



D4.2 | Synthesis report on the "low carbon mobility" case study

Deliverable:	Synthesis report on the "low carbon mobility" case study
Author(s):	Alessandro Silvestri, Sébastien Foudi, Ibon Galarraga (BC3), Elisabeth Schøyen Jensen, Steffen Kallbekken (CICERO), Silvia Gaggi, Stefano Proietti (ISINNOVA), Bartosz Bieliszczuk, Adriana Skorupska (PISM), Mária Bartek-Lesi, Alfa Diallo, Balázs Felsmann, András Benjámín Vékony (REKK).
Version;	Final
Quality review:	Emilie Magdalinski (JDI)
Date:	28/09/2019
Grant Agreement N°:	727524
Starting Date:	01/11/2016
Duration:	36 months
Coordinators:	Silvia Gaggi and Stefano Proietti (ISINNOVA)
E-mail:	sgaggi@isinnova.org; sproietti@isinnova.org



Table of Contents

Executive summary	5
1. General introduction	7
1.1 Low Carbon Mobility	7
1.2 The case study	8
1.2.1 Usual way of travelling: a survey approach	9
1.2.2 Carsharing mobility: a participatory approach	9
2. Methodology	10
2.1 Mobility Household Survey.....	10
2.2 In-depth Interviews.....	11
2.2.1 Households	12
2.2.2 Stakeholders	12
3. Survey results.....	14
4. In-depth interviews results	23
4.1. Summary of findings	23
Summary of findings in Hungary	23
Summary of findings in Italy	24
Summary of findings in Norway	25
Summary of findings in Poland.....	26
Summary of findings in Spain	27
4.2 The case study in Hungary.....	28
4.2.1 National background	29
4.2.2 National specific study design.....	33
4.2.3 Carsharing users' interviews analysis	35
4.2.4 Stakeholders' interviews analysis.....	37
4.2.5 Discussions.....	41
4.2.6 Conclusions.....	42
4.3 The case study in Italy.....	44
4.3.1 National background	44
4.3.2 National specific study design.....	47
4.3.3 Carsharing users' interviews analysis	48
4.3.4 Stakeholders' interviews analysis.....	50
4.3.5 Discussions.....	52
4.3.6 Conclusions.....	53



4.4	The case study in Norway	54
4.4.1	National background	54
4.4.2	National specific study design.....	55
4.4.3	Carsharing users' interviews analysis	57
4.4.4	Stakeholders' interviews analysis.....	59
4.4.5	Discussions and conclusions	60
4.5	The case study in Poland	60
4.5.1	National background	60
4.5.2	National specific study design.....	63
4.5.3	Carsharing users' interviews analysis	64
4.5.4	Stakeholders' interviews analysis.....	65
4.5.5	Discussions.....	67
4.5.6	Conclusions.....	68
4.6	The case study in Spain.....	70
4.6.1	National background	70
4.6.2	National specific study design.....	73
4.6.3	Carsharing user interviews analysis	75
4.6.4	Stakeholders' interviews analysis.....	80
4.6.5	Discussions.....	85
4.6.6	Conclusions.....	87
5.	General discussion and conclusion	89
	References.....	92
	Annexes.....	93
	Annex I - Mobility Household Survey	93
	Annex II - Interviews Guidelines.....	103
A.	Households	103
B.	Stakeholders.....	105



Table of Figures

Figure 1 Modal split in Urban in 100 cities with population higher than 300.000 in Europe. Own elaboration over data from TEMS (http://www.epomm.eu/tems/index.phtml). PT stands for Public Transport.	8
Figure 2 Trip frequency: A) Share of households travelling to the selected destinations at least once in a week; B) Average number of days per week the destination is reached by households who perform the trip	14
Figure 3 Locations distribution between Urban, Periphery and Countryside areas	16
Figure 4 Cumulative shares of time spent in different transport modes per destination	17
Figure 5 Shares of importance given to different factors affecting mode choice.....	18
Figure 6 Percentages of utilisation by frequency of Carsharing, Peer-to-peer carsharing and Bike-sharing .	20
Figure 7 Shares of agreement levels with a policy to make public carsharing and public transport faster by giving them dedicated traffic lanes, and priority at intersections	21
Figure 8 Shares of satisfaction with local Carsharing and Bike-sharing current infrastructure.	22
Figure 9: Energy consumption in the Hungarian transport sector by fuel, 2016-2016. Source of data: Eurostat.	30
Figure 10: Greenhouse gas emissions in the Hungarian transport sector, 2006-2015. Source of data: Eurostat	31
Figure 11 Number of carsharing services activated from 2001 to 2017 and geographical distribution as of 31/12/2017.....	45
Figure 12: Number of carsharing vehicles for typology of service (left axes) and % of electric vehicles (right axes) - 2015, 2016, 2017. Source: Italian Observatory on Shared Mobility.....	46
Figure 13 EU's and Spanish Transport and energy related shares of GHG emissions in 2016. Source: Eurostat.	71
Figure 14 Spanish GHG Emissions of transport sectors by sub-sectors in 2016; Spanish GHG emissions from different road transport modes in 2016. Source: Eurostat.	71

Executive summary

The general aim of the ENABLE.EU project is to define the key determinants of individual and collective energy choices in three key consumption areas - transportation, heating & cooling and electricity - as well as in the shift to prosumption. This deliverable presents the findings of the **case study on Low Carbon Mobility**, conducted in Hungary, Italy, Norway, Poland and Spain.

The main aims of this case study are to:

- Better **understand citizen's choices, habits and preferences** regarding low carbon mobility and alternative transportation modes to private conventionally-fuelled cars
- **Identify key drivers and barriers**, including political, technological and behavioural ones, for low carbon mobility and alternative transportation modes to private fuelled-cars, and
- Explore **potential solutions and best practices** to shift away from private conventionally-fuelled car dependence and reduce the negative impacts of transport on citizen's health and well-being, the climate and the environment.

The case study has been designed to allow for **comparative research** among countries, following common methodological guidelines. The methodology used in this study involves **both quantitative and qualitative approaches**: a mobility household survey and a series of in-depth interviews conducted in the aforementioned countries. We conducted a **mobility household survey**, which analyses citizen travel behaviour, travel mode choices and the factors influencing them. Five specific destinations of the weekly routine have been investigated: trip to the workplace/university, to the grocery/shopping, to recurrent leisure activities, to take children to school and to their recurrent activities. The survey has been conducted using a representative sample of the population of each participating country. With respect to **the in-depth interviews**, our focus has been directed to shared mobility and in particular **carsharing**, as a potential solution and as example of best practice that can contribute to change current mobility. In each country the interviews involved carsharing users and stakeholders, from business, public administration and pressure groups.

Survey results reveal that weekly routine trips follow **similar patterns** across countries. Grocery/shopping is the destination performed by the highest share of population and the work destination is the most recurrent. Leisure trips, on the other hand, shows greater variability both in terms of shares of population having recurrent leisure activities and number of days per week. Leisure activities are more frequent in Spain, Norway and Italy than in Poland and Hungary. The **travel mode** varies with the destination; **public transport** is used much less for shopping and children-related activities. **Private vehicles** seem to dominate for most of the recurrent trips in all countries but Spain where **active modes** (walking, cycling) report the highest share of transport durations for most of the destinations.

The factors that are considered *important and very important* when deciding the travel mode are mainly *safety, availability and reliability*, while *environmental impacts and reputation* are the least valued.

Carsharing is developing differently from country to country in terms of prevalent mode between free-floating carsharing – a system in which vehicles are freely parked on the street of an urban area, where they can be booked- and station-based carsharing – a system in which the vehicles occupy a specific reserved parking lot.

In most countries users seem to choose this service mainly for its **flexibility and comfort** aspects, and characterise carsharing as a practical solution. However, **the costs of the service** also seem to be an important factor for users. **Environmental concerns** related to air quality and global warming have also been mentioned as motivations by some although they tend to take second place. As for the use, the mode comes in handy to reach specific **destinations poorly connected by public transport** due to the location site or the timetables.

The **potential electrification of carsharing services** is seen as a foreseeable future development by business stakeholders and is highly considered by policymakers which consider electro-mobility an important asset in order to meet emissions limits. Moreover, most of the users who have experienced electric vehicles through this service are positively evaluating the technology and prefer it to conventional vehicles.

The main conclusions drawn from the interviews analysis regarding the development of carsharing are the following:

- The shift towards a sustainable transport would benefit from **an integrated system in which carsharing and public transport are connected and complement** each other in order to facilitate modal shifts for users;
- The promotion of carsharing services must **support the switch from private car use to carsharing in contrast to the switch from other modes**, such as public transit, bicycle and walking.
- Carsharing diffusion can be helped by policies regarding parking facilitation, private car access restrictions and integration with other modes such as public transport and bike-sharing, as well as incentives for adopting electric vehicle and investment in charging infrastructure for electric carsharing.

1. General introduction

1.1 Low Carbon Mobility

Mobility is an essential aspect of current society. It is closely connected to economic activity and, especially in developed countries, represents a necessity for the citizen. However, the current paradigm governing mobility, based on petrol-fuelled private vehicle use, is causing **several problems**.

One of the most important is connected to the **environment** where transport is generating externalities with respect to climate and local air pollution. According to the European Environmental Agency, the transport sector accounts for a third of all energy consumption and over 20% of total EU greenhouse gases emissions. Moreover, it is the only sector that has continued to increase its levels of emissions on the 1990 baseline, up more than 25%. Road transport is the main responsible of GHG emissions in the transport sector and its emissions account for about 70% of transport related GHG emissions.¹ This drives the need for lower emissions in this sector, which, based on EU targets, is expected to cut its emissions by 30% by 2030 and 60% by 2050, on 1990 levels.²

Therefore, the EU has set key actions areas of "*increasing the efficiency of the transport system*", "*speeding up the deployment of low-emission alternative energy for transport*" and "*moving towards zero-emissions vehicles*"³. A key role will here be played by the public administration, responsible for implementing incentives for low-carbon mobility and encouraging public transport, active travel and bicycle and carsharing/carpooling schemes.⁴

Moreover, road transport in cities is the cause of problems connected to quality of life such as **congestion** and **noise**. The high presence of private vehicles also requires a high share of **urban space** to be dedicated to cars, which could otherwise be used differently. Furthermore, a high presence of vehicles on the streets is harmful to society increasing the risk of accidents and causing **health** problems due to the aforementioned local air pollution.

Furthermore, UN world urbanization prospects estimate that about 74% of European population currently live in urban areas and this percentage will rise to 82% by 2050. This implies that these are going to be key areas where policies should ensure sustainable development of the transport sector. Urban areas are also the place where a higher number of mobility alternatives are available to citizens, hence where there are greater possibilities to shift away from private vehicle use. Nonetheless, high population concentration, shorter distances as well as congestion and lack of parking space might discourage the use of private vehicles in favour of metro, walking and cycling.

However, as shown in Figure 1, private car is still the main mean of transportation in many European urban areas. This aspect has been explained through the advantages of private vehicle compared to its alternatives, but also by symbolic values attached to it. (Steg, 2005) Private vehicles are exclusively and constantly available to its owner. Moreover, they allow the desired destination to be reached directly. The car thus avoids having to plan a trip with other modes.

¹ <https://www.eea.europa.eu/themes/transport/intro>

² https://ec.europa.eu/clima/policies/strategies/2050_en

³ A European Strategy for Low-Emission Mobility, COM/2016/0501 final.

⁴ https://ec.europa.eu/clima/policies/transport_en



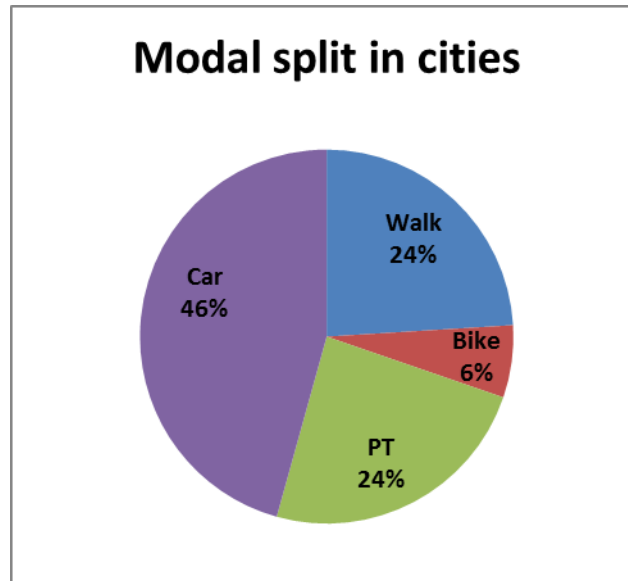


Figure 1 Modal split in Urban in 100 cities with population higher than 300.000 in Europe. Own elaboration over data from TEMS (<http://www.epomm.eu/tems/index.phtml>). PT stands for Public Transport.

A wide literature also explores symbolic values attached to cars and their role in middleclass emancipation during the last century, which transformed this technology into a usual need for the citizen (Graves-Brown, 1997; Urry, 2004). However, other studies argue in favour of a change of this paradigm in the latest generation and suggest future mobility will not require ownership of a vehicle (Steg, 2005).

Lowering carbon intensity of road transport means reducing the amount of GHG emissions needed to satisfy citizen travel needs. In principle this can be achieved in two ways: by reducing the amount of emissions produced by the vehicles involved, or by changing people’s travel behaviour towards more sustainable mobility.

The first group includes **fostering alternatives**, - hybrid and electric vehicles -, and developing measures to make them competitive with respect to the conventionally fuelled ones. This can be done by incentivising R&D for these technologies and the purchase of such vehicles. Moreover, there are also soft measures aimed at informing citizens and nudging their purchasing behaviour, for example with fuel efficiency and emissions labels.

In the second group the main objective would be to **change the current paradigm towards collective and shared mobility**. A reduction of carbon intensity in this case is induced by making people share the emission related to a journey by using the existing technology, for instance buses, metro or sharing a ride. The drawback of this strategy is that it hits against the competitiveness of private vehicle use, since planning a journey using these means is likely to require more effort. Moreover, the cost of the trip when using mobility services such as public transport or shared is directly paid on the use while it is more complicated to derive the cost of the journey when using private vehicles. Hence, increasing competitiveness of these solutions requires the planning of a journey to be facilitated and people to be made more aware of the costs connected to a trip.

1.2 The case study

The **aim of the ENABLE.EU Mobility case study** is to contribute to enabling the transition towards low carbon mobility. Specifically, we want to understand citizen choices, habits and preferences, as well as to identify what the key drivers and barriers to lowering carbon intensity of mobility are. Furthermore, we aim to validate and further analyse research findings in this sector and explore potential solutions to shift away from private conventionally fuelled car dependence.

In doing so, the Mobility case study seeks to deliver a **comparative analysis between 5 countries from different parts of Europe**. The participating countries are Hungary, Italy, Norway, Poland and Spain.

Additionally this study involves **both quantitative and qualitative approaches**: a mobility household survey and a series of in-depth interviews conducted in the aforementioned countries. These tools will be described in more detail in the following two sections.

1.2.1 Usual way of travelling: a survey approach

It is fundamental to be able to understand the current mobility paradigm in order to achieve our purpose. We therefore conducted a **mobility household survey**, which analysed citizen travel behaviour, travel mode choices and the factors influencing them.

With respect to travel behaviour, we want to understand what the weekly routine destinations are and how often these are achieved. Moreover, we seek to understand which modes of transport are used to fulfil weekly travel needs in both urban and rural areas. We do so by allowing for use of more than one mode and for connecting journeys to different destinations. Furthermore, we want to understand what are the main factors influencing the mode choice. Additionally, we also investigate the use of mobility related services such as bike-sharing and carsharing on a national scale.

The household survey is designed to be representative of national population. More details on the methodology used to conduct the survey will be presented in Section 2, while the description of survey results will be presented in Section 3.

1.2.2 Carsharing mobility: a participatory approach

This case study focuses on exploring potential solutions, which can contribute to changing current mobility. Our focus is here directed to **shared mobility and in particular carsharing**. Shared mobility is a broad concept which includes a series of services providing people with access to mobility without the ownership of the vehicle. We can here distinguish three main groups based on the ownership of the vehicle⁵:

- System with public ownership that includes the traditional public transport systems as well as public-owned carsharing and bike-sharing services.
- System with business owned services, which includes the traditional business to consumer (B2C) carsharing and some other models, such as hotel owned vehicles for tourists.

⁵ A comprehensive list of shared-use vehicle business models can be found in the paper "Carsharing and Personal Vehicle Services: Worldwide Market Developments and Emerging Trends", Shaheen and Cohen, 2012, International Journal of Sustainable Transportation.

- System with privately owned shared vehicle, which includes peer-to-peer (P2P) carsharing. People here rent out their private vehicles per hour to other private users through an online platform.

The focus of our study will be directed to B2C carsharing. This form of shared mobility has been introduced in the second half of the last century and is recently experiencing renewed interest in the context of sustainable transportation. It consists of renting a car for a short period of time, a cost directly related to the usage of the vehicle being. Carsharing could contribute to reducing the carbon intensity of the urban transport sector by complementing lack of public transport and providing an alternative to private car dependency of households. It can also contribute to reducing the bias in evaluating the cost of a car trip as it connects the price to the use of the vehicle. Moreover, it can be a tool to spread new and environmental-friendly technologies such as Battery Electric Vehicles (BEVs) and other alternative fuelled vehicles, as well as new vehicles with high fuel efficiency standards.

Carsharing business models can mainly differ in two aspects: **the type of journey and the parking system**. With respect to the type of journey, we can distinguish between **one-way and round-trips**. In the case of the former, the user can take the vehicle from a location and leave it at another. In the latter case, the vehicle has to be returned to the same place where it was booked. With regard to the parking system, we can divide the models between **free-floating and station-based**. Vehicles in free-floating carsharing are normally freely parked on the street in an urban area, where they can be booked. In station based carsharing, the vehicles occupy a specific reserved parking lot.

In general, round-trip carsharing operates under a station-based system, while one-way carsharing operates under a free-floating scheme. However, other mixes of these two options exist, such as one-way/station-based carsharing, where vehicles need to be left in a reserved parking lot which is not necessarily in the same location where the vehicle was collected. Different modes are likewise often connected with different rates with station based carsharing normally charging per-hour rates while free-floating carsharing charges per-minute rates.

In our carsharing study, we seek to provide a snapshot of the development of this sector in the participating countries, by interviewing both stakeholders and carsharing users. By comparing the results from different countries we derive insights on the current practices and policies recommendations.

The report is structured as follows. Section 2 presents the methodology used for the case study. Section 3 then provides the descriptive analysis of the survey results. Section 4 covers the five country case study reports. Section 5 contains the discussion and concludes.

2. Methodology

The methodology used for the mobility household survey and the in-depth interviews will be explained in the following section.

2.1 Mobility Household Survey

The mobility survey is a section of the ENABLE.EU Household survey presented in Deliverable 4.1, along with sections on Heating & Cooling, Electricity, Governance and the transition from consumers to prosumers. It was implemented in Hungary, Italy, Norway, Poland and Spain. The Mobility survey is composed of different sections: a section including socio-demographic questions and a section specific to mobility characteristics. Table 1 below summarizes each country’s sample size and how the survey was conducted.

	Hungary	Italy	Norway	Poland	Spain
N° Observations	1022	1025	1221	1000	760
Type of Survey	F2F	F2F	Online	F2F	F2F

Table 1 Number of observation and survey type in the participating countries

The sample was selected in each country in order to ensure national representativeness. The survey was conducted face-to-face in Hungary, Italy, Poland and Spain, while it was conducted online in Norway. Households were interviewed between December 2017 and February 2018 by sub-contracted companies. The interviews took place in the house of the interviewee and lasted for between 25 and 35 minutes, for the whole household survey.

The mobility section consists of 11 questions (see Annex 1) in **3 blocks of questions** on (i) journeys, (ii) preferences and attitudes and (iii) regulation.

The M1-M4 block of questions focuses on usual **travel behaviour of households** for 5 typical destinations: the workplace/university, children’s school, children’s activities location, grocery shopping and recurrent leisure activities. The participants are first asked about the weekly frequency of travel to these destinations. Second, whether these destinations, as well as the interviewee house location, are in an urban, periphery or countryside location. Third, households are asked to describe in detail which modes they use to take and how long (in minutes) for each destination. And fourth, they are asked about the distance between the destinations described. The way in which these questions are designed also allows connected trips to be described, for instance if a person usually carries on to work directly after taking the children to the school.

A block of questions, M5-M7, elicits **attitudes and preferences** regarding travel modes. M5 asks about the importance of different factors when choosing the modes of travel. M6 focuses on the frequency of use of different types of alternative transport modes: company car, carsharing, peer-to-peer carsharing, bike-sharing and car rental. Finally, M7 asks whether the household benefited from any particular incentive related to the modes of transport used in their routine.

The block of questions, M8-M10, focuses on transport **regulation and satisfaction** of existing travel modes.

The complete mobility survey section can be found in Annex I.

2.2 In-depth Interviews



The second part of the case study consists of semi-structured **in-depth interviews with emblematic households and stakeholders**. The topic focused on shared mobility and in particular on the carsharing sector with an emphasis on the role of electro-mobility, as well as the relation with public transportation and private vehicle ownership.

Interviews were conducted face-to-face and by phone and lasted for around one hour. Each country partner was in charge of selecting the interviewees and contacting the stakeholders, conducting the interviews and developing a country result-based report.

Common guidelines were designed for each of the two types of interviews in order to ensure cross-country comparability. Then each country partner then adapted them according to the specific country situation. Interviews were conducted between February and June 2018.

The common methodology for households and stakeholders interviews are presented in the following sections, while more details on the specific adaptation to the national context will be described in each country report in Section 4.

2.2.1 Households

The *emblematic household* interviewees were selected from among carsharing users. These users were chosen in order to represent different type of households, clustered by consideration of gender, age and whether or not they have children. At least one representative for each of these characteristics was included in the interview sample. Hence, a minimum of 6 interviews was planned in each country.

Each partner was responsible for recruiting and conducting the interviews based on common interview guidelines. The guidelines consisted of **5 different sections**:

1. A first section aimed at **warming up** the conversation, obtaining basic information on the interviewee, on their weekly routine and their typical use of the carsharing service.
2. The second section focused on the **factors** influencing the subscription and the use of the service as well as describing how and why the users started using the service.
3. The third section focused on **the relation with public transport**, aiming at understanding how these modes compared to carsharing and how their use changed after starting using this service.
4. A fourth section focused on the **relation with the private vehicle**. In particular, whether its use changed after joining a carsharing service and how this service could influence the need for a private vehicle.
5. The fifth section focused on possible **future developments** of the service and on the opinion about the type of vehicle, in particular electric ones. Users were asked in this section about advantages and disadvantages of electric vehicles, whether they preferred them compared to conventional ones and whether they could evaluate them as a future purchase after trying them. The complete interview guidelines can be found in Annex II A.

2.2.2 Stakeholders

In the case of *stakeholders*, the aim of the interviews was to depict the current **development of carsharing in the country** and to understand what may facilitate its development both at political and social levels. Stakeholders were selected in order to represent **three groups**: the business sector,



the public administration and pressure groups. Each of these groups should have been represented by at least one stakeholder while the minimum number of interviews per country was set to 4.

Each partner was again given **common guidelines** with the possibility to adapt them to the specific stakeholders they were going to interview. The common guidelines consisted of **5 sections** for which the aim and a list of information to collect was set:

1. Section 1 was aimed at **warming up** the conversation, gathering information on the stakeholders and the institution they represented, their view on the carsharing sector and its development.
2. Section 2 explored the **facilitation of carsharing**. In particular, it focused on the motivations to implement and develop this service further, the main policies and social characteristics that can ease its success and its contribution to urban mobility.
3. Section 3 looked at the **relation between carsharing and other modes of transport** within the urban context and what changes the introduction of carsharing could imply.
4. The fourth section was **specific to the stakeholder group**.
 - a. **Business** stakeholders were asked about details of the carsharing market, whether they benefited from any support, whether they targeted a specific group of people and if they had specific aims to provide an environmental friendly service.
 - b. **The Public administration** was asked about the measures to combat transport related problems, how the decisions were made in this context and what role was intended for electric carsharing in the urban mobility planning.
 - c. **Pressure groups** were asked about the mission and vision of their institution and about their strategy to achieve it.

Finally, all stakeholders were asked about how they interpreted the relation with the other actors in the field and about their vision regarding the future of the sector. The complete interview guidelines can be found in Annex II b.

3.Survey results

Household usual travel behaviour was analysed with respect to a typical week and the most usual way of travelling. Five specific destinations/trip purposes of the weekly routine have been investigated: journey to work/university, going grocery/other shopping, to recurrent leisure activities, to take children to school and to their recurrent activities.

