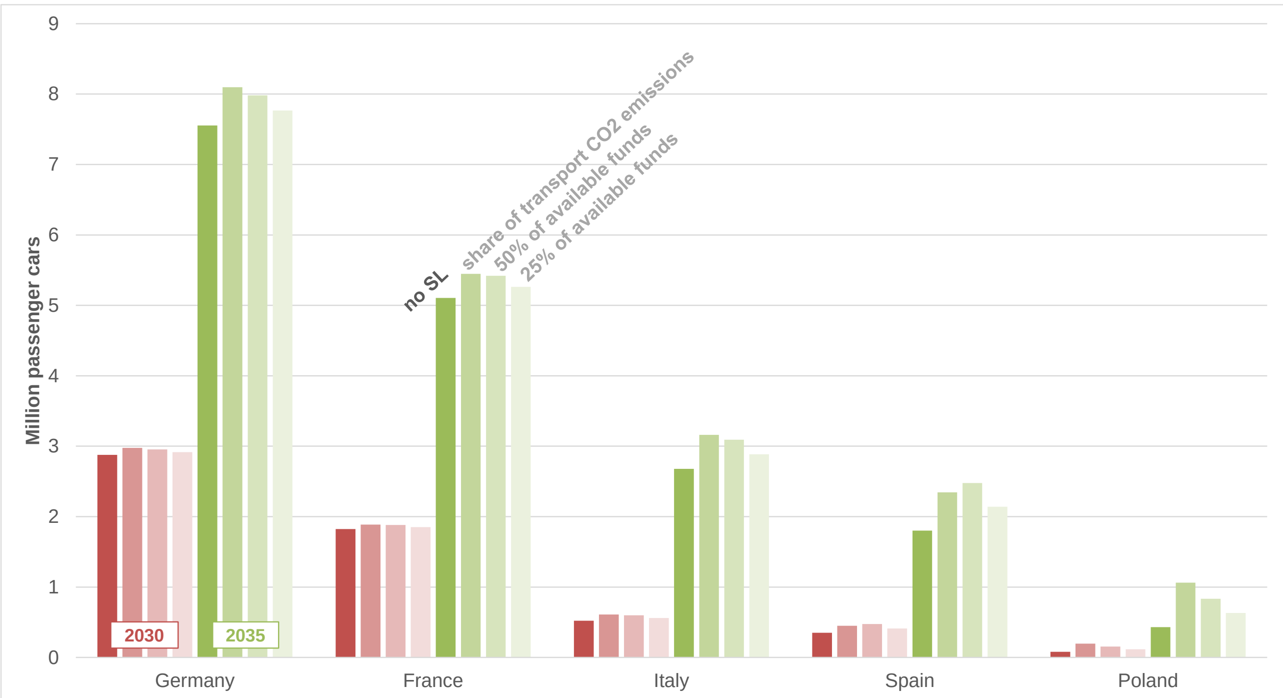
Source: Oeko-Institut's own illustration and calculation based on T&E fleet modelling data.

Table 4-7: **Additional EVs in the passenger car stock due to social leasing (EUR 8,000 contract) (in million)**

Country	2030			2035		
	Transport Share	50 % of funds	25 % of funds	Transport Share	50 % of funds	25 % of funds
Germany	0.3	0.3	0.2	0.4	0.4	0.2
France	0.5	0.4	0.2	0.6	0.5	0.3
Italy	0.5	0.4	0.2	0.6	0.5	0.2
Spain	0.6	0.4	0.2	0.8	0.5	0.2
Poland	0.5	0.7	0.3	0.6	0.8	0.4

Source: Oeko-Institut's own calculation.

Figure 4-6: **Impact of social leasing on the development of the second-hand EV stock in the selected Member States (EUR 8,000 contract)**



Source: Oeko-Institut's own illustration and calculation based on T&E fleet modelling data.

Table 4-8: Additional second-hand EVs in the passenger car stock due to social leasing (EUR 8,000 contract) (in million)

Country	2030			2035		
	Transport Share	50 % of funds	25 % of funds	Transport Share	50 % of funds	25 % of funds
Germany	0.06	0.06	0.03	0.3	0.3	0.2
France	0.10	0.08	0.04	0.5	0.4	0.2
Italy	0.09	0.08	0.04	0.5	0.4	0.2
Spain	0.12	0.07	0.04	0.6	0.4	0.2
Poland	0.10	0.12	0.06	0.5	0.7	0.3

Source: Oeko-Institut's own calculation.