First households were asked about the frequency at which they travel to these selected typical destinations. As shown in *Figure 2*, the pattern of answers is relatively similar within the countries in terms of frequency.

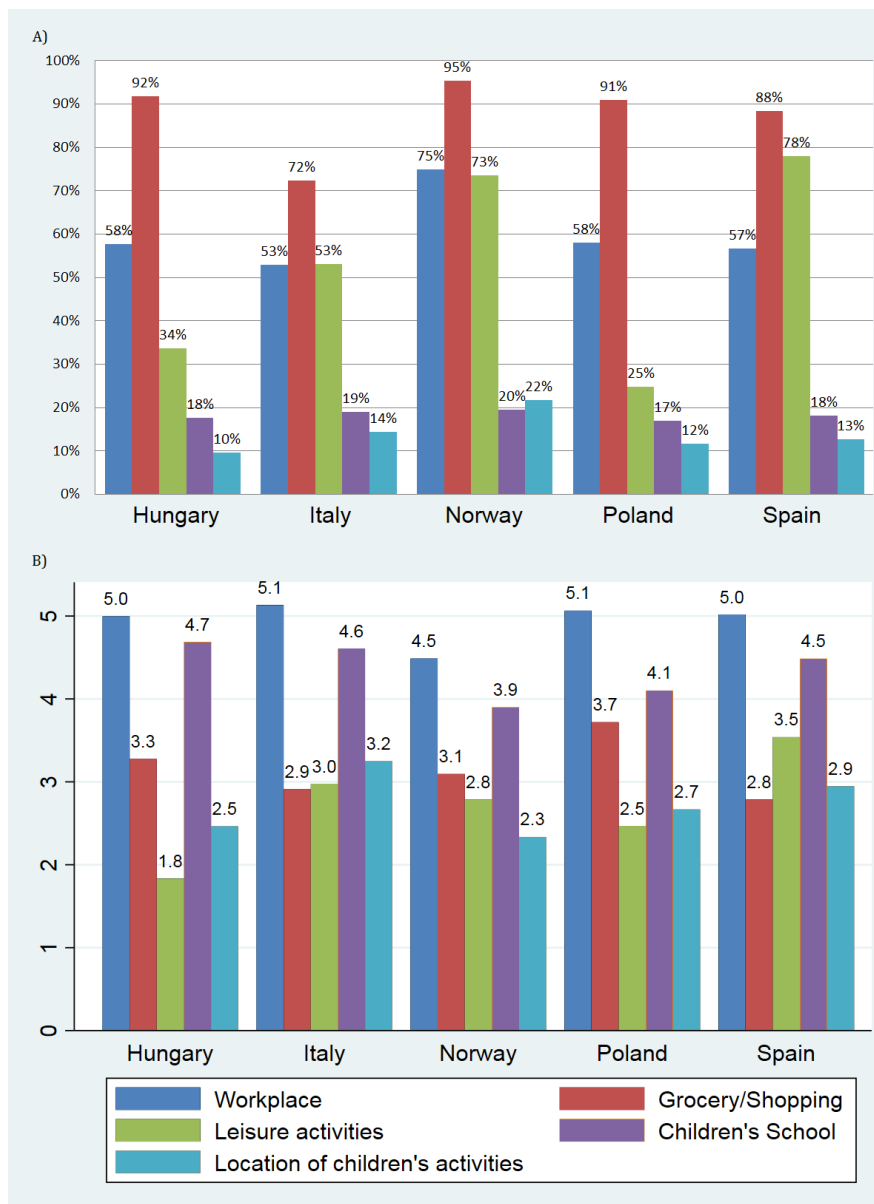


Figure 2 Trip frequency: A) Share of households travelling to the selected destinations at least once in a week; B) Average number of days per week the destination is reached by households who perform the trip



The trip to the **workplace/university** is performed at least once by about 50-60% of the respondents, apart from Norway where the level reaches 75%. For those who travel weekly to that destination, the average frequency is around 5 days per week in all countries, making it the most frequent trip. **Grocery/shopping** is the destination that shows the highest value of share of population in each country, around 90%. On average, the trip is taken around 3 times per week, with the highest value of 3.7 in Poland. Recurrent **leisure activities** are the destinations that present the highest variability across countries. In terms of share of population, the destination is visited at least once a week by around 75% of the sample in Norway and Spain, 53% in Italy, while it stands at 34% in Hungary and 25% in Poland. Some differences are also shown in the frequency of the trip which hits its highest level in Spain at 3.5 days per week and its lowest frequency in Hungary at 1.8. The average frequency in Italy, Norway and Poland ranges between 2.5 and 3 times per week. Finally, destinations related to **children's school** and their **leisure activities** are fairly similar across countries. The former shows population shares that range between 17 and 20% and is performed between 4 and 5 times per week. The latter ranges between 10 and 22% of the population and is taken between 2 and 3 times per week.

Figure 3 shows the distribution of these locations between different areas: *urban*, *periphery* and *countryside*. The shares here vary deeply from country to country, while the difference lowers within the country. Common to all countries and destinations is the prevalence of urban areas with the only exception of household locations in Italy and children's school locations in Norway, where the periphery of urban areas predominates.

In **Hungary**, shares are quite similar across journey purposes. Most of the trip destinations of the respondents are located in urban areas, with the countryside being far behind, and peripheral areas below 7%. There is a slightly higher share of households living in the countryside (30%), while the share for other locations is between 10% and 20%.

In **Italy**, answers were quite similar for all destinations with the exception of household location, where half of the respondents stated they lived on the periphery of an urban area, while 37% stated inside the urban area and only 13% gave countryside as the answer. Additionally, urban area is highly prevalent in the other locations ranging between 68% and 76%, followed by periphery between 20% and 30% while countryside scored less than 5%.

Norway is the country where there seems to be the highest variation between the different areas. Still urban areas is the most answered location for most of the destinations but never reaches 50% of the answers as in the other countries, with the only exception being workplace locations (63%). Periphery of urban area ranges approximately between 30-40%, while countryside between 15-30%.

In **Poland**, urban area is still the most recurrent answer for each location, especially for leisure activities, children's school and grocery shopping. Peripheral areas are marginal especially in children's school and activities, and household locations. While countryside reaches the highest level of 40% for household location and the lowest of 4% for workplace location with the share in the remaining location ranging between 12% and 23%.

Spain presents an almost absolute lack of people answering countryside, although this may be due to a miscomprehension of the translated term "countryside". The vast majority of the locations are set in urban areas while periphery of urban area also got a low rate of answers at around 6-7% with the lowest value in household locations (1%) and the highest share in workplace/university (18%).

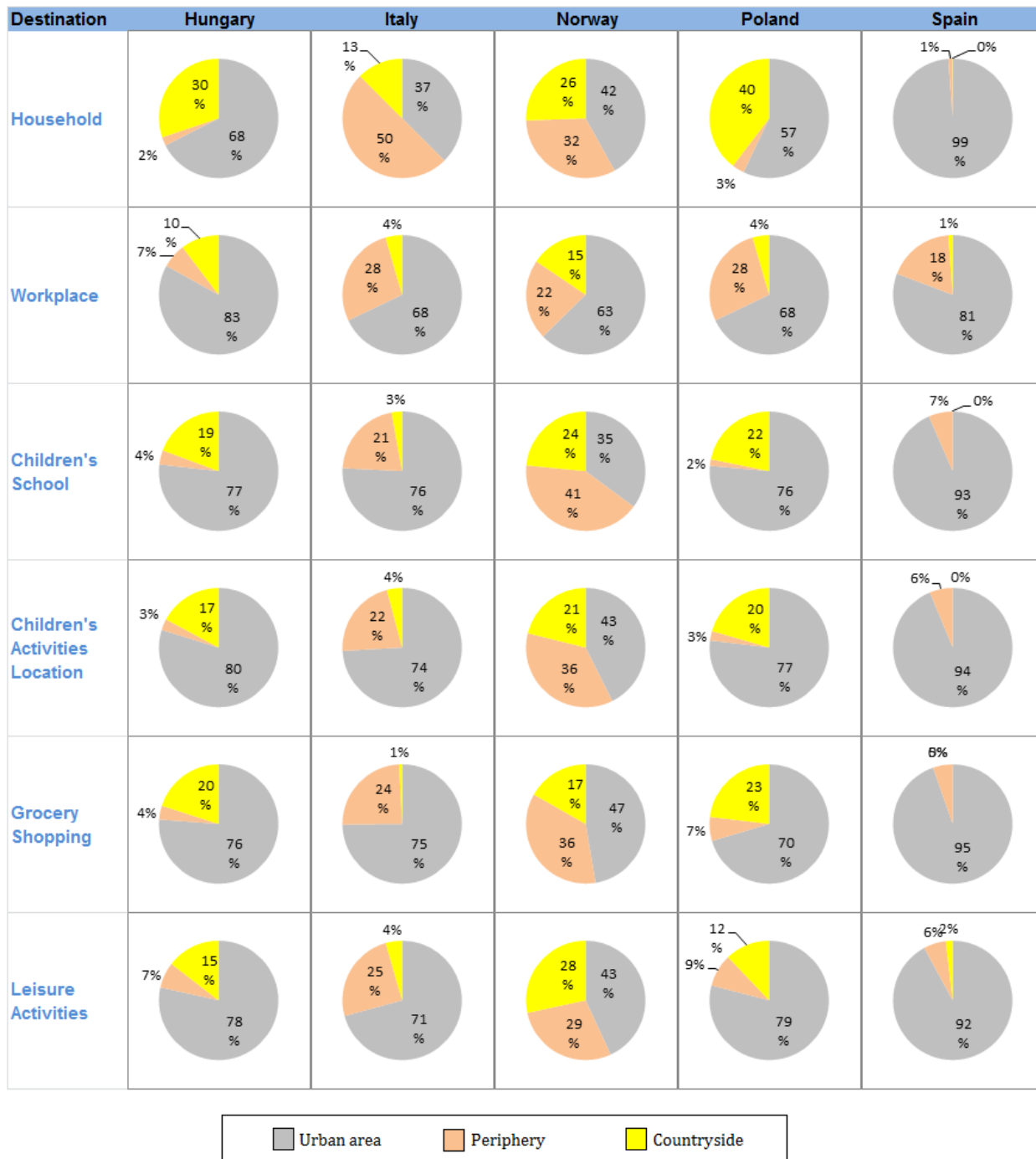


Figure 3 Locations distribution between Urban, Periphery and Countryside areas

Figure 4 shows the comparison between travel modes used to reach each destination. Shares are based on cumulative time spent using each method by country with respect to each specific journey purpose. Cumulative time has been chosen to fulfil the need of a unique value to further compare with households given the possibility to include multiple modes in their journey. The different modes have been grouped in three categories: private vehicles, public transport and active modes (bicycle and walking).



With the exception of Spain where active modes present the highest share (around 60%) for most of the destinations, private vehicles seem to dominate in most of the recurrent journeys in the other countries in terms of time spent to travel.

Overall, the trip to workplace/university shows the highest rate of time spent travelling by public transport, followed by children’s school and leisure activities, while the lowest levels are shown for the grocery/shopping and children’s activities destinations. In this case, there seems to be greater variability between different travel destinations rather than countries. In most of the cases active modes represent the second mode of transport in terms of time spent after private vehicle, with the exception of the journey to workplace where these values are lower compared to public transport ones.

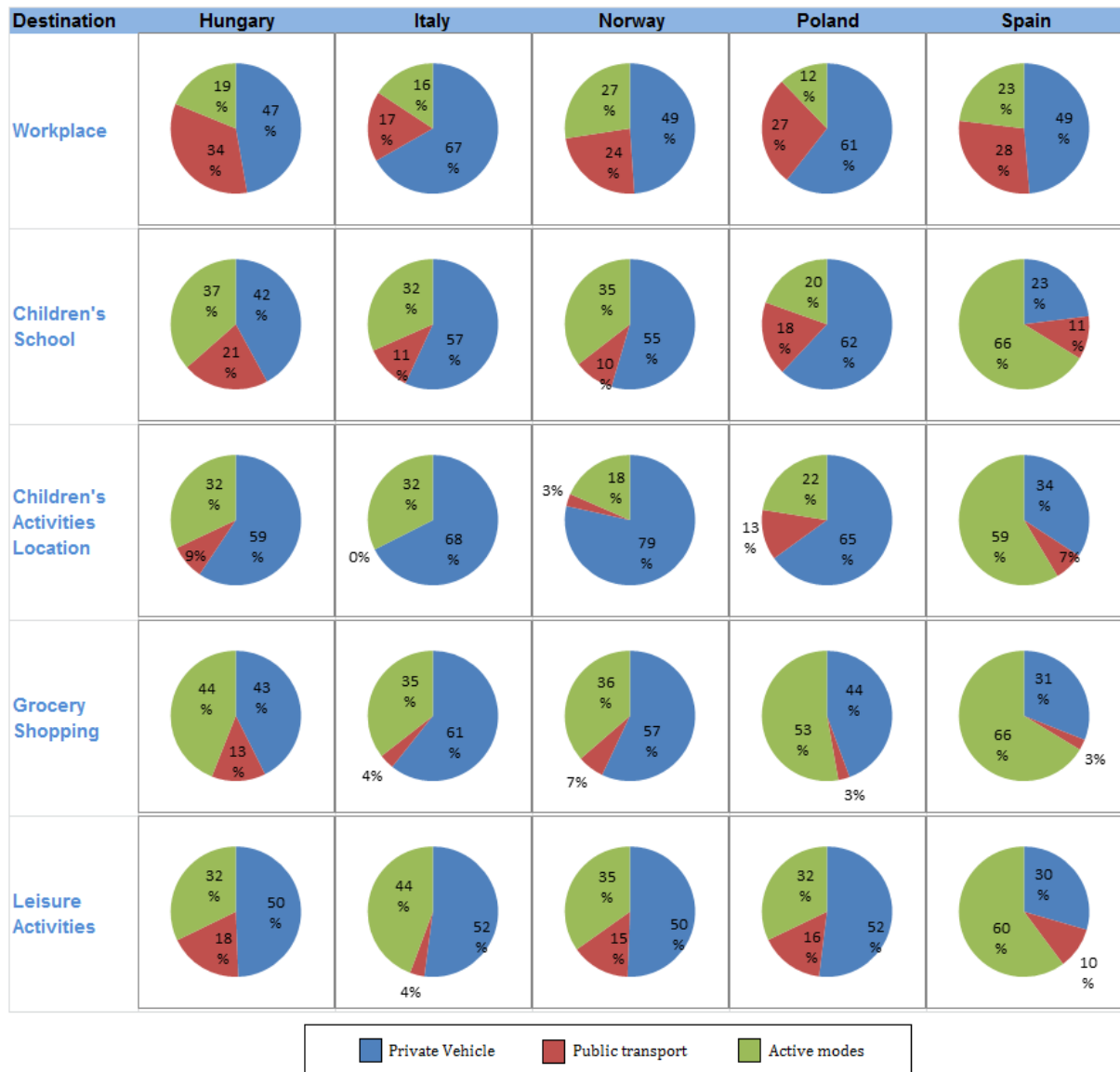


Figure 4 Cumulative shares of time spent in different transport modes per destination

Moving to the elements affecting choice of travel mode, *Figure 5* shows the overall and country specific evaluation of the importance of a predetermined list of factors. Patterns across countries



have some similarities. In almost all countries, factors of **safety, reliability** and **availability** have been considered a priority, followed by the **travel time, cost, flexibility** and **comfort** factors. On the other hand, factors related to **reputation, privacy** and environmental impacts of **local air quality** and **CO2 emissions** are the ones valued less importantly.

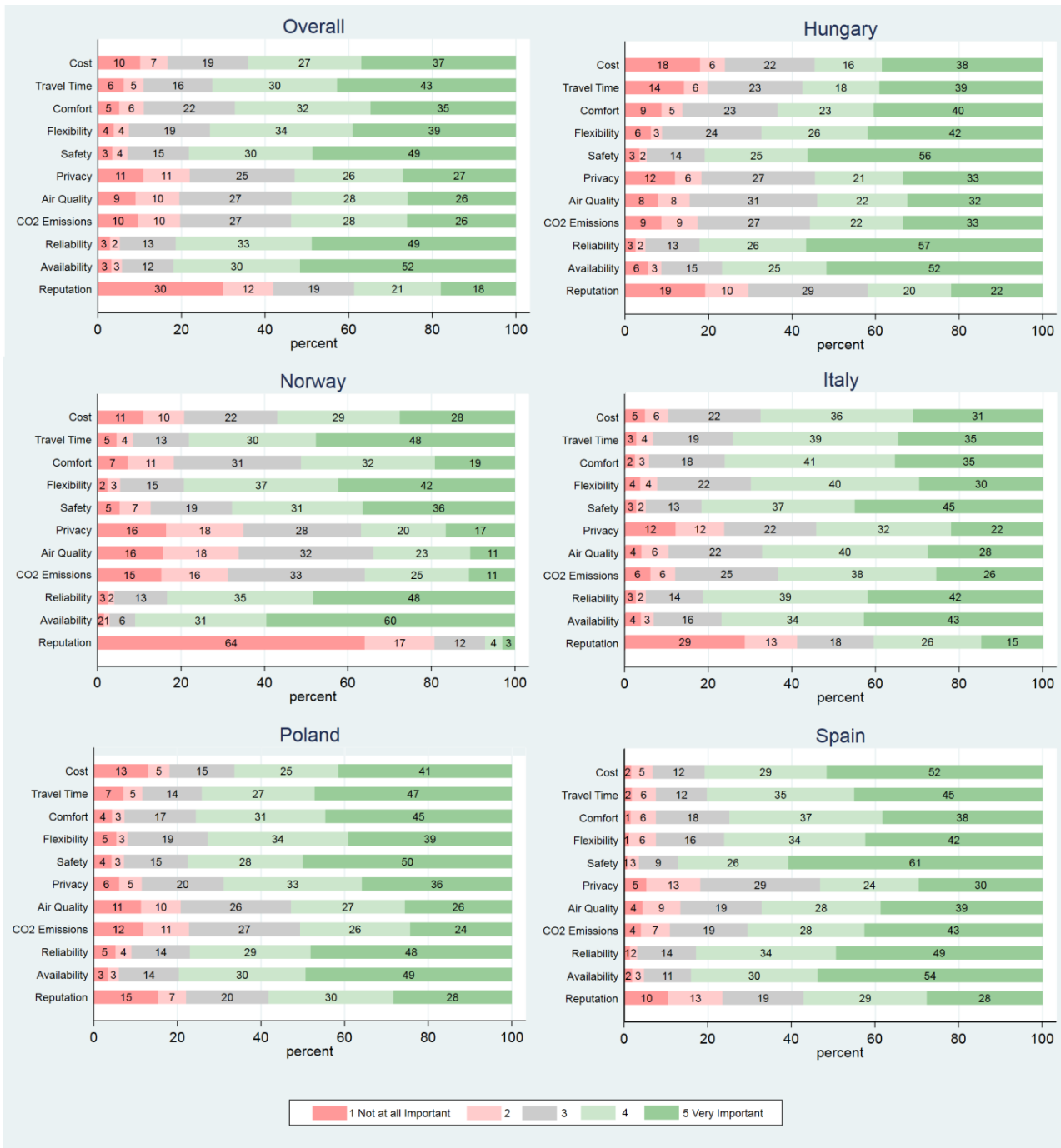


Figure 5 Shares of importance given to different factors affecting mode choice

Cost factors were found to be fairly decisive in all countries, especially in Spain, Poland and Italy, while they were given less importance in Norway and Hungary. **Travel time** seems in general to be considered even more important, with the only exception being Spain where they were at similar



levels with cost factors. **Comfort** also ranked high in the household preferences apart from Norway where it scored notably lower with respect to the others. **Flexibility** received similar votes in each country with around 70/80% of the population stating the factor to be *important* or *very important*. **Safety** was evaluated as influential (*important* or *very important*) by at least 80% of the sample with the only exception being Norway where it scored lowered (68%). **Privacy** scored fairly low compared to other factors apart from Poland where 70% of people marked it as 'important' or 'very important'. An interesting result, although predictable, is the low scores of **environmental factors**, where there seems not to be much difference between local air quality and CO2 emissions. The lowest levels of concern for these factors have been found in Norway, while southern European countries, Italy and Spain, report slightly higher levels. **Reliability** and **availability** scored high and similarly in each country, with around 80% of the population valuing them at least as important. Finally, **reputation** is the least evaluated factor in almost all countries, with the lowest values recorded in Norway, although it still reaches fairly significant levels in Poland and Spain.

In the second part of this section we present some results from the survey related to shared mobility.

Households were asked whether they use, and how often, **carsharing (B2C and Peer-to-peer)** and **bike-sharing**. As expected, given that these modes of transport are not available everywhere, the great majority of the respondents stated they never use them. *Figure 6* shows the frequency of use for the share of respondents that answered that they use these modes at least sometimes.

In all the countries, these modes are mainly used occasionally, with very few respondents using them with high frequency. Carsharing is used by 8% of the surveyed population in Spain, 7% in Norway and 4% in Italy, while it is less used in Poland (1.4%) and Hungary (0.3%). Peer-to-peer carsharing is slightly less common in each country and is more frequent in Norway compared to the others. With respect to bike-sharing, Norway stands out, with more than 20% of the surveyed population using this mode, while in all the other countries these levels are below 4%.

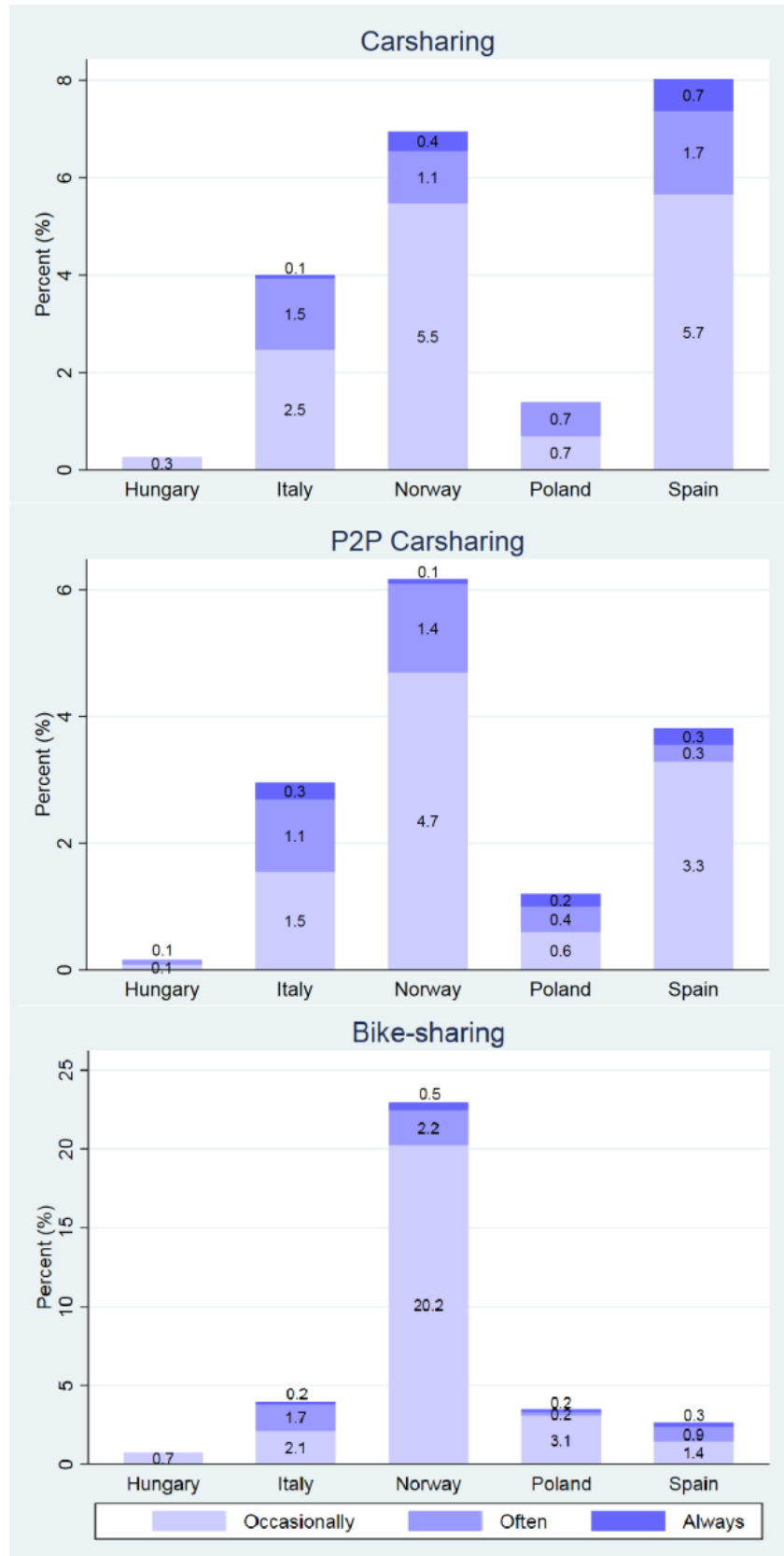


Figure 6 Percentages of utilisation by frequency of Carsharing, Peer-to-peer carsharing and Bike-sharing



Households were then asked about their level of **support for potential transport related policies such as giving privileged access to specific lanes for public transport and shared mobility**. *Figure 7* shows the answers in the format of a Likert scale ranging between strongly opposed to strongly supportive and it also reports information about the share of respondents answering "Don't know". This policy received the highest level of support in Spain and Poland, with around 70% of those populations stating that they support this measure. Italy follows with 56% of supporting households and Hungary with 47%. The lowest level of support was seen in Norway, with only 34% of the sample.

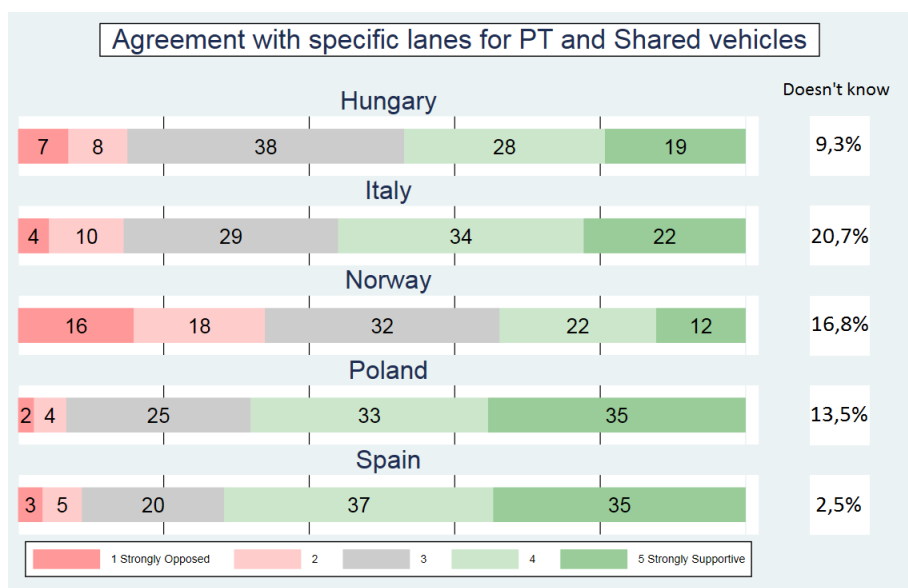


Figure 7 Shares of agreement levels with a policy to make public carsharing and public transport faster by giving them dedicated traffic lanes, and priority at intersections

Finally, households were asked about the **level of satisfaction with the current status of transport infrastructure**. *Figure 8* shows the answers for carsharing and bike-sharing infrastructure in each country based on Likert scales ranging from very low to very high. In all the countries apart from Spain, more than half of respondents answered "Don't know" or "Not applicable", with the highest percentages found in Norway and Poland. However, this result was expected given the limited development of carsharing to date. For the remaining share, the level of satisfaction is fairly low in both cases, in particular in Norway and Spain. This is interesting especially with respect to carsharing since these two countries had the highest level of use of such a method. Poland and Hungary in both cases showed the highest levels of people indifferent to this infrastructure which may also be a result of the limited diffusion of these modes in those countries. Italy is midway in both graphs with a slight prevalence of lower satisfied households.



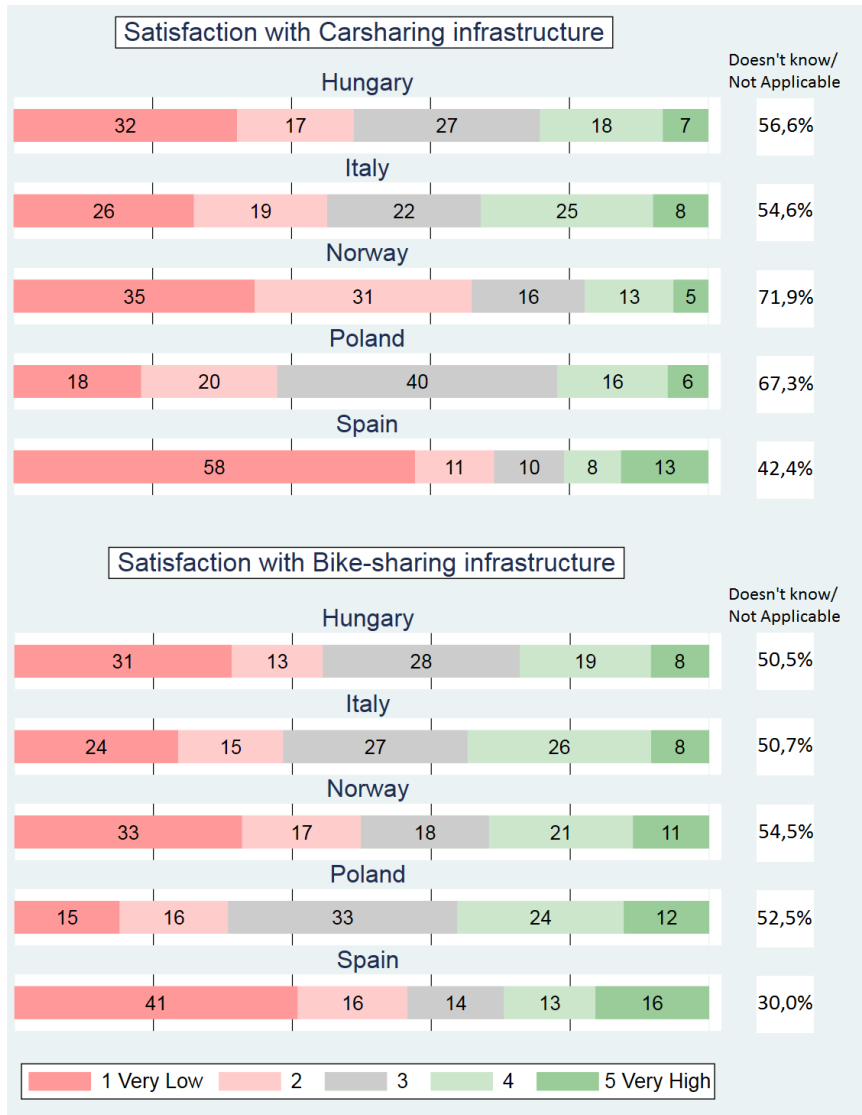


Figure 8 Shares of satisfaction with local Carsharing and Bike-sharing current infrastructure.



4. In-depth interviews results

4.1. Summary of findings

Summary of findings in Hungary

Presently, two companies provide free-floating electric carsharing services in Hungary serving the denser districts of Budapest. The dynamically growing free-floating service is relatively new, with the first company beginning operations at the end of 2016 as a start-up, operating electric cars exclusively, while the second service provider was founded by a large oil and gas company, entering the market in the beginning of 2018, having both electric and traditionally fuelled cars in its fleet.

Our qualitative research in Hungary draws on 9 in-depth interviews with household users, and 6 interviews with the representatives of stakeholders in the industry. The household interviewees share some common characteristics: they are all interested in innovative technologies, they are highly educated and regard themselves to be environmentally conscious. Their most frequently cited reasons for joining one or both carsharing schemes were the opportunity to take advantage of free parking, as well as the flexibility and convenience provided by the system. Most interviewees use the service occasionally, for shorter distances, claiming that their carsharing scheme membership did not significantly decrease the amount of travelling with public transportation and instead replaced their use of taxi service. In general, users are satisfied with the quality of service and stressed the positive outcome of competition in the market. All but one user could imagine not owning a car, if easily accessible, comfortable cars were offered by carsharing companies that would always be available and could be used for travelling longer distances. As regards the preferences for electric mobility, about half of the respondents would be willing to pay a higher fee for electric cars than for traditionally-fuelled vehicles. However, convenience might override the preference for eco-friendly driving: all but two of the interviewed users would choose the traditional vehicle if it requires more time and walking to access an electric car.

Stakeholders of the e-mobility sector do not specifically have carsharing related objectives, but they think that this mode of transportation fits well into the complex supportive vision of the government related to e-mobility. The appearance of the state oil company in the market drew public attention to the carsharing service, which, together with its general popularity among young users, is considered by all stakeholders as a good 'marketing' device helping to promote e-mobility in general. However, opinions diverge as to the use of traditional cars in the service. Both carsharing companies are operated on a commercial basis, benefiting only from the incentives available to all electric vehicle owners.

As regards the future prospects for development, stakeholders agree that integrating carsharing into the information system of the public transportation company of Budapest would be a major step towards the coordination of low-carbon travelling modes. Although the opportunity of free parking adds to the profitability of service providers, they consider the predictability of regulatory rules as a crucial factor in planning their future activities and expanding their service. Interviewees mentioned less cars on the streets, more free space, less noise and air pollution, and wider selection of transportation services as the most important contributions that e-carsharing can provide in urban

areas. Stakeholders consider publicity, availability of infrastructure and parking facilities, and the favourable regulatory environment to be the key factors determining the success or failure of carsharing schemes.

Summary of findings in Italy

In Italy, the phenomenon of shared mobility started already in the early 2000s, but it is only in 2013, with the introduction of the privately owned Enjoy e Car2go free-floating systems, that carsharing experienced a boom both qualitatively and quantitatively, with an immediate positive feedback from the citizens. From 2013 to 2017, the number of shared vehicles is five times bigger, while the number of subscribers has increased by eighteen times, reaching 1 million subscribers and a total fleet of 7.679 vehicles. Today, the number of shared electric vehicles represents 24% of the total cars and scooters shared. The percentage is even more important considering that electric cars for private use represent less than 1% of the Italian automotive market.

The Italian case study was conducted among households and stakeholders based in the city of Rome as the city offers different carsharing options (station-based, free-floating and also electric), and 7% of the population has a carsharing subscription. The interviews to households were based on a sample of 6 contacts covering different users' profiles. Moreover, three stakeholders representing policy makers, pressure groups and carsharing operators were involved in the research.

From the carsharing users' side, the analysis revealed some common patterns. All respondents seem to consider carsharing as a complementary option to the other modes of transport, not the primary way of moving around the city, even when it comes to leisure or occasional trips. The occasions to use carsharing are left for non-ordinary trajectories and when both their private vehicles and public transport are not available. The frequency in use is therefore rather episodic, a couple of times per month. The main factors influencing the carsharing adoption mainly relate to economic and practical reasons. Carsharing is seen as a 'gap filler' in the respondents' mobility options. They consider it handy and easy to use, less expensive than a taxi and faster and more comfortable than public transport.

The current barriers users are facing are limited to two main aspects: the restriction of the zone covered by the service (only city centre) and the availability of the cars. In general, all respondents are happy with their experiences with carsharing and hope the sector will develop further, with more vehicles at disposal, a larger area covered and a wider expansion of electric carsharing for which they would be willing to pay a little bit more than for services using conventional cars.

From the stakeholders' side, the respondents are all in favour of carsharing and they see it at the core of the future transport options. However, to create a sustainable urban mobility system, they share the opinion that considering carsharing alone is a mistake in perspective. All shared mobility services should be developed jointly, starting with public transport. Strong synergies between public transport and all other shared mobility services are undeniable, especially on the last mile, and they could be further reinforced by the creation of carsharing areas near public transport nodes, like rail or metro stations or large bus terminals.

Carsharing also contributes to the reduction of privately-owned cars. The more carsharing develops, the less people will need a private car, or at least it will reduce the number of cars per household. However, where the urban mobility system heavily relies on public transport, carsharing could also

have side effects such as inducing people to move from bike, walk or public transport to the (shared) car, hence generating new mobility.

As for electric carsharing, the stakeholders interviewed are all in favour of a further expansion of electric shared cars in the city. Electric carsharing is seen as a boost for a widespread of electromobility that could lead to an important reduction of pollutant emissions, thereby improving air quality and quality of life of citizens. To further improve electric carsharing and electromobility in general, they consider that an extensive network of recharging infrastructures should be installed across the city. They even suggest making charging points interoperable among all energy suppliers, ensuring fast recharging, and combining them with ad-hoc parking spaces in the nearby. All in all, they see the zero emissions vehicles as the future of shared mobility, implying that electromobility and carsharing should progress hand in hand.

Summary of findings in Norway

Station based carsharing is the dominant model of carsharing in Norway. The biggest and longest running provider, Bilkollektivet, is a member-owned non-commercial co-operative (approx. 350 cars and 7000 members). The main providers in Bergen and Trondheim (approx. 220 cars and 2000 members, and 100 cars and 1200 members, respectively) have the same model. Hertz bilpool is the major commercial actor (approx. 100 cars and 2000 members). Move About is the only all-electric provider (approx. 70 cars and 700 members). Bilkollektivet and Bildelingen have some electric cars, but not many (approx. 10 each). Hertz has approximately 20% electric cars in their fleet. Carsharing has been growing a lot the last ten years, is still growing and new providers are entering the market.

In our study, we have interviewed eight users and six stakeholders (providers, local government and interest organizations).

Users

Carsharing in Norway is typically used by households who do not own a car, and is used as a supplement to public transport, walking or cycling on a daily basis, meaning, at least in the Norwegian context, carsharing does not seem to replace use of public transport, but rather accommodate for this being your everyday mode of transport. Typical use pattern is for weekend trips and for transporting larger items, i.e., carsharing is used when public transport is less convenient.

The main motivation among our interviewees seems to be "practical concerns". This is also what the providers report as users' main motivation. When discussing why they started to use carsharing, the focus is on the benefits of not owning a car. While users do mention the economic benefits of not owning a car, this is not mentioned as a main motivation, but rather as an additional benefit. The average car sharer has a high income, and this is the case with the group interviewed for this project as well.

All interviewees are positive towards electric cars being a bigger part of the carsharing fleet, but most also mention that range is critical. They need to feel confident that they can reach their cabin or make other longer trips, as this is an important part of their carsharing usage.

Providers

Bigger cities where they are already established, and "seamless transport" or "mobility as a service", are where providers see potential for further development. A pre-condition for the providers to

establish themselves somewhere new is access to public transport, or a dense and sufficiently urban city or town where people do not need to travel long distances on a daily basis. The providers, especially the Oslo based ones, emphasize centrally located parking space for carsharing cars as the main threshold for further growth.

Providers are somewhat reluctant towards changing their fleet to only electric cars, but do consider electrification as something that will happen eventually and see this as a positive development with time. One argument is that it is too early for the carsharing fleet to become fully electric given that weekend trips to the cabin is an important part of the usage. Also, some are sceptical as to whether the charging infrastructure is sufficiently developed yet. It is also mentioned that the "know-how" of using an electric car is not yet developed enough in the general population, and that this might make electric cars a further barrier for using carsharing, or that users might have negative experiences. Municipalities might push the development of electrification of the carsharing fleets when accommodating for carsharing, and we do indeed see this in recent developments in Oslo and Bergen.

Summary of findings in Poland

Currently carsharing in Poland is provided mainly by seven companies in the biggest cities and metropolises: Cracow, Lodz, Poznan, Wroclaw, Warsaw (and nearby cities), Tricity and Silesian Metropolis. Most of these companies operate in one or two cities, while Traficar operates in all of the above cities with the exception of Lodz. In total, three or more carsharing companies are present in Warsaw, Poznan and Wroclaw. All companies operate in free-floating system, however in some cases they use also station-based system. For instance, Traficar, beside the free float, offers its cars also on the petrol stations of its partner (Orlen) and in the parking space of Ikea (delivery vans). Some of the operators focus on business clients. Enspiron company, owned by electricity provider Energa, offers electric carsharing to companies with the offices located in one of Gdansk's office buildings.

Carsharing was well-received by the citizens and is developing rapidly in Poland. Smaller cities aim to introduce carsharing as well, the recent example being Siedlce (around 80,000 citizens) which will introduce carsharing this year. Private companies recognize its profitability and there is a growing number of companies offering carsharing. According to the data from the beginning of 2018, about 1.5% of Polish citizens had used carsharing.⁶ At the end of 2017, 4Mobility estimated the number of carsharing users at several tens of thousands. Along with the dynamic development of carsharing, there is a growing interest in media and websites focused on carsharing. For instance, autonaminuty.org (literally: car for minutes) portal not only follows the development of carsharing, but also shares the videos of different cars tests in different cities. Carsharing is also closely watched by portals like "Wysokie Napiecie" (focused on power industry) or "Transport publiczny" (focused on public transport).

Cars provided by carsharing companies are new and meet the high emission norms but most of them are conventional (however some hybrids and some electric cars are also available). The companies assess that electric car fleets will be profitable at some point in the future so electric carsharing will become more popular then.

⁶ Data from Household survey in Poland (ENABLE.EU)



PISM explored the development of carsharing and motivations for using it in 17 in-depth interviews with carsharing users and experts from different Polish cities. Eight carsharing users have been interviewed, of which five from Warsaw and three from Wroclaw. We also interviewed nine stakeholders (municipalities, business, experts) from Warsaw, Wroclaw, Cracow and Lublin.

Carsharing is usually viewed as supplementary to public transport, however, there are also cases when people choose carsharing instead of Uber, taxi or private car. This usually happens when they go out during the evenings or weekends, in urgent situations, when having business meetings in the city centre. Carsharing is regarded as convenient, well-managed mean of transport. Users praise the operators for the system management and high cars' standard. Many people appreciate hybrid cars with automatic transmission system as well-suited for the city. Warsaw car users praise them for being convenient and eco-friendly. In Wroclaw a possibility to drive an electric car is an additional incentive to use carsharing. On the other hand, users also stressed the low price of carsharing as an important factor. Therefore, the above-mentioned advantages of electric cars will not necessarily translate in bigger popularity, if the cost difference remains high. In the long run, carsharing may reduce the number of cars in the cities (users would refrain from buying the second car if carsharing is available).

Public administration view carsharing as an opportunity to reduce traffic, limit pollution and promote environmental-friendly transport. On the other hand, municipalities do not want to support it financially (focusing on its promotion and e.g. offering parking spaces) and want to develop public transport in the first place. This leaves the initiative for the private companies.

Summary of findings in Spain

Carsharing in Spain is provided at the moment by 7 main companies in Madrid, Barcelona, Bilbao, Seville and Palencia. These companies follow two different business models. Three of them are Free Floating One-way carsharing companies which allow users to leave the vehicle at a convenient point within a limited perimeter of the city. They have a 100% electric vehicle fleet and are all located in Madrid. The other 4 are station-based carsharing which require the user to leave the vehicle at one carsharing station. They are located in the aforementioned cities with a varied fleet depending on the company.

The sector experienced rapid growth in the last two years thanks to the entry of free-floating electric carsharing companies in Madrid. The biggest market is in Madrid where 5 companies are operating with about 2000 shared cars, of which 1500 are electric, followed by Barcelona with 2 companies, while Bilbao, Palencia and Seville have one company operating.

We explored the current development of this sector and motivations for using this transport mode through 28 in-depth interviews with carsharing users and experts from different Spanish cities. Fifteen carsharing users were interviewed in the cities of Madrid and Barcelona, from different companies and carsharing types. Moreover, 13 stakeholders representing businesses, public administration and sectoral associations from Bilbao, Madrid and Barcelona were interviewed.

The analysis revealed that the mode is mainly used for leisure activities; younger users seem more inclined towards using more than one carsharing operator, where available, and in general to use multiple modes to get around (e.g. bicycle, walking, shared bike, public transport).

Most of the interviewed users started using the service when they discovered and experienced it rather due to a change in habits or a specific event. The frequency of use varies depending on the carsharing model: free-floating users use the mode more often and for shorter trips compared to station-based users.

Factors influencing the adoption of carsharing mainly seem to be related to **convenience of use**, such as practicality, availability, immediateness and flexibility compared to other transport modes. However, the mode has been also appreciated for its affordability, innovative character and environmental friendliness. This last aspect has been cited only by electric carsharing users.

The use of carsharing could **reduce private car purchases** but may also reduce **public transport use**. In fact, the majority of free-floating carsharing users stated after joining the service that they reduced their use of public transportation, while station-based users stated their use of public transportation remained the same.

The vast majority of users owning at least one car stated that the service may allow them not to buy a second car or to reduce the number of cars owned in the household; Users not owning a car stated the service helped them not needing to buy one.

The **electric technology** is demanded by users. The majority of users would prefer the service being offered by electric cars and, all else being equal, the majority of them state they would be open to paying a bit more for the electric technology. Those who use electric carsharing have a generally positive opinion of the vehicle type and say that their experience could make them consider such vehicle in an eventual purchase.

On the stakeholder side, carsharing is regarded as an **opportunity by the public administration to complement public transportation and reduce carbon emissions** thanks to electric vehicles. For instance the enhancement of carsharing is included in a specific measure of the mobility plan in Madrid. Parking facilitations and restricted areas access, as well as a specific legal standing are key policies identified to drive carsharing development.

According to business stakeholders, carsharing should be pursued as the benefit to society it could bring is threefold: economic, avoiding car purchasing and maintenance costs; social, mainly connected to the freeing of public space, and environmental. The use of electric vehicles in carsharing services is at the moment seen as viable only by free-floating operators; while station-based carsharing have concerns with respect to the autonomy due to the higher length of the trips.

Moreover, cities would benefit from the integration of carsharing with other urban services and in particular public transport to make it easier to avoid using private vehicles. Both types of carsharing services can contribute in this sense to sustainable mobility. However, it will be important to ensure that the flow of carsharing users will come from people reducing their private vehicle use rather than their public transport use.

4.2 The case study in Hungary

4.2.1 National background

4.2.1.1 The mobility sector in Hungary

Hungary has a relatively well-developed highway infrastructure in the region. The length of the Hungarian motorways doubled in the last decade and reached 1,924 km in 2016 (Eurostat). The density of the motorway infrastructure is the highest in the Eastern part of the European Union. Its railway network is also traditionally dense, with a total length of 7,811 km, only 3,018 km of which is electrified (Eurostat, KTI⁷).

Modal split

The modal split of the Hungarian passenger transport differs significantly compared to the EU average. The share of passenger cars is well below the EU average, due to the high frequency public transport services and the relatively low income of the population.⁸ The Hungarian households' spending on transport was 700 euro per capita in 2016 while the average EU spending was 2000 euros in EU-28 (Eurostat). However, based on Eurostat data, the share of transport-related spending in final consumption was nearly the same in Hungary and the EU (12.7% in Hungary and 13% in EU-28).

Region	Passenger Cars	Buses and Coaches	Railways	Tram & Metro
EU-28	81.3	9.4	7.6	1.8
HU	65.8	21.5	9.2	3.6

Table 2: Modal split of passenger transport in Hungary according to passenger km, %, 2015 Source: EUROSTAT

Public transport modes also dominate urban transport, mainly in Budapest, where the share of public transport was 48%, individual motorized ways of travelling accounted for 31%, and the share of walking and biking reached 21% in 2015 (EMTA in KTI, 2017)⁹

Trends in energy consumption and emissions

The Hungarian transport sector accounted for 4536 ktoe (190 PJ) of energy consumption in 2016, representing 25% of total final energy use, 92% of which is attributed to road transportation. Following five years of decline after the economic crisis, the level of consumption has been on the rise since 2013, in 2016 approaching its 2006 level. The use of diesel oil and gasoline account for the highest share, 57% and 31% respectively, while the proportion of fuels other than petroleum products is still quite low; 1% natural gas, 4.2% biofuels, and only 2.2% electricity (Eurostat).

⁷ Source: KTI, Institute for Transport Sciences, 'Trendek', Graphical database on transportation, KTI Budapest, 2017

⁸ The adjusted gross disposable income of households per capita was 38% less than the EU average. Hungary is among the five countries having the lowest per household income according to this measure.

⁹ Source: KTI (2017) 'Trendek', Graphical database on transportation, KTI Budapest, 2017



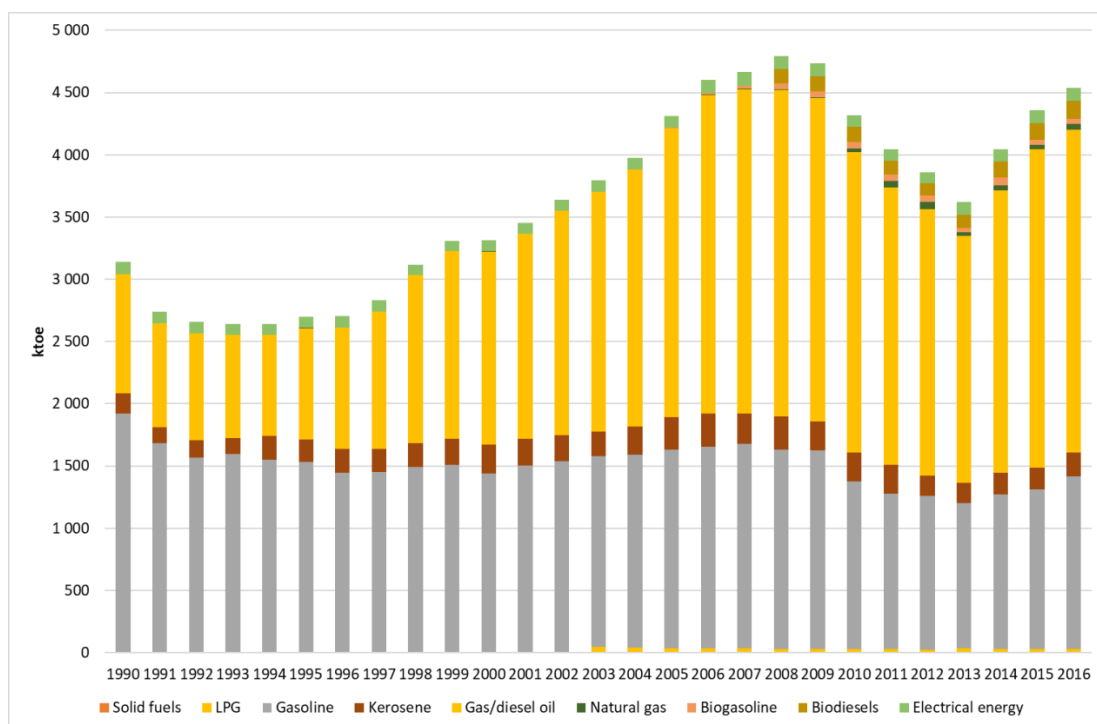


Figure 9: Energy consumption in the Hungarian transport sector by fuel, 2016-2016. Source of data: Eurostat.

The proportion of electricity use in transportation has remained consistent over the last 10 years, reaching a high water mark of 2,9% in the year of the lowest total consumption (2013), owing to the railway sector’s relatively stable energy demand and dependence on electricity.

The emissions of the main air pollutants from transportation decreased substantially in the last 25 years, except for non-methane volatile organic compounds (NMV) resulting from the evaporation of petroleum products and incomplete combustion. The improvement is a result of the strict EU regulation and the concomitant technical development leading to increased environmental performance of new vehicles. However, the amount of nitrogen-oxides and particulate matters has been levered, even increased slightly since 2013. The rising trend can be mostly attributed to the increased transportation activity following the economic recovery and the relatively lower fuel prices of the period of 2015-2017 (Eurostat).

As the following chart shows, transportation is responsible for a rising share of Hungary’s total greenhouse gas emissions¹⁰, more than doubling in the last 15 years (from 10% to 22%). Compared to 1990, emissions increased from 9 to 12 million tons. Similarly to some categories of air pollutants, emissions declined in the period 2010-2013 before rising again. Road transportation accounts for 98% of the emissions from transportation, within which car usage is responsible for 48% (Eurostat).

¹⁰ Eurostat, inventory data, total emissions excluding memo items.



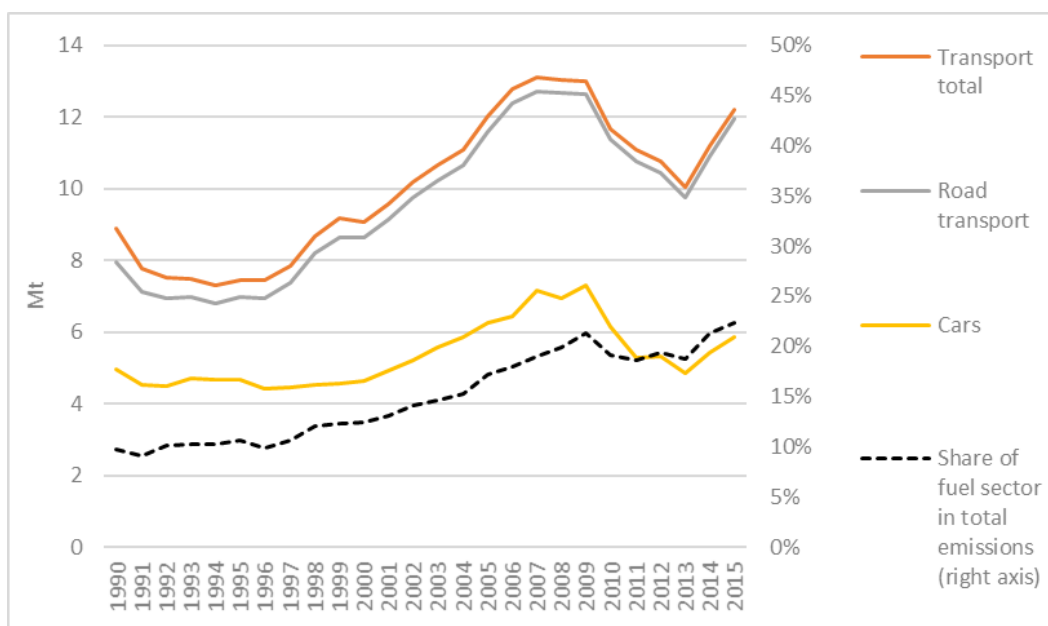


Figure 10: Greenhouse gas emissions in the Hungarian transport sector, 2006-2015. Source of data: Eurostat

Number of electric cars

The total number of passenger cars reached 3.3 million in 2016. The majority, 1.8 million (55%) were aged more than 10 years with only 0.2 million (6%) newer than two years (Eurostat). The number of zero-emission passenger cars remained marginal, but the growth dynamics are undeniable. There were 5,927 electric cars in Hungary including FEV, PHEV and EREC in April 2018, indicating a 22.5% increase compared to the previous quarter. The composition of e-cars is as follows:

	Number by category	Share by category
Fully electric (FEV)	2768	46.7%
Range extended electric (EREC)	1527	25.8%
Plug-in hybrid (PHEV)	1626	27.4%
Other zero emission	7	0.1%
	Number by location	Share by location
Budapest	3177	53.6%
Other settlements	2750	46.4%
Total	5927	100.0%

Table 3: Number and composition of e-cars in Hungary by category, April 2018. Source: e-cars.hu ¹¹

According to the ENABLE.EU household survey conducted in Hungary, almost half of the households own at least one petrol car, while only 8% own one or two diesel cars. The share of households having an alternative fuelled car (using methane, LPG) is only 0.5%, slightly below the percentage driving hybrid vehicles (0.7%). Although there were no electric car owners among the respondents of the survey, 1% use motorcycle driven by electricity. This is almost one sixth of the households possessing

¹¹ <https://e-cars.hu/2018/05/07/jol-fogytak-a-zold-rendszamok-2018-aprilis-30-ig/>



motorcycles. The majority of households (65 %) hold at least one bicycle, of which 1.5% are electric.¹² The use of shared vehicles is not yet widespread in Hungary according to our survey results. Out of the 2012 observations in the weighted database, 2 respondents used a carsharing service, 1 person used peer-to-peer carsharing, 9 used bike sharing, and 14 rented a car occasionally.

4.2.1.2 Overview of the carsharing systems in the country

In recent years, Hungary has launched several types of carsharing services, including free-floating, station-based and peer-to-peer services. Out of these, the free-floating carsharing services can be highlighted based on relatively extensive public awareness and customer base. For that reason, our study focuses on those services and phenomena attributable to 'carsharing', meaning free-floating services, and only presents a short, limited summary of other types of carsharing services.

Of the two existing free-floating carsharing operators, *GreenGo*, a Hungarian start-up company, entered the market first (at the end of 2016) with a fleet of 45 electric cars. The fleet has since expanded to 168 cars with further expansion planned of up to 300-500 cars. *MOL Limo*, the subsidiary of the main Hungarian oil company started its service in January 2018 with a fleet of 300 cars (200 conventional and 100 electric). The services of the two providers are very similar in almost every dimension:

- **Prices and price structure:** Two tariff schemes are available at both companies, one for occasional users where the rates are solely usage-based (per minute drive/rental and stop-over/parking fee), and one for regular users where a monthly fee and discounted usage-based fees are charged. While price differences are trivial, the registration fee is much lower at GreenGo and can be used towards rental payments (rentals, monthly fee, etc.). Moreover, GreenGo offers additional rate plans for companies which MOL Limo does not advertise.
- **Booking and payment methods:** Customers can book cars and pay fees via online applications. Initially registration was possible only with GreenGo's customer service, but after MOL Limo entered the market with online registration GreenGo also made it available.
- **Service areas:** The services are available in the densely populated area of Budapest, and as they continuously expanded, the overlapping area between the two carsharing providers is large but not complete.
- **Car fleet:** Both companies operate VW Up/e-UP in their fleets, but while GreenGo runs only full electric cars the majority of MOL Limo's vehicles are conventional petrol-fuelled cars. This is an important difference between the two services, with the brand name 'GreenGo' emphasising the environmental friendly nature of the service.

Among other types of services, Avalon's station-based service (CareSharing) is the oldest taking shape as early as 2011. The service combines the features of the above mentioned carsharing services and a classic car rental. The company has 8 stations in Budapest and operates a differentiated car fleet from small cars to vans, which can be booked for pre-selected time intervals. Prompt renting is not available. However, users only pay for the used time and distance, and pricing is based on 30 minutes intervals. The company relies on traditional vehicles.

On the other side, two different peer-to-peer carsharing services are also present in Hungary. *Autopal*, established in 2016, connects car owners and potential renters across the entire territory of the country, while *Beerides* started its airport-based peer-to-peer service in 2017. The latter is a

¹² Using data weighted by gender, age, education and settlement category.



combined parking/renting service: travellers arriving with plane can rent the cars of departing locals who came to the airport by car and do not need it during the time of their travel.

4.2.2 National specific study design

The study employs the method of semi-structured deep interviews, conducted face to face with household users and the representatives of stakeholder organizations in Hungary. The interviews took 1 hour on average, and mainly followed a common guideline described in section 2, including topics and questions related to users’ preferences, attitude, habits and evaluation of the service, as well as the view of industry stakeholders on the future development potential of the travel mode. In the following we give an overview of the participants to the explorative research.

Participants of household interviews

For the purpose of exploring users’ attitude towards e-carsharing and their views on its future role in passenger transport, semi-structured in-depth interviews were conducted with 9 carsharing users. As the use of carsharing services is not yet widespread in the country and carsharing companies cannot provide personal data of the users who joined their schemes, participants were reached through personal contacts and by recruiting volunteers through a dedicated social media group. To ensure insights from a wider range of perspectives, participants were considered by age, gender, car ownership and household size. Table 4 summarizes the main characteristics of the 9 interviewees providing information.

Participant	Gender	Age	Household size	Education	Owning a car
1	female	33	2, no child	university	yes
2	female	51	1 (grown-up children)	university	no, just sold it
3	female	38	1	university	no
4	female	26	2, no child	university	no, but can use the car of the family
5	female	28	3, 1 child	university	no, but can use the car of the parents
6	male	37	1	university	yes
7	male	44	4, 2 children	PhD	no
8	male	24	3, no child	university student	no, but can use the car of the family
9	male	65	3, 1 child	university	yes

Table 4: Main characteristics of household interviewees

As can be seen from table 4, the group of participants was quite balanced according to gender, age, family status and car ownership. Out of the nine persons, five are female and four are male. The age of the participants ranges between 24 and 65 with an average of 38 years. About half of the participants have family and children. 3 participants possess a car and 3 further interviewees can use the car of their family. Because carsharing services are currently available only in the capital, all participants live in Budapest or in its close agglomeration. By level of education, all participants have

a university degree or is currently involved in a university program. This fact is not a result of ex-ante selection, which might indicate that people with higher education are more likely to use carsharing, but can be the consequence of a selection bias. Recent research shows that education level is positively correlated with the use of carsharing services¹³.

One important feature of the interviews in Hungary is that some participants do not exclusively use electric carsharing. Many GreenGo users registered with MOL Limo to take advantage of the substantial initial discount they offered at the launch of their business and to have access to a larger number of cars. Since MOL Limo also has petrol cars in its fleet, some of the participants occasionally drive those vehicles as well. Also, one of our interviewees uses Avalon, a station-based carsharing service, operating traditional cars. This fact, however, made it possible to study the importance of environmental awareness as a factor of using electric carsharing.

Most of the household interviews took place at REKK offices at the Corvinus University of Budapest. In some instances, the interviews were made at other more convenient locations for the participants (e.g. in the home of a female respondent who has a baby).

Participants of stakeholder interviews

Six semi-structured in-depth interviews were conducted with eight representatives of six stakeholder organizations, listed in the following table.

Company/organization of the interviewee	Company's profile
BKK Centre for Budapest Transport	Transport company of the municipality of Budapest
Jedlik Ányos Cluster	Non-profit organization with the mission of promoting electric transport
e-Mobi Ltd.	Non-profit organisation, responsible for e-mobility infrastructure development. 100% owned by the state.
ELMŰ (Affiliate of Innogy)	Electricity DSO, charging point operator and developer.
GreenGo	E-carsharing service provider
MOL Hungarian Oil & Gas Plc./MOL Limo	National Oil Company/Carsharing service provider

Table 5: Organizations of stakeholder interviewees

The first three stakeholders represent interests of the non-profit sector and the last three are from the private sector, including the two carsharing service providers operating in the market. An attempt was also made to interview a representative of the governmental office responsible for e-mobility, but unfortunately the interview period coincided with governmental elections in Hungary which triggered a substantial reorganization of the ministries and their responsibilities, making it impossible to organize a meeting with a competent officer.

The interviews took place at the offices of the interviewees.

¹³ See for example M. Prieto et al. 'Carsharing adoption intention in urban areas: What are the key sociodemographic drivers?', *Transportation Research, Part A* 101 (2017) 218–227, or H. Becker et al. 'Comparing carsharing schemes in Switzerland: User groups and usage patterns', *Transportation Research, Part A* 97 (2017) 17–29.

4.2.3 Carsharing users' interviews analysis

Registered users of the available carsharing schemes were asked about their general usage patterns, their motivations for using this travel mode, and the way the service has changed their former transportation practices. They also expressed their view on having a private car versus using a shared car and provided suggestions on how to improve the services in the future.

4.2.3.1 Description of how the mode is used

Generally, participants' first experiences with carsharing were threefold. There were two participants eagerly waiting for carsharing to become an option in Budapest that registered early for the service. One gained experience in using the mode in Paris while the other read about it on the internet. Three people were introduced more conventionally; one heard about the service from a friend, another saw a GreenGo car on the street and became interested, while the third previously heard about it from his colleagues.

There is a huge variation among the participants with respect to the frequency of carsharing service usage. Five of the interviewees can be considered as regular users, travelling at least two or three times per week. These individuals seem to constantly optimize between the different traveling modes, considering time, cost and comfort level as main influencing factors. However, the other 4 participants are just case by case users, taking the cars only monthly or even less regularly for special destinations. As to the purpose of travel, two of the participants make use regularly to get to the edge of the service zone where they switch to their own cars and drive to their homes located in the outskirts of the city, avoiding the search for parking places and paying high parking fees. Others use them to transport children, old relatives or pets, do shopping, visit friends, travel to locations of sport activities and entertainment, or simply get to work in the morning when it seems to be the fastest option.

The pattern of usage is relatively similar among interviewees. Most of them use carsharing for relatively short distances, within the range of 3-8 km. Some of them tend to use it in evenings and weekends, when city traffic is not as prohibitive. The reasoning lies in the pricing method of the service, and with the fee at least partially based on time; the cost of the service can grow drastically in the periods of high traffic making alternative transportation methods more attractive. Some users stated carsharing can even replace public transportation on weekends.

4.2.3.2 Insights on the factors influencing carsharing adoption

Most of the interviewees used and continue to use public transportation and/or bicycle for travelling to their usual destinations and take a taxi occasionally. As for the motivation for trying the service, responses were similar. Almost all described herself/himself as a person generally interested in innovation and new technology. Other crucial elements were the cost of the service and the high comfort level associated with the transportation method. Although all participants highlighted the positive effects of electric vehicles on the environment during the interview, it was interesting to see that concern for the environment was mentioned only once as a main driver for using the mode. One participant joined the scheme when his own vehicle was damaged and had to undergo a lengthy repair, after which he continued using the service occasionally. All in all, most of the interviewed carsharing users seem to be conscious consumers optimizing between the available travel modes such as public transportation, bike, carsharing and taxi. Some of them also strictly monitor expenses related to transportation.

4.2.3.3 Insights on the relation between carsharing and public transport use

Most participants agreed that at a basic level carsharing is competing with the taxi service. It is cheaper and more comfortable since they do not have to sit in a car with an unknown person. This also implies that in their case carsharing does not compete with public transportation. For most of the participants the usage of public transportation has decreased only slightly since they joined any of the schemes, and they consider the travel mode to be complementary to public transportation. There was only one participant who never takes public transportation vehicles because she finds them unsanitary, crowded and uncomfortable. Some participants reported a minor drop in their public transport usage, generally on weekends.

4.2.3.4 Insights on the relation between carsharing and private vehicle ownership and use

Out of the six interviewees not owning a car one asserted that the main reason is environmental awareness. Three people based their decision on financial factors, considering it too costly to pay for the car and its maintenance if they drive it rarely. Two of those formerly had private cars but sold them and decided to switch to carsharing. However, four younger participants plan to buy a car in the future, claiming that it is necessary if one has a family and children. Some of them would prefer having an electric car but because currently this technology is too expensive they consider it as a mid-term option. Besides the two users who sold their cars and switched to carsharing, there is one interviewee who clearly declared that she would not buy a car in the future.

It is important to highlight that almost all carsharing users having private cars use their vehicles quite rarely but still consider it important to have their own cars to reach destinations not accessible within the carsharing service (e.g. travelling to the countryside). At the same time, most do not like to use the currently existing renting options for longer travels. Switching from car ownership to carsharing scheme membership was deemed to be an appropriate solution only if the services were available for longer travels in the whole country, cars were always easily accessible, and recharging would not cause time loss during the travel. Some participants also claimed that the current vehicle model(s) available within carsharing schemes are not appropriate for travelling to longer distances or carrying children because they are not large and safe enough, so a wider range of models would also be necessary.

4.2.3.5 Users' future expectations on the development of the sector and opinion on the type of vehicles used in the service

Preference for electric cars

Participants were asked whether they prefer using electric to traditional cars within a carsharing system. Their answers revealed almost no preference for electric cars, which implies that electric propulsion is not always the most important decision factor in using the service - easy access and comfort might be more important. In case both kinds of cars are available at a similar distance from their point of departure, all of them would choose the electric car. However, if they had to walk much more to reach the electric car, they would settle for the traditional vehicle. Only two of the respondents declared a clear preference for the electric car. Another person said that traditional cars should be phased out from carsharing services, albeit at present he does not refuse using the traditional car if it is easier to access.

To the question whether they would be willing to pay more, the same or less for an electric car than for a traditional one, none of the respondents answered they would pay less. 3 users would pay the same and 4 people would be willing to pay 10 – 20% more for the electric car. One user said she would be willing to use the petrol-driven car if it cost half of the fee payable for the electric. One respondent said that she should be paid for using the traditional car.

Evaluation of current system and suggestions for improvement

Users are generally satisfied with the service, they described the customer services as quick, professional and helpful. However, most of them could identify minor points for improvement. Several participants mentioned that security measures for GreenGo cars are too strict and registration was a little complicated in the beginning, given that users had to physically go to the customer service office of the company. However, the situation changed with the entrance of MOL Limo which made registration possible on-line through a mobile application, which was then followed by GreenGo. Users agreed that competition had a positive effect on the quality of service. One common problem identified is a result of many scheme members living in the outskirts of Budapest that exchange their private cars to shared cars at the border of the service zone, making it difficult to find accessible cars in the city centre in certain hours of the day. They urge a more efficient reallocation of cars. Users would also welcome expanding the carsharing zone, especially to the airport. Some participants suggest making child safety seat and bicycle rack available in the cars. Another issue identified by the respondents was the lack of parking places in the inner city. The associated time searching for free parking increase the time of travel and may substantially increase the cost of the service. Some participants suggested that service providers pay for dedicated parking places.

Users share the expectation that the carsharing market should and most probably will increase in the future. Most of them do not see any disadvantage of electric carsharing, although they agree that it does not necessarily help solve congestion problems and might even worsen them if shared vehicles do not replace private cars but public transportation or bikes. One participant highlighted the danger that inexperienced drivers may have easier access to cars which might lead to more accidents. However, another participant criticized the stipulation requiring a one-year-old driving licence for registration, which could deny the younger demographic an opportunity to use shared vehicles before buying a private car.

4.2.4 Stakeholders' interviews analysis

As described in section 2, six semi-structured in-depth interviews were conducted with representatives of stakeholder organizations. Interviewees were asked about their specific roles in the sector, the way they contribute to its development, and the barriers and opportunities related to the future expansion of carsharing services.

4.2.4.1 The current development of carsharing, the opinions of stakeholders

Three of the stakeholders represent the non-profit sector, while the other three come from the business side. BKK is a 100% affiliate of Budapest Municipality and is responsible for the organisation of the municipal transport. Jedlik Ányos Cluster is a representative association of companies, NGOs and academic institutes with special interest in electric mobility. e-Mobi's main responsibility is the development of the electric charging infrastructure. The non-profit company organizes charger-

development programs and manages the allocation of related state grants and subsidies. Non-profit stakeholders do not have specific carsharing-related objectives but they agree that this mode of transportation fits well into the complex supportive vision of the government related to e-mobility.

From among the private companies, ELMŰ has the widest range of interest in electric mobility. The company's main owner is Innogy, which has several electric mobility related business units including charging infrastructure development and operation, platform management and roaming services, and commerce of electricity for cars. The other two interviewed companies are the competing carsharing service providers (GreenGo and MOL Limo) currently active in the electric carsharing market. As mentioned in section 1, GreenGo is a newly established company with private equity founders while MOL Limo is a subsidiary of the national oil company MOL. Both companies plan the further development of their businesses by expanding service zones and vehicle fleets.

All respondents share the view that electric carsharing is a promising area in Hungary. The two service providers contribute to a high visibility of the service and electric mobility in general. Both are operated on a commercial basis without benefiting from any special subsidies on top of the incentives available to all electric vehicle owners. Respondents think that the innovative character of the electric cars and environmental awareness are important motivators to use the e-carsharing services.

Respondents are optimistic and see the segment as a dynamically improving market. With the entrance of MOL Limo and a growing number of cars the issue of how to integrate the travel mode into the public transportation system becomes paramount. However, there are different views on the future role of carsharing in urban transport. The extension of the available service area and the increase of fleets can support the short-term development of the service, but in the long term, autonomous cars can cause a disruptive change in the whole value chain of urban transport. Interviewees generally think that e-carsharing will be an important element of the transition to a new transport ecosystem.

4.2.4.2 Facilitation of carsharing: contribution, political measures and social characteristics

From the viewpoint of the public transportation company of Budapest, the main motivation behind the development of electric carsharing systems is to open up new more complex opportunities for reaching the sustainability goals of cities. The necessity of improving the environmental performance of transportation was emphasized by all participants. They agreed that carsharing can meet the requirements of the new generation, eroding the need and demand for private vehicle ownership.

Regarding the most important measures that will facilitate the development of carsharing systems, all respondents highlighted the need for increasing the pace of the installation of charging stations and filling gaps in the regulatory fabric. According to one of the carsharing providers, the introduction of a congestion fee in Budapest would probably boost the development of the market, and the service could also be promoted by the integration of the carsharing schemes into the public transportation system, as well as providing additional advantages to users, such as dedicated parking places or the use of bus lanes.

All stakeholders think that it is worth to count on this travel mode in the future. It complements public transportation well and can free up space in the cities. More interviewees pointed out that this service can currently be economically viable only in large cities. The CEO of one of the carsharing companies thinks that autonomous cars operating in carsharing systems will eliminate car ownership

entirely in the future, and public transportation, electric carsharing and taxi services will merge into a hybrid service.

Two respondents highlighted the importance of rethinking the policy of using public space in the capital. For example, conflicts of interest arise when there is a need for allocating parking plots for e-charging stations, because less parking facility means foregone revenues for the municipalities.¹⁴ There would be a need for an integrated smart city strategy in Budapest. Service providers point to the fact that recent benefits provided for e-car operators contribute to the success of operating their business and introducing or changing some regulatory measures too early (e.g. imposing an excise duty on electricity as a fuel) could be detrimental.

4.2.4.3 The relation between carsharing and other transport modes

There were different opinions on the potential integration of e-carsharing into the public transport system. Most respondents consider carsharing services to be complementary to the traditional modes of public transport. However, some of them think that in the long run, with the emergence of autonomous cars it can also become its competitor.

BKK, the public transport company of the municipality of Budapest, operates a trip-planner application¹⁵ enabling travellers to organize their journey based on the schedules and actual position of all public transportation vehicles, including bike sharing services. The transport authority is open to cooperate with e-carsharing operators in the integration of their services into the information system. To maintain fair competition among market actors, neutrality should be ensured during the integration process.

The views of the stakeholders vary widely as to the impact of electric carsharing on traditional taxi services. Some interviewees think the two modes can complement each other, while according to others, carsharing schemes might decrease the demand for taxis. Some of the respondents argued that the extension of the service zone to the Budapest airport might cause a serious decline in the use of taxi services between the airport and the city. As to the ownership of private vehicles, respondents think that e-carsharing can be a potential substitute of a second car in a family, but it cannot yet substitute private cars.

4.2.4.4 Business, political and associations views on the future of mobility

Policy makers

One of the duties of BKK is to prepare and implement the transport strategy of the city and assist in the preparation of regulations related to urban transportation. Measures that have been taken by the company to reduce the carbon intensity of urban mobility include the modernization of the fleet of public transportation vehicles, the development of the trip-planner application, the launch of the bike-sharing system of Budapest called 'BUBI', and the installation of automatic ticket vending machines, creating modern customer service centres, and expanding the electricity-driven vehicle fleet and lines (tram and trolley). Promoting electric carsharing involves the provision of support and ensuring the necessary infrastructure for its operation. With the phasing out of the responsible department at the Ministry for National Economy, BKK cooperates with e-Mobi in installing charging

¹⁴ Budapest has a two-tier local government system, including the Municipality of Budapest and the local governments of all of its districts which are not subordinated to the Municipality of the City. Their specific duties and powers are specified by law.

¹⁵ See: <http://futar.bkk.hu>

stations in the city. The division of responsibilities between the municipality of Budapest and the municipalities of the districts is problematic when conceptual issues are to be addressed because of the conflicting interests previously mentioned.

BKK basically shares the values and targets related to the deployment of sustainable transportation represented by pressure groups and service providers. The vision of the interviewee is that electric carsharing will further develop and fill the gaps in public transportation serving as a complementary travel mode to other public transportation methods. The emergence of autonomous vehicles used as a taxi or shared car will be an interesting development opportunity.

Pressure groups

The Jedlik Ányos Cluster (JÁK) provides recommendations for the improvement of legislation related to e-mobility, representing the interests of its members, thereby informed about most problems and issues needing to be addressed. They cooperate with the relevant regulatory bodies, although one of their most important partners, the above-mentioned working group within the Ministry for National Economy with dedicated responsibilities related to electric mobility ceased to exist. e-Mobi, the state-owned company responsible for the development of the charging infrastructure also considers itself to be an organization representing e-mobility-related interests. Both organizations promote e-mobility in general. JÁK has two related targets: one is to avoid a centralized structure in the transportation strategy of the capital and moving MOL Limo into the direction of having only electric cars in its carsharing fleet. e-Mobi promotes everything that can be associated with e-mobility. The maximum 1.5 million HUF support provided for purchasing cars can also be accessed by carsharing system operators.

Pressure groups do not see any factors that would presently hinder the operation of carsharing systems. There is not a considerable divergence between their views and the approach of regulatory bodies, with all parties considering charging infrastructure and parking rules highly important issues. Both organizations have positive visions on the future of the service, facilitated by the continuous development of vehicle technology, and urge the use of carsharing services relying exclusively on electric cars.

Industry stakeholders

The current offer of free parking and free charging contribute significantly to the economic viability of carsharing companies. Their main target group is the generation in their late twenties to early thirties, however, because of the relative novelty of this type of business, the characteristics of their customers still must be assessed. The average age of users is around 34 years, mostly having higher education level, and very actively participating in social media.

Both companies consider the other carsharing service provider as the only competitor. Although taxi service can also be regarded as competitor, the nature of the service is quite different. The CEO of GreenGo thinks that Limo copied their business model, while Limo claims it is good for the market to have two competing companies. As for relations with policymakers, Limo believes that the emergence of their service was received positively and the company does not expect a ban on petrol-driven cars used in their fleet. GreenGo also generally feels a positive attitude towards their business, but is awaiting upcoming legislation. The representative of ELMŰ hopes that the strong lobby power of a large player in the market (MOL) will not deteriorate the level playing field in the electric carsharing market. All stakeholders have a positive vision and plan for further development of their business. They also hope that their services can be integrated into the public transportation system.

4.2.5 Discussions

Issues related to the attitude and behaviour of consumers

As the interviews revealed, some carsharing system members take shared-cars occasionally and use public transportation or bicycle in their daily routine. Considering the positive effects of electric mobility, expanding the carsharing service should not mean diverting them from public transportation, but rather to involve people by using their own cars or the company cars in their everyday travel, contributing to the reduction of pollution and congestion in the city. The question is, what kind of incentives could make them switch from those vehicles to using the electric carsharing? One promising initiative is GreenGo's price plan for firms with vehicles mainly anchored in Budapest offering the use of shared cars instead of managing their own fleets. For individuals, incentives that make carsharing less expensive compared to using private cars, like the introduction of congestion fee or increased parking fees, could contribute to more switching.

One important finding of the interviews is that easy access and comfort appear more important than environmental considerations for those deciding between electric and traditional shared vehicles. The issue here is how to arrange the system towards decreasing the number of traditional cars and expanding the electric fleet. Some interviewees proposed a ban on petrol cars, which would, however be a direct intrusion into business decisions. A more appropriate way could be to create a regulatory environment that makes using electric cars more profitable, bearing in mind the important precondition of accelerating the installation of charging points.

As to the problems with leaving the car at busy areas of the city, the question arises whether to create dedicated parking plots for the vehicles. If yes, should they be company specific or accessible for all carsharing schemes? To maintain fair competition, the latter solution would probably be more appropriate.

Another outcome of the research is that households willing to switch to carsharing from owning a personal car would require the extension of services to the countryside. An interesting question is how to handle this problem, given the short range and the small selection of cars available within the current free-floating system, and the demand of users for a ready-to-use car during their travel, without having to lose time with recharging the vehicles. If the goal is to induce users to drive electric rather than conventional cars even for longer trips, this question will need to be addressed.

Issues related to the development of the electric carsharing segment

Currently the main support of the electric carsharing is the free-parking opportunity in Budapest. It is important to underline that this support is based on legislative decisions of the responsible municipalities and available for all passenger cars with green plates. All stakeholders agreed that it wouldn't be appropriate to extend the free-parking opportunity for cars with internal combustion engine in carsharing fleets. The free parking opportunity gives a competitive advantage to the electric fleet operators compared to the traditional vehicles. However, as the operators underlined, this kind of support also carries risks since there are no contractual guarantees from the municipalities ensuring the benefit for a specified time period. The parking fee in city centre of Budapest is over 1.2 euro/hour, so a potential change in the legislation can undermine the profitability of the free-floating business model.

Although respondents agreed that there is no reason to give the same support to combusted engine cars in parking, there were different opinions on whether to use only electric cars in the carsharing schemes. MOL Limo argued for keeping internal combustion engine cars in the fleet because of the higher range they offer with one refuelling and because of the limited e-charging infrastructure. The extreme weather conditions in winter also might cause problems for electric vehicles. In contrast, GreenGo thinks that the currently available electric models give appropriate solution for city services. The "independent" stakeholders think that future carsharing services must be based on electric services.

Interviewees drew attention on the following barriers related to e-carsharing that need to be resolved:

1. One of the most important barriers is the limited number of public charging points and the relatively low range of the e-cars.
2. The market size also determines service potential. Most respondents think that only Budapest and its agglomeration offers sufficient demand for the carsharing operators.
3. From an operational perspective the main barrier is the unstable legal background for parking, which is currently supportive, but operators do not have a long-term understanding on how the conditions will change in the future. This uncertainty holds back capital investments into the sector and slows the development of the e-car fleets.

Stakeholders and households' views/opinion

The interviews revealed no major deviation between the opinion of users and stakeholders as to the operation and desired future development of electric carsharing. One question in which opinions differ is the inclusion of traditional cars in the service. Households think that the operation of electric vehicles within carsharing schemes would be desirable, albeit in some cases convenience might be the principal factor in their choices. Some stakeholders also underlined the importance of moving towards zero-emission transportation, and some of them even argued that non-electric cars should be withdrawn from the service. The representative of BKK thinks that a temporary use of these cars might help the uptake of carsharing through the increase in the number of available cars.

4.2.6 Conclusions

Summary of findings

The household users participating in our research share some common characteristics: they are all interested in innovative technologies, they are highly educated and identify to be environmentally conscious, and yet, as it turned out, convenience might be more important than the eco-friendliness of driving, e.g. when a conventional car is more easy to access. Other frequently cited reasons for joining one or both carsharing schemes were the opportunity to take advantage of free parking and the flexibility and convenience provided by the system. Most interviewees use the service occasionally, for shorter distances. One problem raised by the users was the difficulty of finding free parking plots in the inner city during busy periods. Respondents claim that their carsharing scheme membership did not significantly decrease the amount of travelling with public transportation, mainly because they use the mode only occasionally, replacing their use of a taxi service. In general, users are satisfied with the quality of service and stressed the positive impacts of competition in the market. All but one user could imagine not owning a car, if easily accessible, comfortable cars were

offered by carsharing companies, that would always be available and could be used for travelling longer distances.

Stakeholders in the e-mobility sector do not specifically have carsharing related objectives, but they think that this mode of transportation fits well into the complex supportive vision of the government related to e-mobility. The appearance of the state oil company in the market drew public attention to the carsharing service, which, together with its general popularity among young users, is considered by all stakeholders as a good 'marketing' device helping to promote e-mobility in general. However, opinions diverge as to the use of traditional cars in providing the service. Both carsharing companies are operated on a commercial basis, benefiting only from the incentives available to all electric vehicle owners.

As regards the future prospects for development, integrating carsharing into the information system of the public transportation company of Budapest would be a major step towards the coordination of low-carbon travelling opportunities. Although free parking adds to the profitability of service providers, they consider the predictability of regulatory rules as a crucial factor in planning their future activities and the expansion of their service.

Interviewees mentioned less cars on the streets, more free space, less noise and air pollution, and wider selection of transportation services as the most important contributions that e-carsharing can provide in urban areas. Stakeholders consider publicity, availability of infrastructure and parking facilities, and the favourable regulatory environment to be the key factors determining the success or failure of carsharing schemes.

Possible future developments

Involving the carsharing schemes into the public transportation information system of BKK will be an important step towards the integration of the service in the transport system of Budapest. Another important future development area includes the extension of the service zone, possibly including the option of using the cars outside of Budapest for travelling to the countryside. However, this latter option would present a challenge given the low range and variety of car models currently operated by service providers. This would likely need to be provided in a framework different from the free-floating type of service.

Policy recommendations

Based on the outcome of our research, the following policy recommendations are proposed:

- Filling the missing gaps of the regulation and a clear vision provided by municipalities related to free parking could create a predictable regulatory environment for the service providers and enable them planning their further expansion (e.g. long-term contracts ensuring discounted parking fees.)
- Integrating the carsharing services into the public transportation system of the BKK has to be implemented in a non-discriminatory way, so that all market actors have an equal opportunity to be involved. In order to maintain fair competition among market actors, neutrality should be ensured in the integration process.
- Use of traditional cars should be gradually withdrawn from the service. To offer driving opportunity for shorter distances within a city, there is no reason for having longer range that would justify their use. This process does not necessarily have to be forced by regulation, other regulatory steps can foster replacing them to electric, e.g. introducing the congestion charge ensuring exemption for electric vehicles only. Also, in case the number of e-cars will increase in

the future, presumably resulting in more cars accessible on the streets, the preference for electric cars might override the convenience factor influencing the choice of system users.

- Resolving the problem of conflicting interests among the municipalities of districts and the municipality of Budapest related to the use of public space without impairing the autonomy of local governments would be an important step towards expanding the use of the service and e-mobility in general.

A further issue is whether e-carsharing should be given a priority compared to private e-car ownership, especially when the support for electric car owners will be phased out due to the higher penetration of electric vehicles. One possible way of continued support could be to maintain free parking for shared electric cars.

4.3 The case study in Italy

4.3.1 National background

According to the most recent monitoring of global emissions made by ISPRA¹⁶ (Istituto Superiore per la Protezione e la Ricerca Ambientale), in 2015 in Italy the **total greenhouse gas emissions diminished by 16,7% from the base year 1990**. The positive trend started in 2008 as a result of a general reduction in energy consumption and industrial production due to the economic crisis, the increase of energy production from renewables and improvement of energy efficiency. CO2 emissions, which contribute by 82,5% to the total emissions, decreased by 17,9%. The sectors most contributing to them, for about a half, are energy production and transport. However, while emissions from energy production and industrial plants diminished by -23,7% and -38,9% respectively, **greenhouse emissions from the transport sector augmented by 3,2%** from 1990. **Transport is responsible for 25%** of the total greenhouse emissions (data from 2014), **93,7% being road transport**.

4.3.1.1 The mobility sector in Italy

According to the 14th Report on Mobility released in 2017 by Isfort¹⁷ (Istituto Superiore di Formazione e Ricerca per i Trasporti), with the contribution from Asstra e Anav, between 2002 and 2016 **sustainable mobility in Italy (walking, cycling and public transport) decreased** from 37,2% to 31,1%. During the same time, **the use of the car increased** from 57,5% to 65,3%, with 38 million cars sold in 2016 reaching a motorization rate of 62,4 cars every 100 inhabitants.

	2001	2008	2016	Trend
Walking	23,1	17,5	17,1	↓
Bike	3,8	3,6	3,3	↓
Two-wheel	5,7	4,5	3	↓
Car	57,5	63,9	65,3	↑

¹⁶ <http://www.isprambiente.gov.it/it/pubblicazioni/rapporti/trasporto-su-strada-inventario-nazionale-delle>

¹⁷ http://www.isfort.it/sito/pubblicazioni/Convegni/AC_2017_19_04/Rap_2016.pdf



PT	5,7	4,1	4,4	→
Coach	1,4	1,4	1,3	↓
Train	0,7	0,6	0,9	↑
Multi-modal	2,3	4,5	4,6	↑

Table 6 Evolution in the use of means of transport between 2001 and 2016: distribution % of movements per means of transport – Source: 14th Report on Mobility, Isfort

As for urban public transport, while in big cities (>250.000 inhabitants) the modal split in favour of public transport reaches around 30%, in urban areas between 10 and 15 thousand inhabitants it falls to around 5%. In addition, **the average age of the bus fleets has increased** from 9,76 years in 2004 to 11,38 years in 2015 - compared to 6,9 in Germany, 7,6 in UK, 7,8 in France and 8 in Spain. However, a **National Strategic Plan for Sustainable Mobility** has been approved in 2017, where 3.7 billion euros have been earmarked for bus fleets renewal by 2033.

4.3.1.2 Overview of the carsharing system in the country

In Italy, **the phenomenon of shared mobility started in the early 2000s** as a result of the Ministry of Environment decree on Sustainable Mobility of 27 March 1998 and the public interventions that followed to reduce pollution in urban areas. Only recently, private operators have entered the market and radically changed it. Public-private cooperation is the strength of the Italian shared mobility.

The introduction of **free-floating carsharing by Enjoy e car2go in 2013** represents a turning point both qualitatively and quantitatively, with an immediate positive feedback from the citizens. From 2013 to 2017, the number of shared vehicles is five times bigger, while the number of subscribers has increased by eighteen times and the rentals by thirty-seven times.

For the current situation on carsharing in Italy, the key and most updated information and data available can be found in the recently released **2nd National Report on Shared Mobility** issued by the **Italian Observatory on Shared Mobility**.¹⁸ The Observatory was founded in 2015 by the Italian Ministry of the Environment and the Sustainable Development Foundation (Fondazione per lo Sviluppo Sostenibile), with the aim to create a collaborative platform between public authorities, private companies, service providers and research, and boost shared mobility in Italy.

Statistics

According to the 2nd National Report on Shared Mobility, in 2016 carsharing in Italy reached **1 million subscribers**, with a **fleet of 7.679 vehicles in 35 cities**. During the year, about **8 million rentals** have been made, for a total of **62 million k/m**. One negative note is that carsharing services are concentrated in few urban areas: 43% in



Figure 11 Number of carsharing services activated from 2001 to 2017 and geographical distribution as of 31/12/2017. Source: Italian Observatory on Shared Mobility

¹⁸ <http://osservatoriosharingmobility.it/wp-content/uploads/2018/04/Rapporto-nazionale-Sharing-mobility-2018.pdf>

Milan, 24% in Rome, 15% in Turin and 8% in Florence.

The use of low emission vehicles in the Italian carsharing system is in expansion. The number of shared electric vehicles has increased by 3,5 times in the last three years, from 620 vehicles in 2015 to about 2.200 vehicles in 2017, representing 24% of the total cars and scooters shared. The percentage is even more important considering that electric cars for private use represent less than 1% of the Italian automotive market.

As for the specific types of carsharing services at disposal, Italy largely prefers the free-floating system compared to the station-based, as illustrated in the following figure.

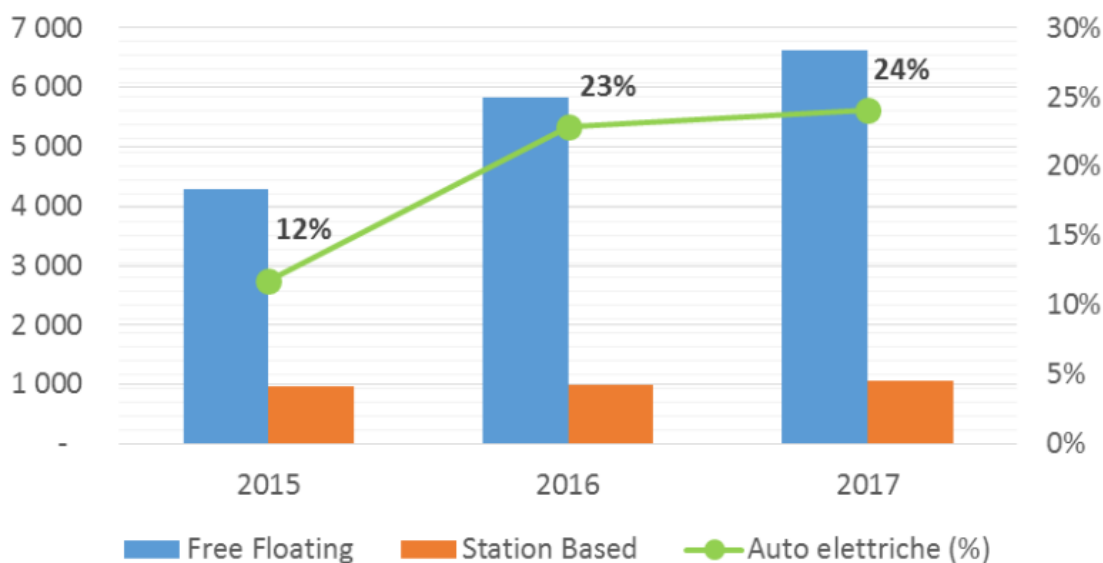


Figure 12: Number of carsharing vehicles for typology of service (left axes) and % of electric vehicles (right axes) - 2015, 2016, 2017. Source: Italian Observatory on Shared Mobility

The actors

At the end of 2017, the number of active carsharing services operating in the national territory are 29, managed by 11 operators. The main companies are **Enjoy**, with more than 500,000 registered users, and **Car2go**, with 343,000 users. The **ICS** (Initiative Carsharing) network is the third operator followed from close by **Share'Ngo** for the number of shared vehicles.

The most recent operators entering the Italian market are **Drivenow** and **Bluetorino**, that opened a carsharing service in Milan and Torino respectively. Drivenow has 60,000 users with 500 cars (from Minis to BMWs.). Bluetorino, together with Share'ngo have a fleet composed by 100% electric vehicles, while **E-Vai** by 85%.

Operator	First activation	N° services	N° vehicles	Fuel	Diesel	LPG	Electric	% Electric Fleet
Consorzio Nazionale Gestori Carsharing	2002	7	493	238	41	103	27	5%
Ube ego	2004	1	149	124	18	0	7	5%
E-VAI	2010	1	84	13	0	0	71	85%

car2go	2013	4	2200	2200	0	0	0	0%
Enjoy	2013	5	2360	2360	0	0	0	0%
Carsharing Sudtirolo	2013	1	34	16	16	0	2	6%
Playcar	2014	1	48	33	5	4	6	13%
Sharen'go	2015	4	1531	0	0	0	1531	100%
girACI	2015	3	128	87	6	0	35	27%
Drivenow	2016	1	500	480	0	0	20	4%
Bluetorino	2016	1	152	0	0	0	152	100%

Table 7 Carsharing operators in Italy at 31/12/2017 and their vehicles fleets - Source: Italian Observatory on Shared Mobility

At the moment, for the first time the carsharing sector is confronted directly with **short-term rentals**. The most important ones are GirACI's expansion (a division of ACI Global that recently acquired Genova Carsharing,) and the arrival of Europcar through their subsidiary Ubeeqo (which took over Milan's GuidaMi.) formal partnerships have been established with DriveNow (Sixt) and Car2go (Europcar).

4.3.2 National specific study design

The specific case study has been conducted among households and stakeholders based in the **city of Rome**. The city offers different carsharing options: station-based, free-floating and also electric.

There are 4 carsharing services at disposal. Three free-floating (enjoy, car2go, share'ngo), and one station-based (ICS, managed by the Mobility Agency of the city of Rome). Share'ngo fleet is 100% electric. The complete fleet from all operators is composed by 2188 vehicles: 769 with a gasoline conventional fuel engine, 35 diesel cars and 534 electric cars.

7% of the population has a carsharing subscription.

With the free app 'free2move' the user can book a car from all the services available (It also includes bike-sharing operators).

The standard IDIs guidelines have been followed. The only adjustment made was in the questionnaire for households where a question was added at the beginning asking *what* carsharing service the respondents were using. Indeed, answers could differ for the four carsharing services present in Rome, in terms of how the service function, the type of cars at disposal (Fiat 500, Smart, ZD1), how to subscribe and the price to the end users.

Households

The sample was thought as to cover different users' profiles in terms of age and gender, with or without children, and different carsharing operators. The interviewees were reached by spreading the word among colleagues and their families and friends, and social groups on Facebook and Whatsapp.

Interviews were conducted in person and by phone. The following are the respondents considered in the present report.

Participant	Gender	Age	Household size	Car ownership
1	female	33	2, no child	No, use bike
2	female	45	5, 3 children	Yes
3	female	52	1, no child	No
4	male	32	2, no child	Yes, also scooter
5	male	49	4, 2 children	Yes, also scooter
6	male	65	2, (grown up children)	No

Table 8 Main characteristics of household interviewed

Stakeholders

Different stakeholders have been contacted, from the categories identified by the mobility case study working group: pressure groups, policy makers, industry/service providers. It proved difficult to reach representatives from the private sectors, who could provide for feedback from the real market.

Interviews were conducted in person and by phone. The following are the respondents considered in the present report.

Company/organization of the interviewee	Company's profile
Shared Mobility Observatory - Fondazione per lo Sviluppo Sostenibile	Non-profit organization with the mission of promoting shared mobility
Rome City Council	Local authority
Roma Servizi per la Mobilità	Rome Mobility Agency

Table 9 Profile of the stakeholders interviewed

4.3.3 Carsharing users' interviews analysis

4.3.3.1 Description of how the mode is used

The respondents present some common patterns with respect to the use of the carsharing services available in the city of Rome. They all live in the city centre or just outside and have quite regular lives during the day, with daily commuting to and from the office. None of them uses their own car for such trips but prefer public transport or walking. Two respondents also make use of bicycles, even though the city is not yet bike-friendly, and other two use their privately-owned scooters. For none of them carsharing is an option for their daily home-work commuting.

All respondents seem to consider carsharing as a complementary option to the other modes of transport, not the primary way of moving around the city, even when it comes to leisure or occasional trips. Most of them owning a vehicle, being it a car, a scooter or a bike, the occasions to use carsharing are left for non-ordinary trajectories, when it rains (for the ones using scooters) and when public transport is not available. The frequency in use is therefore rather episodic, a couple of times per months for the majority of respondents.



In the case of the only respondent not owning a car, the service is used more frequently, whenever there is a need to move around the city and public transport is not the seamless option. In this case the use is usually twice per week.

For all respondents, the distances covered with carsharing is 5 Km in average.

4.3.3.2 Insights on the factors influencing carsharing adoption

Respondents range from old users (subscribed more than 10 years ago) to very recent users (one year ago). Besides the oldest user who is a pioneer of carsharing and discovered the service by reading an article in some newspapers, the other interviewees got to know the service mainly by seeing the vehicles on the streets or by friends already using it. Since Enjoy and Car2Go entered the market in Rome, the vehicle fleets are quite visible and became an integrate part of the city traffic.

The main factors influencing the carsharing adoption are quite similar and mostly relate to economic and practical reasons. Carsharing is seen as a 'gap filler' in the respondents' mobility options. They consider it handy and easy to use, less expensive than a taxi and faster and more comfortable than public transport. It is also safer than a scooter for the ones using this mode.

In general, respondents are quite happy of the service and consider that it works well. They appreciate the simplicity of the system, from the detection of the car, to the opening of the vehicle and its use, to the payment system and invoicing.

4.3.3.3 Insights on the relation between carsharing and public transport use

Respondents provided quite similar answers when asked to compare and relate carsharing services with public transport and taxi. While carsharing is more expensive than public transport, it is considered more comfortable, flexible, faster and often chosen as representing the seamless option, especially to reach neighbourhood not well served by public transport. Carsharing also offers the possibility to carry goods and run a series of little errands in different neighbourhoods.

On the other hand, carsharing is less expensive than a taxi, and makes you feel more autonomous. However, the time planning is more uncertain as it depends on the availability and proximity of the cars. There are also limits in its use as the service doesn't cover the whole urban territory.

4.3.3.4 Insights on the relation between carsharing and private vehicle ownership and use

Most of the respondents own a car or other private vehicles, such as scooter or bike. Only one interviewee doesn't own a private vehicle. The perception for most of them is that carsharing is an alternative to the private vehicles only in particular circumstances (extra-ordinary trips), not a real substitute.

In spite of this premise, a number of positive aspects of carsharing compared to the privately-owned car have been mentioned. Carsharing allows to avoid all hassles of owning a car, such as maintenance, fuelling, and finding parking spaces. Also, if the use of the car is not frequent, carsharing is economically advantageous considering the full costs of owning a private car, which includes not only the purchase cost, but also yearly insurance, taxes, maintenance, fuel and parking tickets. Carsharing also allows to avoid city centre tolls or access restrictions.

On the other side, there are some drawbacks compared to the private car. The zones covered by the

carsharing services are limited, and mostly corresponding to the city centre. If you need to go just outside the centre, carsharing is not an option. Also, the carsharing vehicles are not always available when you need them, or you might find them to get there but not back.

4.3.3.5 Users' future expectations on the development of the sector and opinion on the type of vehicles used in the service

In general, all respondents are happy with their experiences with carsharing and hope the sector will develop further. The current barriers they face are limited to two main aspects: the restriction of the zone covered by the service (only city centre) and the availability of the cars. Other difficulties experienced in the past have been solved over time, such as the bureaucracy to subscribe, which implied the need to go to an office with copies of the driving licence. Now everything is done online in a user-friendly manner.

In order to solve the current limitations of lack of vehicles and zone restrictions, the solutions proposed are rather unanimous: increase the number of cars in carsharing and enlarge the zone covered. This could be done by providing incentives when taking a vehicle in a remote neighbourhood, bringing it to a more central and profitable area. Also, it could be useful for carsharing users to have access to statistics telling about pick hours and most affected zones when planning to use the service in special circumstances (for instance to and from the airport).

When asked about their opinions about electric carsharing, respondents seem to be all in favour of such an option and interested to try it. Beside simple curiosity, the environmental concern would be the main motivation to subscribe and most of them (4 out of 6) would be willing to pay a little bit more than a carsharing service using conventional vehicles. However, only two interviewees subscribed to Share'Ngo, which is 100% electric and available in Rome since 2016. Even, one of the two never used it so far.

4.3.4 Stakeholders' interviews analysis

4.3.4.1 Facilitation of carsharing: contribution, political measures and social characteristics

According to all stakeholders interviewed, the development of electric carsharing is seen as a powerful way to improve air quality and quality of life of citizens, as it reduces private car use and associated pollutant emissions in the city. It is seen as a chance offered to all citizens to experience the use of the electric car while avoiding the obstacles related to a privately owned electric vehicle, such as the higher price, the limited autonomy, and the need for recharging. Once made the experience, users can recognise electric vehicles as a viable alternative to combustion cars giving a boost for electromobility widespread.

As for the measures necessary to facilitate the implementation and further improvement of the electric carsharing, the priority is given to the provision of appropriate infrastructures: without a large number of recharging points, it will be difficult to convince people to switch to ZEVs. A widespread network of recharging infrastructures, interoperable among all energy suppliers ("I don't need to have different contracts with different suppliers"), ensuring fast recharging (almost like the gas station refuelling), and possibly next to ad-hoc parking spaces, constitute the success factors that would improve the adoption of electric cars while solving the 'recharging anxiety' associated with their use.

The provision of the necessary infrastructure is a responsibility of the local administration (as referred by one of the stakeholders interviewed), which has recently issued the 'Municipal Plan for the electric vehicles recharging points', freshly adopted by the Municipal Assembly.

As for other success factors, all stakeholders seem to agree that governments (local and central) should push for tax exemptions and concessions in order to compensate for the extra costs of ZEVs compared with combustion cars of same dimensions and capacity. Free access to Low Emission Zones, and rebates on parking fees constitute additional incentives. According to the pressure group, local administrations should also ensure priority to electric fleets compared to conventional fuels when awarding public tenders.

4.3.4.2 The relation between carsharing and other transport modes

As a common opinion, stakeholders believe that to create a sustainable urban mobility system, all shared mobility services should be developed jointly, starting with public transport. Considering carsharing alone is a mistake in perspective. Although the size of carsharing provision and use in Rome is yet too little to prove an evident shift in modal split, its role to push citizens toward public transport is undeniable. The creation of carsharing areas (both for station-based and free flow systems) near public transport nodes (like rail or metro stations or large bus terminals) would further reinforce synergies between public transport and all other shared mobility services. Carsharing indeed integrates the public transport use especially on the last mile.

As for the relation between carsharing and the privately-owned cars, stakeholders share a common view. The more carsharing develops, the less people will need a private car, or at least it will make less economically viable to 'have' two or more cars per household. Car ownership will therefore reduce.

However, according to the representative of the pressure group, this assumption is not always true, but depends on the offer available. If the transport system relies on a large quota of public transport and shared options, carsharing will indeed progressively reduce car ownership. Otherwise carsharing can have side effects such as inducing people to move from bike, walk or public transport to the (shared) car, hence generating new mobility.

4.3.4.3 Business, political and associations views on the future of mobility

Policy makers

The Municipality of Rome has implemented a vast programme to reduce the carbon intensity of the urban mobility system in the city. The measures adopted range from an increase of tram and metro lines, to the extension of LZT areas and environmental zones, and preferential lanes for public transport. Additional measures of road pricing, and modifications of parking rules and tariffs complete the list.

A strong emphasis is given to public transport when talking about reducing congestion and the future of low carbon mobility in general. The objective of the Municipality is to increase public transport offer, its affordability, reliability and punctuality. According to the stakeholder view, together with public transport, the future of mobility will be marked by an even stronger development of carsharing, especially electric.

Pressure groups

The Italian Observatory of Shared Mobility is a recent organisation that was created in 2015 with the

aim to modernise the political and administrative culture on shared mobility themes and influence public opinion. The purpose of the observatory is to create a coalition of the interests coming from all mobility service providers while supporting the integration of all actors involved, which are often in conflict of interest among themselves. The political and administrative culture on shared mobility themes, and a platform for integrating all actors involved is in fact what is missing in the current situation of electric carsharing schemes.

According to them, policy makers don't give the right priority to shared mobility, but just make public declarations of intent. Shared mobility is a spontaneous phenomenon, made possible by the absence of regulations. When regulation exists (ride-hailing, taxi e NCC), new business models cannot be developed. For now, the market is proceeding by experimentations, where one fails, one stops.

As for electric carsharing, they see the zero emissions vehicles as the future of shared mobility, so as to contribute fundamentally to the decarbonisation of the transport sector. Electromobility and carsharing should progress hand in hand.

Service provider (public)

The Carsharing Unit at Roma Servizi per la Mobilità is the only station-based system in Rome. It is owned by the Municipality, but it doesn't enjoy any direct funding for the operations. The free-floating systems are operated on a commercial basis, but it is a very recent new service and it is currently unknown if they enjoy any return from the operations. Both systems offered by the Unit (station-based or free floating) give to all the citizens the same ease of access; there can be some commercial campaign aimed at certain categories but limited in time.

Until recently, the fleet had several CNG-powered cars, but they've been removed, due to the scarce availability of CNG refuelling stations. Even some hybrid car ran in fleet till 2015, but the customers had some problem to manage them, due to the limited knowledge of this type of cars. As both policymakers and pressure groups are more and more pushing toward sustainable mobility, carsharing is given room to expand and evolve. Electric carsharing is the way in which the system will evolve, although there is the need to implement appropriate infrastructure.

4.3.5 Discussions

The analysis of the responses provided by both households and stakeholders allows to make some interesting remarks:

- Interviewees are all **in favour of carsharing and quite pleased with the service**. They highlighted practical personal benefits as well as contributions to the environment and quality of life of citizens. They all remarked present limitations and potential barriers for a further development of the service, also providing possible solutions. All in all, none reported particular problems or bad experiences in using the carsharing vehicles.
- However, when looking at the Facebook¹⁹ pages of the three private carsharing operators present in Rome, quite a number of posts relate to complains from the users about

¹⁹ <https://www.facebook.com/enjoyvehiclesharing/>
<https://www.facebook.com/search/top/?q=car2go>
<https://www.facebook.com/Sharengo.eu/>

misfunctioning of the service and lack of ex-post assistance. It is true that social media are often used to raise instances and complains, more than to publicly make rewarding statements. However, we need to consider that **carsharing may also generate negative feedback**, although related to the way the service is managed from the one or the other operator and, not to the sharing concept *per se*.

- From the stakeholders' side, we were able to reach only the public sector, including the carsharing service provider from the Municipality of Rome. The fact that we didn't get insights from the private service providers is no coincidence, as the **private sector is reluctant in providing feedback** to socio-economic analyses which could play against their business.
- From the households' feedback, it is clear that **carsharing is seen as a complementary transport option** to the transport means respondents use in their daily life. None uses the service for their daily commuting, just for occasional trips. Also for leisure-related trips, carsharing is not always the first choice. This is in line with the stakeholders' opinion that carsharing should not be dealt with in isolation but as part of the entire transport system. All **shared mobility services should be developed jointly, starting with public transport**. Considering carsharing alone is a mistake in perspective.
- Despite the carsharing fleet in Rome is composed by 24% electric vehicles, half of the **respondents don't seem to be aware of the high presence of electric shared-cars available in the city**. According to the responses, **respondents are in favour of electric carsharing** and like its contribution to the environment and to make the city centre more liveable. However, **respondents would not be willing to pay more to use it**, or just a small difference compared to carsharing using conventional fuels.
- All respondents live in the centre of Rome or just outside it. Indeed, **carsharing services are restricted to certain zones** - the city centre and its outskirts. The limitation seems to be connected to the rentability of the neighbourhoods: the more in the centre, the more the vehicles can be used multiple times per day. **The restriction is a limitation to the use of carsharing**, according to some of the respondents.

4.3.6 Conclusions

As for the conclusions we can draw from the whole exercise, the following seem to be the most stringent ones:

- The success of carsharing will depend on the **growth in the number of cars** available and **geographical coverage** of additional areas of the cities (not only the most central ones);
- The qualifying aspect of carsharing (sharing a vehicle) should be part of a **more general culture of sharing** and for a **re-design of urban spaces** (streets, parking, etc.);
- CARSHARING companies still have room in order to **increase easiness of use** and the quality of the service provided to users;
- The public administrations should increase the integration and the **harmonisation between carsharing, bike-sharing and public transport**;
- There is a strong favour towards the use of clean vehicles and fuels, but the expansion, e.g., of the electric option will strongly depend on the rapid spread of **adequate recharging**

infrastructure network and on the **level of additional costs**, and its existence should be adequately disseminated among users.

4.4 The case study in Norway

4.4.1 National background

4.4.1.1 The mobility sector in Norway

In 2017 there were 2.7 million registered private cars in Norway, an increase of 11.3% over a period of five years (SSB, 2018a). The population of Norway reached approximately 5.3 million in 2018 (SSB, 2018b). 73% of the population older than 18 years had a driver’s license in 2014, and this share has been quite stable for the last 30 years (Nordbakke et.al. 2016). Sales of battery electric vehicles reached a market share of 20% in Norway in 2017, and a fleet share of 5.1% (Figenbaum 2018). In addition, plug-in hybrid electric vehicles made up another 20% of sales and 2.6% of the fleet (ibid.).

77.7% of all trips are done in a private car (SSB, 2018c). By comparison, in Europe only the French drive more (in km per person) than Norwegians (ibid.). Norway, together with Portugal, has the lowest public transport mode share in Europe with 11% (also measured in km driven per person). The mode share for public transport is, however, increasing. The number of trips by public transport increased 6.3% from 2016 to 2017 while travel by private cars seems to have flatten out somewhat (SSB, 2018d).

Road transport was responsible for emissions of 9.93 million tons CO2-equivalents in 2016, with private vehicles making up 5.3 million tons of this total (SSB 20178c). 37% of Norway’s carbon emissions come from transport (ibid.).

4.4.1.2 Overview of the carsharing system in the country

Round-trip or station based carsharing is dominant in Norway, and is therefore what we have focused on. The table below shows the main carsharing providers, their chosen model, number of cars and members. While the peer-to-peer platform, Nabobil (“neighbourhood car”), might appear to be the biggest provider, we have to take into account that the numbers only show registered cars and users (downloading of the app), not actual usage. Bilkollektivet is the biggest carsharing actor measured in number of trips.

	Model	# cars	Members/users
Bilkollekitvet (est. 1995, five cities)	member-owned non-commercial co-operative	325 (350 by summer 2018)	7000
Trondheim bilkollektiv (est. 1996, Trondheim)	member-owned non-commercial co-operative	50 (100 by autumn 2018)	1 200
Bildeleringen (est. 1996, Bergen)	member-owned non-commercial co-operative	217	1950
Hertz bilpool (est. 2010, 14 cities/ places)	B2B /B2C	100	2 000
Move about (est. 2007, Oslo. Electric)	B2B /B2C	70	700



Nabobil (est.2015, national)	P2P	4 000	15-20 000*
------------------------------	-----	-------	------------

Table 10 Main carsharing providers in Norway. Sources: toi.no, and providers. *80,000 have registered, i.e. downloaded the app.

The biggest and longest running provider, Bilkollektivet, is a member-owned non-commercial co-operative relying on a round-trip model. The main providers in Bergen and Trondheim have the same model. Hertz bilpool is the major commercial actor. Hertz bilpool has more business customers than Bilkollektivet, also, they have an agreement with IKEA, providing cars at different IKEA stores. The IKEA customers make up about half of Hertz bilpool’s activity. Move About is the only all-electric provider. About 80% of Move About customers are businesses. Bilkollektivet and Bildeleringen have some electric cars, but not many (approx. 10 each). Hertz has approximately 20% electric cars in their fleet.

Carsharing in Norway has increased a lot during the current decade. In urban- and mobility planning in the largest cities in Norway carsharing is now mentioned as one of many contributions to a development towards "green mobility", and measures to accommodate carsharing are being made. For instance, Oslo municipality decided in June 2018 to establish 600 parking spaces for carsharing in Oslo city centre by 2020 and Bergen municipality has so far established two "mobility spaces" combining charging infrastructure, bicycle parking, carsharing parking and bus stops and is planning to establish more (Oslo municipality 2018 and Bergen municipality 2018).

4.4.2 National specific study design

Description of recruitment and interviewees

The carsharing companies we have been in contact with were not willing to provide us with the contact information of their members or customers. We therefore recruited interviewees through CICEROs own webpage and Facebook-page, and the carsharing companies then shared this invitation on their Facebook-pages. Informants received a gift card for participating (500kr, approx. 50 euros). This strategy for recruitment will often lead to a group of informants whose interest in the topic is above average. The gift card may compensate somewhat for this effect. Based on the interviews it does indeed seem that the informants are very enthusiastic users of carsharing, and many of them are long time members. The biggest carsharing provider in Oslo (and Norway), Bilkollektivet, is, as mentioned, non-profit and owned by its users. Some of the interviewees seem to display a sense of ownership and loyalty to this provider, and this seem to have contributed to their signing up for interviews.

While we do have some variation in the group of interviewees concerning age, sex and family situation, we lack low-income and low-education groups, and ethnic diversity. In addition, the average age is relatively high and most participants have children. Still, we know that the average car sharer in Norway is more highly educated than average, with higher income, and aged above 30. Thus, our sample may not be atypical of the full carsharing population. Interviews were conducted at the work place of the informants, their home, or at a café of their choice.

Table 11 and 12 below describes key characteristics of the interviewees. We conducted 8 interviews with users and 6 with stakeholders.

Informant #	1	2	3	4	5	6	7	8
Age	40	51	47	48	34	56	46	36

Sex	m	f	f	m	m	m	f	f
Children	2 (age 3 and 6)	2 (age 13 and 15)	2 (age 6 and 8)	2 (age 18 and 15)	1 (age 1)	2 (2, both over 18)	1 (age 5)	none
Education	high	high	high	high	high	high	high	high
Partner	yes	no	yes	yes	yes	yes	yes	no
Car/former car ownership	No /no	No/ "not really"	Yes, got first car last year together with (and because of) buying a caravan	No/yes (recently got rid of car because of no need for it)	No /no	No/ yes (got rid of car when moving more centrally in Oslo)	No / yes (got rid of car when moving to Oslo)	No /no
Carsharing model, length of membership	B2P 10 years	B2P 3 years	B2P 13 years	B2P 1 year	B2P 4 years (partner 8 years)	B2P 3 years	B2P 4 years	B2P 4 years
City	Oslo	Oslo	Oslo	Oslo	Oslo	Oslo	Oslo	Bergen
Time and mode spent getting to work, one way	Approx. 25min on bike in summer and public transport in winter	Approx. 30 min on public transport	Self-employed, days vary, but approx. 35 min on electric bike or 20 min by tram/bus	Approx. 25 min on bike in summer and 30 min on public transport in winter	30-35 min on bike in summer and public transport in winter	Walk 20-25 min	Public transport approx. 20 min.	Walk 7 min
Use of carsharing	1-3 times a month	10 times a month	1-3 times a month	Once a month	1-3 times a month	Once a month	20 times a month	1-3 times a month
Other	Considering private car because of children, but not	Has a cabin	Has a dog Does home schooling		Has a cabin Got a drivers license at 29 with carsharing in mind.	Has a cabin Held systematic account of his own car use for a	Has a cabin Both home and workplace has carsharing	Plays golf. Sometimes takes bus even though it is not very



	decided. Does not have a cabin, but visits others' cabins often.					while before deciding to sell it and try carsharing	g cars very close (closer than possible to park private car).	convenient because she does not like to drive alone.
--	---	--	--	--	--	---	---	--

Table 11 Key characteristics of users informants

Industry	Pressure groups	Governmental
Hertz bilpool	Electric vehicle association	Oslo municipality
	Bilkollektivet	Buskerud county
	Bildeleringen	

Table 12 Distribution of stakeholder informants by stakeholder type

4.4.3 Carsharing users' interviews analysis

4.4.3.1 Description of how the mode is used

Carsharing is used mostly for longer weekend trips, typically to a cabin (4 of 10 households own or have access to a cabin, SSB, 2017), and when buying or transporting larger items. The interviewees typically use public transport on a daily basis and most of them prefer to use public transport whenever they can, rather than to use carsharing. They use carsharing when public transport is not convenient because they need to transport large items or when there is no public transport service to their destination at the time needed. Many mention that when they do need a car for one purpose, they also try to do other errands at the same time. This tendency might also be enhanced by the pricing system used by Bilkollektivet in Oslo, where you pay per hour up to 6.5 hours, and then you pay per 24 hours.

Most interviewees have grocery stores in their immediate surroundings, and do their shopping on a day-to-day basis on their way back from work. They seem to have calm mornings and time for weekly activities in the afternoons. They give the impression of a calm everyday life; everyday logistics is not a big issue, it seems. The one informant who lives in a more residential area uses a grocery delivery service, and so receives most groceries once a week on his doorstep, and fresh bakery goods in the morning together with the newspaper delivery. All informants note that you do have to plan, and be a bit extra organized when not owning a car and using carsharing. They do not seem to find this bothersome, and point out that it becomes a habit like everything else.

An exception to the relaxed impression concerning everyday logistics and use of carsharing is the issue of car seats for children when using carsharing. Among the interviewees in this project, this was mentioned by some, and for one participant, this was the most important issue leading the family to consider buying a car. A recent master thesis on carsharing and urban mobility behavior in Oslo



based on qualitative interviews with families with small children also found this to be major issue, noting that "the most consistent complaint among informants was the difficulty associated with installing and uninstalling car seats for children before and after each use "(George 2017:82).

4.4.3.2 Insights on the factors influencing carsharing adoption

The main motivation among our interviewees seems to be "practical concerns". This is also what the providers report as users' main motivation. When discussing why they started to use carsharing, the focus is on the benefits of not owning a car. While many are very enthusiastic about carsharing and to some extent display a sense of being part of a community, the main "category" they place themselves in is "not having a car/ user of public transport", rather than "car sharer".

While users mention the economic benefits of not owning a car, this is not mentioned as a main motivation, but rather as an additional benefit. The average car sharer has a high income, and this is the case with the group interviewed for this project as well. Most importantly, living centrally with good access to public transport, they do not see owning a car as necessary. Not having the hassle of owning a car (access to parking, insurance and maintenance is most often mentioned as main hassles), while still having access to a car for those occasions where public transport is not an option or not convenient, is highlighted as the main motivation.

Both users and providers also highlight gaining access to a variety of cars as a motivation for membership.

Most informants mention that they have indeed prioritized living in a way where they do not need a car on a daily basis. They have chosen to live less spacious and more expensively in the city center, rather than a more spacious house outside of the city center, or instead of buying other expensive things (cabins, cars and holidays were mentioned).

All but one informant grew up in a family with one or two cars. Only one informant display a particular interest or enthusiasm for cars, and only one mentions that she/he enjoys driving.

4.4.3.3 Insights on the relation between carsharing and public transport use

Most of our interviewees use public transport on a daily or weekly basis. This is their main mode of transport. Some walk or ride a bike during the spring and summer season, and use public transport during autumn and winter. A pre-condition for the providers to establish themselves somewhere new is access to public transport, or a dense and sufficiently urban city or town where people do not need to travel long distances on a daily basis. At least in the Norwegian context, based on the knowledge and experience of the carsharing providers we interviewed and the group of users we have interviewed, carsharing is an extra service used by those who use public transport, biking or walking, as their main modes of transport.

4.4.3.4 Insights on the relation between carsharing and private vehicle ownership and use

Four of our informants have previously owned a car, but got rid of it because they noticed they did not really need it. This is often in connection with moving to a more centrally located area, to children growing up, or both. According to the providers, this is a typical pattern. The providers estimate that about 50% of their members have previously owned a car or have previously had access to a car in their household.

Only one informant owns a car in addition to using the carsharing service. The providers estimate that about 10-15 % of their members owns a car, and uses carsharing as their "second car". Two of the providers mention that these are often owners of electric cars who use carsharing as a "second car" for when they are going on longer trips or transporting bigger items. "Car enthusiast", e.g. owners of veteran cars etc., is another group mentioned here.

4.4.3.5 Users' future expectations on the development of the sector and opinion on the type of vehicles used in the service

All interviewees are positive towards electric cars, but most also mention that range is critical. They need to feel confident that they can reach their cabin or make other longer trips, and this is an important part of their use of carsharing. In general, the expectation among the informants is that battery electric vehicle technology is developing fast, and so they are positive towards a bigger part of the carsharing fleet being electric. For shorter trips, they are positive towards electric cars.

4.4.4 Stakeholders' interviews analysis

We have interviewed three carsharing providers. From Oslo, Hertz bilpool and Bilkollektivet, and the Bergen based Bildelingen. We have also interviewed representatives of Oslo municipality, Buskerud County and the Norwegian Electric Vehicle Association, in total six stakeholder interviews.

4.4.4.1 The current development of carsharing, the opinions of stakeholders

All providers agree that carsharing activity has had a significant rise over the last ten years, highlighting the development of apps and more focus on the "sharing economy" in general. One of the Oslo providers also mentions the last two years as especially good, attributing this partly to the change in local government in Oslo and its focus on mobility issues.

4.4.4.2 Facilitation Facilitation of carsharing, views on the relation between carsharing and other transport modes, and the future of mobility

The providers, especially the Oslo based ones, emphasize centrally located parking space for carsharing cars as the main threshold for further growth. One provider also adds that, on the other hand, they do not really feel that restrained, business is good, they are growing at least 10% a year, and have done so since their foundation.

None of the providers see future development focusing on smaller towns and places, emphasizing again that everyday travel has to be done by walking, bike or public transport, and this limits where it is worthwhile for them to establish. Bigger cities where they are already established, and "seamless transport" or "mobility as a service", are where they see potential for further development. One of the providers is "testing out" some cars in smaller towns close to Oslo as there are many commuting to Oslo by train living in these smaller towns.

Oslo municipality is positive towards accommodating for carsharing, but see carsharing as one piece of a big complicated puzzle that is the issue of urban/green mobility and the use of city space. The interviewee underlines the need to plan this with a more integrated and long-term perspective, and comments that this is one reason for why even though they are very positive towards carsharing, they cannot simply give out a lot of space in the city center that easily.

4.4.4.3 Business, political and associations views on electric carsharing

Providers are somewhat more reluctant towards changing their fleet to only electric cars, but do consider electrification as something that will happen eventually. One argument is that it is too early for the carsharing fleet to become fully electric given that weekend trips to the cabin is an important part of the usage. Also, some are skeptical as to whether the charging infrastructure is good enough yet. It is also mentioned that the "know-how" of using an electric car is not yet developed enough in the general population, and that this might make electric cars a further barrier for using carsharing, or that users might have negative experiences. Interestingly the Norwegian Electric Vehicle Association agrees that it is too early for electric cars to be a big part of the carsharing fleet, stressing the issue of "know-how" and potential bad experiences negatively affecting the further adoption of electric cars.

The interviewee from Oslo municipality, who in general commented on the issue with a longer time-frame in mind, and from the perspective of a somewhat bigger picture of "urban mobility", considers electric cars as a condition for further development and accommodation for carsharing in Oslo. Recently the bigger cities in Norway have decided to accommodate for carsharing through different measures (e.g. allocate space for parking and making other allowances concerning parking regulation for carsharing cars), and all stress electrification of the carsharing fleet as a goal, and also plan for the allotted space to have charging infrastructure. In this sense it seems the municipalities might possibly push the development of the electrification of the carsharing fleet in Norway.

4.4.5 Discussions and conclusions

Carsharing has been growing a lot the last ten years, and is still growing. Station based carsharing is the dominant model of carsharing in Norway. Carsharing in Norway is typically used by households who do not own a car, and is used as a supplement to public transport, walking or cycling on a daily basis, meaning, at least in the Norwegian context, carsharing does not seem to replace use of public transport, but rather accommodate for this being your everyday mode of transport. Main factors for adoption of carsharing seem to be practical concerns. It is a hassle owning a car, especially centrally in big cities. Typical use pattern is for weekend trips and for transporting larger items.

As carsharing is used as a supplement to public transport, walking or cycling, it is likely to work well only in cities and larger towns. Also, for there to be any benefit in carsharing, both from an climate/environmental -, and business, perspective, you need to have a certain level of use of each car, i.e., a certain amount of people having access to the car.

Providers are somewhat skeptical towards too early introduction of electric vehicles in the carsharing fleet due mainly to limited range and charging infrastructure, but they all see electric vehicles as a positive development with time. Municipalities might push this development when accommodating for carsharing, and we do indeed see this in recent developments in Oslo and Bergen.

4.5 The case study in Poland

4.5.1 National background

4.5.1.1 The mobility sector in Poland

According to Eurostat data from 2014, greenhouse gases emissions in Poland was above EU's average (the figures shows thousand tons of CO₂ equivalent)²⁰:

	Transport and storage <i>(thousand tones of CO₂ equivalent)</i>	Total emissions <i>(thousand tones of CO₂ equivalent)</i>
EU-28	497,709	3,565,958
EU average	17,775	127,355
Poland	29,111	339,858
Portugal	5,632	57,130
Spain	33,799	247,701
Italy	45,482	313,419
Romania	7,406	97,147

Table 13 Greenhouse gas emissions in 2014. Source: Eurostat

In 2015 the share of the passenger cars was 75% of the total number of cars. Around 12.4% was lorries and 0.4% - buses. Passenger cars in 2015 were responsible for 55.7% of road transport CO₂ emissions, 57% of nitrous oxide, 76.6% of carbon dioxide, 35.3% nitrogen oxides and 49% of sulphur dioxide.²¹

4.5.1.2 Overview of the carsharing system in the country

Carsharing development is a business undertaking: the companies started to introduce it to Polish cities in 2016. The main stakeholders in Poland are private companies (4 Mobility, Panek, Traficar, Vozilla) and municipalities (e.g. Wroclaw, Warsaw, Cracow, Poznan). Some of the companies have previous experience in a traditional car renting (Traficar, Panek). All of them operate in free-floating system, however in some cases they use also station-based system.

Recently also petrochemical companies (running petrol stations in Poland) entered carsharing market. Some petrol stations chains cooperate with carsharing companies, e.g.: Orlen and Traficar; Circle K and 4 Mobility; BP, Circle K and GoGet. Traficar also has an agreement with Ikea: its trucks are available on the Ikea parking spots. There are also examples of cooperation with insurance companies: Traficar with Warta and Panek with Hestia. Their fleet is offered as an alternative for the replacement car. In some cases carsharing at company's level is available for employees. There are also smaller players, like Smart City Poland, which develops Kracar project – electric carsharing for Cracow.

Some of the biggest cities decided to support carsharing, with the aim to promote electromobility, fight air pollution or (in the long run) limiting the number of cars in the city centers. The first city that decided to offer carsharing (public-private partnership arrangement) was Wroclaw. It promotes

²⁰ Energy, transport and environment indicators. 2017 edition, Eurostat, 2017, str. 147 [online]
<http://ec.europa.eu/eurostat/documents/3217494/8435375/KS-DK-17-001-EN-N.pdf/18d1ecfd-acd8-4390-ade6-e1f858d746da>

²¹ Ochrona Środowiska 2017, Główny Urząd Statystyczny, 2017, p. 225 [online]
https://stat.gov.pl/files/gfx/portalinformacyjny/pl/defaultaktualnosci/5484/1/18/1/ochrona_srodowiska_2017.pdf



carsharing, offers parking spaces and allows to use bus lanes.²² However, the city is not supporting this financially. The main goal of Wroclaw is the promotion of electromobility, low-emission transport and improve air quality. Other cities view electric carsharing only as a long-term goal, and they currently focus on investing in infrastructure for electric cars and electric cars promotion.

After the successful launch of public bike sharing, Warsaw will promote carsharing – another project based on the sharing economy, hoping that the citizens will limit their use of private cars. But Warsaw postponed the introduction of electric carsharing until charging points in the city are ready. Poznan also decided to support carsharing. It designated 60 parking spots for the hybrid cars of Easyshare company, promoting them as environmental-friendly solution.

Carsharing was well-received by the citizens and is developing rapidly in the most of the Polish biggest cities and private companies recognizes its profitability. There is a growing number of the companies offering carsharing as well as cities interested in it.

	4 Mobility	Easyshare	Panek	Traficar	Vozilla	GoGet	Click2Go
Silesian Metropolis	-	-		Yes	-	-	-
Cracow	-	-		Yes	-	-	-
Lodz	-	Yes		-	-	-	-
Poznan	Yes	Yes		Yes	-	-	Yes
Tricity	-	-	-	Yes	-	-	-
Wroclaw	-	-		Yes	Yes	Yes	-
Warsaw (and nearby cities)	Yes	-	Yes	Yes	-	-	-

Table 14 Presence of carsharing providers in Polish cities

According to the data from the beginning of 2018, about 1.5% of Polish citizens had used carsharing.²³ At the end of 2017 4Mobility estimated the number of carsharing users at several tens of thousands. The municipal carsharing in Warsaw will start operation soon (by Panek carsharing) and will offer 300 hybrid cars (the same number of cars Panek already has in Warsaw). Companies have the following fleets:

- 4Mobility – Warsaw: 300 vehicles, Poznan: 30 (some of them are electric), free-float and bases.
- Easyshare – Poznan: 150; Lodz: 50. Hybrid cars.
- Traficar - 1.500 vehicles. Cars with traditional combustion engines.
- Panek - Warsaw 300 (hybrid), free-float and bases.
- Vozilla – 190 personal cars and 10 vans. Electric cars.
- Click2Go – Poznan, 102 Hybrid.

²² Since the introduction of the Act on Electromobility and Alternative Fuels of 11 January 2018, all electric vehicles can use bus lanes.

²³ Data from Household survey in Poland (ENABLE.EU)



Most of companies offer free-floating carsharing fleets and some of them have also the bases. For instance, Traficar, beside the free float offers its cars also on petrol stations of its partner (Orlen) and in front of Ikea stores as well. Some of the operators focus on business clients. Enspiron company, owned by electricity provider Energa, offers electric carsharing to companies with the offices located in one of Gdansk’s office buildings.

Along with the dynamic development of carsharing, there is a growing interest in media and websites focused on carsharing. For instance, *autonaminuty.org* (literally: car for minutes) portal not only follows the development of carsharing, but also shares the videos of different cars tests in different cities. Carsharing is also closely watched by the portals like “*Wysokie Napiecie*” (focused on power industry) or “*Transport publiczny*” (focused on public transport).

Apart from media coverage, there aren’t much publications regarding specifically carsharing.

4.5.2 National specific study design

PISM has conducted 9 interviews with stakeholders and 8 with users. In stakeholders group, we focused on the municipalities authorities, carsharing companies and experts. Interviews with the representatives of 4 municipalities:

- Warsaw – capital city, and the biggest city in Poland. The biggest number of the cars available for carsharing
- Wroclaw – the first municipal electric carsharing. There are also other companies, which offer traditional cars.
- Cracow – headquarter of Poland’s biggest carsharing operator (Traficar). The city itself has a serious air pollution problem.
- Lublin – a city with well-developed low-emission public transport, skeptical to support of carsharing.

Interviews with the representatives of carsharing companies:

- Vozilla – electric carsharing in Wroclaw
- Traficar – the biggest carsharing operator in Poland

Interviews with experts:

- An expert of PKN Orlen – Polish oil refinery and petrochemical leader in Central Europe
- Former secretary of state in the Ministry of the Environment and government plenipotentiary for climate policy and vice-minister of the environment, currently promoting electromobility in Poland.
- A journalist specializing in the energy sector and low carbon transport, he focuses on carsharing in Poland

The interviews with carsharing users:

Participant	Gender	Age	Status	Car owner?	City
1	male	23	studying and working	no car	Warsaw



2	male	32	working	car	Warsaw
3	female	28	working	no car	Warsaw
4	female	33	studying and working	no car	Warsaw
5	male	42	working	car	Warsaw
6	male	24	studying and working	no car	Wroclaw
7	female	30	working	car	Wroclaw
8	male	27	working	no car	Wroclaw

The interview with the local authorities of Lublin city. The authorities are focused on the development of low carbon transport. However, from their perspective carsharing is not a part of public transport or a way to limit the number of cars in the city.

4.5.3 Carsharing users’ interviews analysis

4.5.3.1 Description of how the mode is used

Carsharing is usually viewed as supplementary to public transport, however, there are also cases when people choose carsharing instead of Uber, taxi or private car. This usually happens when they go out during the evenings or weekends, in urgent situations, when having business meetings in the city centre. All our responders have been using carsharing in private life for 3-12 months. In most cases carsharing was recommended to them by friends. In general there are two groups of people: first, whose members use carsharing 2-3 days a week and the second, whose members use it 2-3 days per month. The overall duration of car usage in most cases is rather short – approximately 10-20 minutes.

4.5.3.2 Insights on the factors influencing carsharing adoption

Carsharing is regarded as convenient, well-managed mean of transport. Users praise the operators for the system management and high cars’ standard. Many people appreciate hybrid cars with automatic transmission system as well-suited for the city. Warsaw car users praise them for being convenient and eco- friendly. In Warsaw electric carsharing was tested but only for a month and there were just several cars.

In Wroclaw a possibility to drive an electric car is an additional incentive to use carsharing. The cars in Wroclaw’s fleet are user-friendly, so the drivers become regular customers and promote carsharing.

4.5.3.3 Insights on the relation between carsharing and public transport use

Carsharing in most cases is regarded as supplemental to public transport and taxis. There are two models of carsharing usage. Some people use it as a part of their journey (they link carsharing with others modes), some for whole journey. Carsharing is cheaper than taxi, especially during peak hours. Depending on the situation, travel destination and time of the day, residents choose the most comfortable means of transport. As the most important reasons for choosing carsharing is comfort, privacy, availability and quickness are mentioned.



4.5.3.4 Insights on the relation between carsharing and private vehicle ownership and use

Thanks to carsharing young, childless customers may postpone the decision to buy their own car. In bigger households shared cars are used instead of buying second car. The important feature of the service is the possibility to park free of charge in the city center.

4.5.3.5 Users' future expectations on the development of the sector and opinion on the type of vehicles used in the service

The users point out that the cars are new and low-emission. Warsaw citizens praise hybrid cars, pointing at ecological advantage (smog fighting) and convenient driving in the city, because of automatic transmission. Some of them said that they are ready to pay higher fees for using electric cars (however, the survey conducted by Vozilla showed the opposite: people were willing to drive electric cars but not to pay more).

4.5.4 Stakeholders' interviews analysis

4.5.4.1 The current development of carsharing, the opinions of stakeholders

Stakeholders recognize fast pace of carsharing development. In their view this is a response to the demand by the society and the changes in the society. However, they still think that it should be promoted, so more people get to know about such option of transport. When it comes to electric vehicles, most local authorities think it would be beneficial (with some exceptions e.g. Lublin), but rule out any financial support, leaving the initiative for the private companies.

Experts explain changes promoted by carsharing, one of which is the fact that a car ceases to be a product and becomes a service. Carsharing's main task and benefit is encouraging people to make informed decisions on moving around the city: to give up their private car and use one of the numerous services offered by the city. This means carsharing's second goal is to limit the number of cars in the city and to fight smog, or rather the latter is a consequence of the former. Another aim is to promote low-emission transport and electric cars.

4.5.4.2 Facilitation of carsharing: contribution, political measures and social characteristics

The most urgent challenge is lack of charging infrastructure. The another is the promotion of carsharing so the customers are aware that such option of transport exists. What is more, allowing to drive through bus lanes or designating parking spaces in the city centers will encourage the use of carsharing.

Local authorities and experts alike believe a specific role will be played by low-emission transport. Cities are gradually replacing their public transport fleet with low-emission electric or gas vehicles. They are also introducing public bicycle systems and some are even providing electric scooters. Low-emission and electric cars offered by carsharing allow it to be part of this trend. The decision makers want to promote the sharing economy and behaviours that will change the way people move around cities.

However, although local authorities prefer electrical carsharing, so it can help fighting air pollution and promote clean transport, most of the companies do not want to invest in it (because of no profitability), preferring traditional cars or hybrids.

4.5.4.3 The relation between carsharing and other transport modes

The local authorities and experts in general view carsharing as the part of public transport. Currently many users use carsharing as the alternative for public transport. The private companies recognize strong competition from the public transport, viewing carsharing as complementary with the public transport. The opinions differ when it comes to the impact of carsharing on the public transport: it could have no impact or just minimal on the popularity of the public transport. Part of the decision-makers hopes that people without their own car will postpone the decision on buying one (and in case of the families already owning a car – they will postpone the decision to buy second car or resign from it).

4.5.4.4 Business, political and associations views on the future of mobility

Carsharing (including electric carsharing) is auxiliary means of transport to ensure effective and clean transport. Local authorities do not regard as strategic project, however, some of them (e.g. Wroclaw) actively started to promote electric carsharing and to introduce incentives for them (Parking places in the city centre). Other local authorities also support electric carsharing (Cracow, Warsaw), but their declarations and scale of the support shows, that clean public transport remains a priority for them. The authorities of Lublin city developed clean public transport (trolleybuses) and leave electric carsharing for the private companies. On the other hand, bike sharing is developing well in the cities and is popular among the citizens.

Carsharing is the commercial undertaking and private companies invests in traditional cars or hybrids. Such fleet is economically viable but according to the forecasts of some companies, electric cars could become profitable in the longer perspective.

Interviews with authorities and companies also showed different perspective of the particular stakeholders on the goals which should be achieved by carsharing. Companies recognize the environmental aspect of carsharing, but economic viability remains the main goal for them. Local authorities view electric carsharing as a way to promote clean transport and limit traffic.

Cracow (2nd biggest city in Poland, around 761,000 citizens)

The local authorities support electric carsharing, however, at the beginning there will be small fleet of 30 cars. Because of heavy air pollution, local authorities want to focus on electric cars fleet. Such decision made the cooperation with the largest carsharing company in Poland, Traficar, which has 300 combustion cars in Cracow. Traficar would like to cooperate with the city and start with traditional cars, which would be gradually replaced with the hybrid cars and finally – electric cars (when it becomes profitable).

Lublin (9th biggest city in Poland, around 340,000 citizens)

Local authorities of Lublin (9th largest city of Poland with around 340,000 citizens) developed clean public transport (trolleybuses) and such strategy remains in the center of their interest. Therefore, in their view, implementation of (electric) carsharing is task of private companies. There was an attempt to start such service by private investor (with small fleet of around 10 cars), however it was not

successful. According to the authorities their task is to develop public transport. Carsharing could be also competition for this so it is not viable option for Lublin.

Warsaw (the biggest city in Poland, around 1,700,000 citizens)

Warsaw authorities want carsharing to become a missing link in the city's mobility system. After successful launch of city's bike-sharing system, the authorities decided to start city's carsharing. The city promotes carsharing among the journalists and the citizens. A company chosen in a tender will be allowed to use parking spaces in the city center for the lump sum. The city authorities want to discourage citizens from using their own vehicles. In the long run, Warsaw authorities want to introduce electric vehicles to their carsharing system, however, currently this is too soon, as the infrastructure is insufficient.

Wroclaw (4th biggest city around 637,000 citizens)

After years of preparations a public electric carsharing system was launched. It is an innovative project that is part and parcel of the city's policy that supports low-emission transport. The city had previously developed a policy to support the electric car market. At the end of 2013 the City Council passed a resolution which introduced preferential parking terms for hybrid and electric cars. A network of chargers was also slowly being developed. The public electric car rental was opened in November 2017 in the form of a public-private partnership and it turned out to be a big success. Currently it offers 200 electric cars. As part of the deal the city facilitates the promotion of the service and provides designated parking spots for cars. The growing interest in carsharing made electric cars popular in the city and increased the retail sales of Nissan Leaf - the model used in the sharing scheme. Thus, the city reinforced its image as an innovative and eco-friendly place.

4.5.5 Discussions

Carsharing is primarily a business project developing as a bottom up initiative in Polish agglomerations and large cities. The largest carsharing operators in Poland are Polish companies. Some of them (including the largest one - Traficar) had previous experience in running traditional car rentals.

Why choosing carsharing?

From the local governments' perspective, ecology is essential (fight against smog, fewer cars in the city, less noise). Carsharing is a supplemental means of transport, compared to low-carbon public transport.

It is also important to promote innovative solutions and encourage city dwellers to change their travel style. For Wroclaw, the launch of electric carsharing has become a very important image element. The city has strengthened its promotion as innovative and pro-ecological.

From the business perception, the profit, perspective of the company's development and the implementation of new innovative solutions are the most important factors. For most companies, diesel and hybrid cars are currently the only profitable solution. The introduction of electric cars is planned in a slightly longer perspective, depending on external conditions. The exception is Wroclaw and the Vozilla. To combine these two perspectives, cooperation is important. There is synergy between these activities

Who is a carsharing user?

Carsharing is the most popular among young and mobile people. Many of them work and study at the same time or only work. For these people the idea of sharing economy is not unfamiliar. After the success of public bicycles, carsharing seems to be the next natural stage in the development of urban mobility. What's more, some young carsharing users postpone the decision to have their own car until they have children.

Users treat the service itself not only as a useful urban mode but also as an attractive, modern and innovative way of travelling. Curiosity and willingness to drive an electric car is a significant impulse for many people to use the service in Wrocław. Warsaw residents, on the other hand, are very satisfied with cars with an automatic transmission system for city driving. People would also be happy to use electric cars if they were available in other cities.

Differences:

Among representatives of companies offering carsharing as well as among representatives of local governments there are some differences as to the role and method of carsharing development.

Business representatives recognized the potential in the development of a new service in Poland and started preparing for its introduction a few years ago. Based on their business experience from similar ventures, as well as looking at companies in other countries, they have launched a new service on the Polish market.

In the case of prominent companies already in the first years or even months of operation, it turned out that the number of rentals and people registering in short-term car rental companies are higher than expected. Operators monitor the development of the service and respond to current needs. They increase car fleets, expand parking zones, but also enter into cooperation with business partners by offering new services. However, their assumptions of the companies and municipalities on the dynamics and directions of carsharing development are different.

In Wrocław, in response to the city's idea, the company offered carsharing based only on electric cars. But other companies started with traditional or hybrid cars, stressing that it is currently a prerequisite for them to be profitable in business. However, taking into account the changes in customer demand or the requirements of cities, they do not exclude the gradual introduction of electric cars to their offer, but currently their costs make electric carsharing not profitable.

Differences in the approach to carsharing, its role in the city and the pace of development can also be seen among local governments. Most of the cities support and promote carsharing, for example by launching municipal rental companies. They see carsharing as an element of urban transport. However, there are also local governments, which currently leave the development of a new service only to private companies. After a long period of preparation, expert and social consultations, Wrocław decided to introduce municipal electric carsharing. Warsaw has chosen a company offering hybrid cars, but it does not rule out the introduction of electric cars after charging infrastructure is built.

4.5.6 Conclusions

The extension of the discussion on Energy Union to transport and low-carbon mobility is of particular importance in Poland, where transport seems to have wider options/support for change than energy sector.

Carsharing is developing dynamically in Poland. It fills the gap in transport and responds to changes in lifestyle. It may be an alternative to car ownership, taxis, and traditional public transport. However, for it to help in the fight against smog, noise and to help promoting low-emission transport and electromobility, it should be based on electric vehicles. An introduction of such fleets is possible in the long term perspective.

The first companies offering short-term car rental based on the free-floating carsharing appeared in Poland in 2016. Although most of the vehicles available in the various carsharing schemes are conventional petrol car, they are newer and more ecological than most private vehicles. The company with the largest offer is Traficar, which has provided rental cars in Cracow since 2016, and from 2017 in Warsaw, Wroclaw, Poznan, Tricity (Gdansk, Gdynia and Sopot). From March 2018, Traficar's cars can be used in 14 cities in the Silesian agglomeration (Katowice area). Most of the other companies focus on individual locations but may expand their services: 4mobility cars have been available in Warsaw from 2016, this year also in Poznan; Panek Carsharing, operating in Warsaw, plans to launch its services in the Tri-Cities (Gdansk, Sopot, Gdynia).

Carsharing is developing primarily in large cities, but it gradually enters also neighboring municipalities.

It is worth noting that the largest companies like Traficar and Panek, which have extensive facilities and know-how (experience in car renting, large scale of operations) do not exclude the transition to a fleet of electric cars, but in the longer term. The companies monitor the market. Their analyses show that the electric fleet will gradually develop, when it will be profitable. The biggest player's business decisions can be analyzed as a cost-effectiveness benchmark for electric carsharing in Poland.

Perspectives:

The dynamics of the development of electric carsharing depends mainly on the development of the necessary infrastructure - the construction of charging points, but also decisions of local governments and government policy. Currently in Poland there is a discussion about electromobility and incentives to buy electric cars. Carsharing is a good way to promote electric cars. If local governments introduce low-emission zones in the cities, carsharing can gain new users. Electric cars in Poland can already use bus lanes.

In addition to increasing cars number, parking areas, carsharing popularization is the important challenge for the companies. Some employers are beginning to recognize that it is more convenient to give employees access to carsharing than to maintain their own company cars. The sharing economy changes the way cars, bicycles or motorcycles are used. Such trend will become more popular among younger generations. In the long-term, this may translate into a smaller number of cars in cities and greater promotion of hybrid or electric cars praised for the comfort of driving. With the development of carsharing, increase in the number of cars and parking zones, the amount of business partners and services will also grow. Carsharing users will be offered new services, the good example here is the cooperation with IKEA shops and insurance companies.

Recommendations:

Carsharing is still a new service in Poland. It develops very dynamically, because it responds well to market needs, but it is difficult to say exactly where it will go. Does it now require more detailed legal

regulations? As a business and the bottom-up initiative, it has its own dynamics. Companies and local governments respond to current needs and changes.

A "must-have" for the success is big fleet of efficient cars (few hundreds). There are several carsharing companies operating in Polish big cities. Domestic companies are the biggest players.

Cooperation between local government and companies offering such services is crucial in the development of carsharing. When designing municipal carsharing, the public-private partnership formula works well. However, even if a city does not decide to run a municipal rental company, it still remains a partner for the carsharing companies.

It is up to local governments to limit the traffic in the city. For instance by discouraging people to buy another car (or at least make the citizens buy more eco-friendly one).

To make the expansion of carsharing an important step towards the development of electromobility in Poland and an effective way to improve air quality, cities should focus on electric carsharing. Local government's support for this would help to build the image of Polish cities as the leaders of low-emission transport, focused on innovative solutions.

Present needs:

A social campaign should be introduced to encourage people to use carsharing. It is important to inform residents about the opportunities it offers and about the goals of the service. However the system of privileges also must be explained. In Wrocław, private cars are still being parked on the parking spaces dedicated for carsharing.

The development of electric carsharing is a process which requires the promotion of low-emission transport, electric carsharing, and the development of the necessary infrastructure, innovative technical solutions (rapid chargers), efficient management of the rental system and cooperation with local government. To encourage electric carsharing, local governments, could create special parking spots exclusively for electric cars like Wrocław did. It is also important to mark the parking spaces for electric cars.

4.6 The case study in Spain

4.6.1 National background

4.6.1.1 The mobility sector in Spain

In Spain, the transport sector is one of the main contributors of national Greenhouse Gases (GHG) emissions. As shown in Figure 13, it accounted for about 30% of total emissions in 2016, 7 percentage points above the European average. This contribution is more than twice as high as the whole sum of non-energy related sectors: agriculture, industry and production, waste management and land-use (which is actually negative); and it is more than a third of the whole energy sectors emissions.

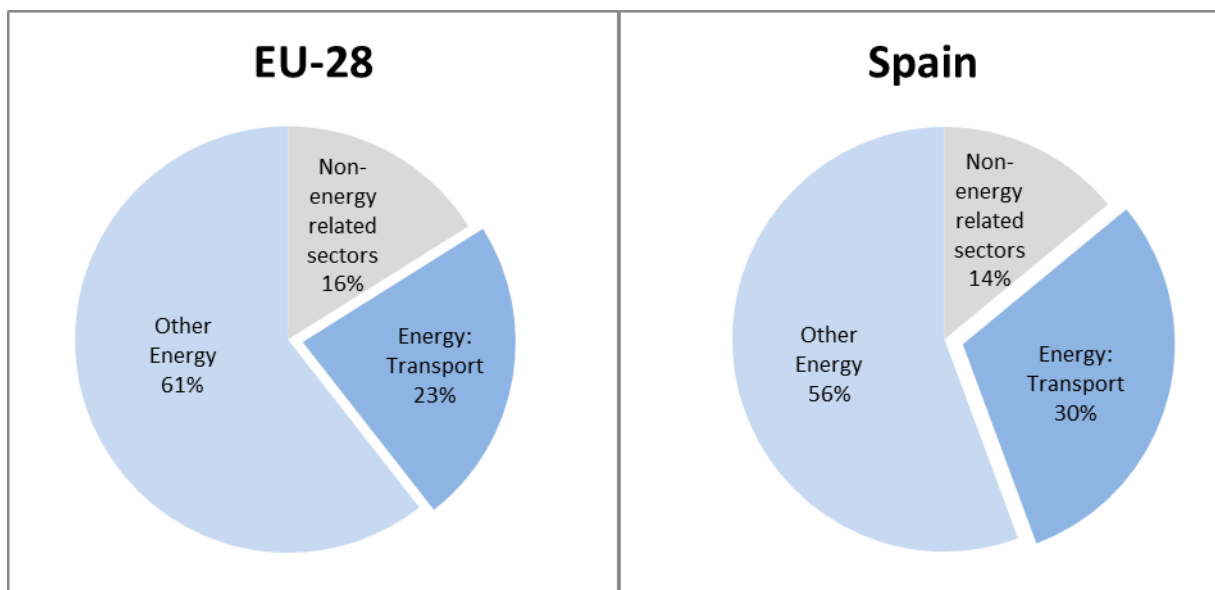


Figure 13 EU's and Spanish Transport and energy related shares of GHG emissions in 2016. Source: Eurostat.

Within the transport sector, the vast majority of emissions come from road transport which accounts for more than 94% of the total. While, 64% of the emissions in road transport come from private vehicles: passenger cars and motorcycles.

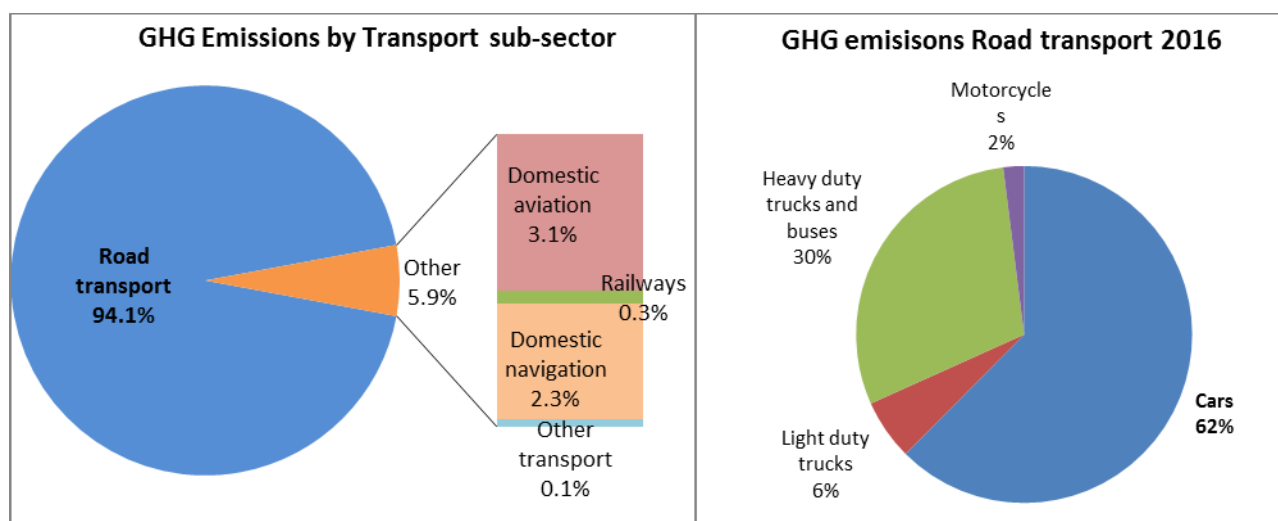


Figure 14 Spanish GHG Emissions of transport sectors by sub-sectors in 2016; Spanish GHG emissions from different road transport modes in 2016. Source: Eurostat.

Moreover, in the same way as in the rest of Europe, transport sector and private vehicle emissions have increased in the last four years after a downward period as the indirect effect of the financial crisis.²⁴ As shown in Table 15, Spanish passenger transport is similar to the European average, with a high prevalence of private car use, more than 80% compared to bus and train use.

²⁴ National Inventory of GHG Emissions - 2017 Edition. Available at (in Spanish): http://www.mapama.gob.es/es/calidad-y-evaluacion-ambiental/temas/sistema-espanol-de-inventario-sei-nir_2017_abril_tcm30-378883.pdf

	Passanger cars (%)	Trains (%)	Motor coaches, buses and trolley buses (%)
EU-28	83.1	7.7	9.2
Spain	81.4	6.7	11.9

Table 15 EU-28s¹ and Spanish Modal split in 2015. Source: Eurostat.

These considerations show how important the management and the transition towards low carbon mobility are in the Spanish context. Hence, carsharing, given its potential benefit as a facilitator of public transport and independence from private vehicle use can help urban areas reach this transition.

4.6.1.2 Overview of the carsharing system in the country

In Spain, 7 major companies are currently offering carsharing services to consumers. Four of them operate under a *station-based round-trip* model, where cars have to be collected and returned to the same car park (station). Users of this mode book the vehicle by paying a constant rate per hour, normally around 3-4 euros depending on the city, company and car type (in 2018). Moreover, the rate includes an amount per kilometre depending on the vehicle fuel. The first carsharing companies using this model appeared in the period between 2004 and 2010 and are now operating in the cities of Barcelona, Bilbao, Madrid, Palencia and Seville. This mode will be referenced as station-based carsharing in the rest of this chapter.

From 2015 onwards, a further 3 companies have started operating in Madrid using a *free-floating one-way* model, exclusively based on 100% battery electric vehicles (BEVs). In this model, cars are collected from the streets and they can be left in any parking space within a certain area, which in the case of Madrid is the central area within the M-30 circle.²⁵ Users of this mode pay rate of about €0.20 to €0.25 per minute without there being any specific costs per kilometre. This mode will be referenced as free-floating carsharing in the rest of this chapter.

The two models target mainly different journey types: the station-based model is directed at peri-urban or outer areas journeys; while, the free-floating model is mainly for urban trips. Furthermore, the two models involve a different number of vehicles and human resource efforts, since free-floating carsharing has to guarantee an even distribution of vehicles along the area served.

Common to both models is the search and booking process, conducted using a mobile app for all companies. The vehicle is normally opened using the app in the case of free-floating carsharing while some station-based carsharing operators rely on the use of a specific card.

The sector has boomed and rapidly increased from the arrival of the free-floating carsharing companies, especially in Madrid which is now one of the European cities with the highest number of users and shared cars available (more than 2000).²⁶ The interest in this sector is mainly down to car manufacturers and car rental companies, which have started or bought the majority of the operating carsharing companies.

²⁵ The area served changes slightly between companies to some specific boarder locations. The trip can be finalized with the app only inside that area

²⁶ <https://www.lavanguardia.com/local/madrid/20180111/434202788767/fiebre-carsharing-guerra-precios-madrid.html>



Madrid is the city with the highest number of shared vehicles with at least 1500 free-floating carsharing vehicles and around 350 vehicles for station-based carsharing. Barcelona has the second biggest concentration of vehicles with about 450 shared cars, while Bilbao, Seville and Palencia having a smaller number of vehicles.

Given the recent development of this sector, research is still lacking to explore and unveil potentials of this mode, which according to existing literature from other countries has been proven to enforce public transport use and private vehicle use, as the direct effect of the reduction of car ownership.

4.6.2 National specific study design

In Spain, **carsharing users** have been recruited through an external company to represent the criteria of gender, age and whether or not they have children. Moreover, we asked to have both types of models represented, - free-floating and station-based -, and the highest number of companies represented. Fifteen users were selected using this method, 4 users of station-based carsharing in Barcelona, 10 users of free-floating electric vehicle based carsharing and one user who uses both free-floating and station-based in Madrid., A monetary remuneration was given to the interviewees to incentivize their participation. Interviews were conducted in hotel lobbies or coffee shops at a convenient location for the interviewee.

Interviewee	Gender	Age	Children	Living with Partner	Carsharing Type*
1	F	31	2	Yes	SB/FF
2	M	36	2	Yes	FF
3	M	31	0	Yes	FF
4	M	46	0	Yes	FF
5	M	55	3 (adults)	Yes	FF
6	M	45	0	Yes	FF
7	F	42	0	Yes	FF
8	M	25	0	No	FF
9	F	37	0	No	FF
10	F	25	0	Yes	FF
11	M	26	0	Yes	FF
12	M	35	0	Yes	SB
13	M	38	0	Yes	SB
14	M	33	0	No	SB
15	M	44	0	No	SB
*: SB stands for station-based and FF for free-floating carsharing					

Table 16 Interviewed carsharing users' description



Stakeholders were first contacted via email to explain the project and the case study objective. Those who did not reply were then contacted by phone or in some cases in person.

With respect to the business stakeholders, all carsharing companies operating in Spain were contacted, with the only exception being those businesses working exclusively with companies (company vehicles fleet management). Five out of 7 operating companies positively answered the call.

The transport and environment sections of the public administrations in the areas of Madrid, Barcelona and Bilbao were contacted. The institutions at municipal, provincial and regional levels were considered in each case.

The following sectoral pressure groups were included: two carsharing associations, one operating at national and one at local level; one national level public transport association; one company working on the electric vehicle grid and charging towers. Taxi driver associations and car manufacturers were contacted but decided not to participate in the study. The interviews were conducted in the cities of Barcelona, Bilbao and Madrid, usually at the offices of the companies/institutions.

Business		
Code	Type of Carsharing	Location
B1	SB	Barcelona
B2	SB	Bilbao
B3	SB	Madrid-Barcelona-Seville
B4	SB	Madrid-Palencia
B5	FF	Madrid
Public Administration		
Code	Area	Level
P1	Bilbao	Province
P2	Barcelona	Province
P3	Madrid	Municipality
P4	Bilbao	Region
Associations		
Code	Sector	Level
A1	Carsharing	National
A2	Carsharing	Local
A3	Public transport	National
A4	Electric vehicles	National

Table 17 The groups of stakeholders interviews in Spain

All interviews were conducted following the topic guidelines described in Section 2.2. No particular changes were implemented in the stakeholder interviews. With respect to the household interviews,

the only change was to introduce a last phase at the end of the interview where factors valued as motivators to use carsharing service were listed and ranked by order of importance.

4.6.3 Carsharing user interviews analysis

4.6.3.1 Description of how the mode is used

At the beginning of the interview, carsharing users were asked about their normal routine and travel needs to understand the occasions on which they used the mode. With respect to frequency of use, answers varied from person to person but in general free-floating consumers appeared to be more frequent users. Seven out of 11 interviewees stated they use it around 3 times per week; station-based carsharing interviewees use the mode more on a monthly basis and sometimes even more occasionally. With regard to the journey length, most free-floating users have a normal range of 10 km or 15 minutes, normally affected by traffic congestion. Station-based carsharing instead, is generally booked between 2-3 hours up to a full-day or weekend. Some users of both systems also stated their use to be dependent on the period of the year, with a higher frequency during summer or holidays.

Most of the interviewees began to use the transport method during the last year with the exception of three users who had been subscribed to the service since the very beginning. **Carsharing became part of their routine in many cases by substituting a usual means of transport on a trip, mainly by public transport or private car.** Particularly in relation to evening activities, several users stated they used to take a taxi to come home while now they can opt for a shared vehicle. Some users also used a friend's car instead of renting a car. However some interviewees stated that, rather than substituting, carsharing somehow increased their mobility, as it allowed them to perform trips which they would otherwise have avoided due to laziness, complexity or external conditions (e.g. weather, time of the day).

With respect to the means of use, both type of consumers mainly used carsharing for leisure activities, especially in weekends, at night when the public transport stops or to reach locations that are not easy to reach using the latter. Other uses mentioned are to replace their own car while it is being repaired and the need to move equipment from one place to the other. Free-floating carsharing users, given the limited area where this system operates, mainly use the mode to reach the city centre from the periphery, where they can park for free, or to move from one place to another within the centre. Moreover some of them also used shared vehicles on weekdays, during their lunch break or to go to work when it is raining instead of going by foot. Station-based users mainly booked vehicles for weekend trips or as a substitute for their own and mainly use the system to reach outer places such as mountains, the seaside or nearby villages. With regard to the weekly routine, the vast majority of the users are working full-time while after work activities mainly include sport, shopping and attending evening events.

With respect to the mix of modes used apart from carsharing, about half of the respondents at least go to a recurrent location on foot, while only three used bicycles. Almost all the interviewed users use public transport with half of them having it as the main transport mode. In particular, users of station-based carsharing in Barcelona use public transport a great deal as most of them did not own a private vehicle. Users who own a private car mainly use it to go to work and for weekend trips. Age seems to influence the propensity to use different modes; younger interviewees of both carsharing models use a wider range of modes in their normal routine, mainly due to a higher number of

activities and a less structured schedule. In particular it is interesting to note how the majority of young interviewees in Madrid were subscribed to more than one carsharing company, while older ones normally only to a single operator.

4.6.3.2 Insights on the factors influencing carsharing adoption

For most of the interviewed users, the discovery of the method is related to the main channels companies use to advertise it. People from both Madrid and Barcelona said they had seen the vehicles on the streets and used internet to understand how the method worked. However, the most common way cited by users is being informed by friends, colleagues or relatives. Most users cited a combination of seeing them on the streets and then understanding the service by talking to acquaintances. Especially free-floating carsharing users asserted that they first saw the vehicles, while most of the station-based carsharing users stated they had discovered it by talking to people.

As regards the motivation to start using the mode, many interviewees cited a specific external condition such as the unavailability of their own car, a specific unusual trip they had to do out of their usual routine, or a change in the city mobility due to an event or holiday. Some users stated they had also been curious about the type of vehicle and the way the method functioned.

Interviewees were asked to list all the motivations and factors influencing them in choosing to use carsharing services and, at the end of the interview to review and order them according to their importance. Given several similarities in the answers these factors were then grouped into 4 different classes: namely, convenience in use, technological, economic and environmental factors.

Convenience in use includes those factors that identify carsharing as a more practical alternative compared to other modes available. Five different specific factors were cited in this category: accessibility, ease of parking, immediateness of booking and use, flexibility with respect to the travel need and comfort. Although they are separately classified here, their definitions were often mixing with each other. Accessibility was linked to the vehicle availability around the city and proximity, to the possibility to reach any destination with relative ease and less dependence on other people (e.g. parents, partner). Ease of parking refers to the advantage of being able to easily park the car thank to its size (free-floating cars are normally city or supermini cars) and to the avoidance of parking costs. Immediateness of booking and use implies the possibility to rapidly reach your destination, hence saving time and its flexibility within the urban context, but also to the possibility of booking the vehicle in few minutes without requiring planning too far in advance. Flexibility was described as the possibility to change plans or connect different trips into one thanks to the possibility to leave and take the vehicle to any location, and to take a different vehicle depending on the specific needs. Comfort was then identified with respect to the quality level of the service and with respect to public transport.

Moving on to technological factors, these mainly includes the aspect of the app control system which allows the car to be booked, opened and closed through the user's own Smartphone, but also with respect to the vehicles themselves in the case these were electric or hybrid electric. Other technological factors mentioned are the car size, which was appreciated for its flexibility in the urban context and the general quality and good state of repair of the vehicles. Some interviewees also mentioned the novelty of the system and the newness of the cars available.

With respect to economic factors, most users commented about the price, which most of them defined as affordable or cheap. Some other interviewees mentioned the advantages compared to the costs related to a private vehicle, in particular the possibility to pay according to the use of the

mode and the avoidance of purchasing, maintenance and parking costs. Another economic aspect cited is the possibility to park in the city centre without paying, which influences the decision between having to pay for parking your own or booking the shared car.

Finally all free-floating electric carsharing users mentioned the advantage of being environmental friendly as a valuable aspect of carsharing. Conversely, none of the station-based carsharing users mentioned this aspect and when asked about it said they did not relate carsharing to environmental friendly mobility as vehicles were not low carbon fuelled.

When looking at how these factors were classified by users it is clear how aspects related to convenience in use ranked at the top, with a preference for accessibility and comfort advantages. Factors related to this class occupy 11 out of 15 in both the first and the second highest ranked factors. Only two interviewees set economic factors as the most important and a further two gave technological ones. There is no trace within the first two positions of any environmental factors which start to appear for 3 users as third most important factor and it is normally in the mid/bottom part of the rankings. However, as already mentioned it is interesting to note how this factor was only taken into account by free-floating carsharing users.

Apart from the advantages of carsharing, some users also mentioned some constraints to the mode. In particular, the impossibility to exit from a given area of the city (the M-30 area in Madrid) was given as the main constraint for free-floating carsharing, which limits the use by people living outside of that area. Station-based users mentioned the constraint of having to return the vehicle to the same station and the time required to register the first time. Some other issues were linked to the tidiness of vehicles and limited vehicle options within the same company.

4.6.3.3 Insights on the relation between carsharing and public transport use

Users were asked about their frequency of use of public transport, then to compare between public transport modes and shared mobility, then to discuss how they think their use of public transport had changed after subscribing to a carsharing service. Surprisingly 6 out of 15 interviewees stated they rarely use public transport, less than once a month, three interviewees use it around once a week, while 6 use it more often as the main transport mode. It is interesting to note that all 6 users with low public transport use come from the free-floating carsharing group, while 4 out of 5 station-based carsharing users stated they use public transport on a daily basis. Within public transport modes the majority of users preferred the metro to the bus. Their opinion regarding the metro is that it is cheap and relatively fast, while the bus is considered too slow. However many interviewees pointed out several negative aspects of both these modes, mainly related to the rigidity of the routes and timetables, especially at night. Other disadvantages are the crowdedness, which implies queues and the uncertainty of having a seat, and the perceived slowness compared to other modes, due to different stops and connection changes. Taxi use is limited to emergencies, occasions where it is not possible to drive or at night, but it is considered to be extremely expensive.

When it comes to the comparison between public transport and carsharing, competitive advantages of public transport were identified as the possibility of doing something else while travelling (read, talk...) and not being directly subject to the stress deriving from driving in urban areas. The most cited advantage is related to price, which is considered cheaper than carsharing and in some cases can be limited to the payment of a monthly ticket. One interviewee also mentioned the advantage of not having to look for parking which, especially during holidays, is a problem also for carsharing.

On the other hand, carsharing is almost always described as faster, more comfortable and flexible; in particular, it offers the advantages of being able to move directly from and to where you need, the possibility of choosing the route, speed and flexibility. Some young interviewees also mentioned the advantage of having more independence and being able to reach other places, stating that somehow this mode increased their mobility possibilities. One interviewee also mentioned the love of driving rather than being driven as an advantage of carsharing, while another mentioned the possibility of appearing as an innovative person.

On the contrary, when considering the disadvantages of public transport, users repeated the several constraints due to rigidity of routes and timetables, crowdedness and slowness. With respect to carsharing, users complained about the constraints to restricted areas, the higher price and the remaining problems connected to traffic and parking.

When asking how their use of public transport changed after subscribing to carsharing, all free-floating carsharing users except one stated that their use reduced. Those of them using public transport as their main mode said that it fell slightly on those occasions where many changes were needed, when not knowing about when they would have come back or in case of emergencies. Moreover, most of them also stated that this mode increased their mobility possibilities. Conversely, all station-based carsharing users said that, given the occasional use, it did not greatly influence their behaviour with respect to public transport. Indeed a couple of them said they rather complement each other, leading to greater independence as an alternative mode exists.

4.6.3.4 Insights on the relation between carsharing and private vehicle ownership and use

Users were then questioned about their ownership and use of a private vehicle, to compare it with carsharing, and about their perspective on the future purchase of a vehicle.

Most free-floating carsharing users owned at least a car, a motorbike or had access to a vehicle within their household, through their partners or parents. However, the majority of them only had one in their household. Not out of the five station-based carsharing users personally owned a car, although one owned and principally used a motorbike and another one had access to its partner vehicle if needed.

Most owners of a private vehicle use it to go to work every day while preferring to take a shared car when needing to go to the city centre. Some of them also expressed the need for a vehicle when going on a longer journey for holidays or at weekends.

The main advantage of a private vehicle over a shared one is the complete freedom of movement and the exclusivity of its availability. This last aspect is especially important as a guarantee for possible emergencies. Another advantage mentioned is making it easier to manage children's activities. With respect to free-floating users, the private car is also often the only alternative when having to go out of the city.

Most of the interviewees cited various and considerable costs as the main disadvantage of a private vehicle, specially related to the purchasing, maintenance, insurance and parking. Some users also mentioned the additional problem of finding a place to park in the centre, which is getting more difficult due to restrictions. A couple of interviewees also said that with private vehicle costs are less visible. One of them said this is as an advantage of carsharing for instance when having to share the

cost of a trip with friends, as they are more likely to offer to pay their part when the vehicle is a shared one and they see the exact price.

Most of the interviewees stated they had partially reduced the use of their private vehicle since using carsharing although they normally have different uses. Some users living in periphery areas stated that when they need to go to the city centre they use their own car to the closest point where they can park for free and then change to a shared car as it would be more expensive to pay for several hours' parking than to pay for a shared car.

Finally, almost half of the respondents were positive about the possibility of living without a private vehicle, while the great majority of them were open to at least reducing the number of cars to one for the whole household. All of them directly connected this possibility to the existence of the carsharing service. However, most of them also related the decision of whether or not to buy a vehicle to the change in daily routine, to the area of where they live or if they had children. Most of the interviewees stated they had had the car since before discovering carsharing and a couple of them stated they otherwise would not have bought one. A barrier to reducing the number of cars cited by some of the respondents is the low market value of their vehicle, while the policies overvaluing used cars are connected to the buying of another one. Hence, some of the interviewees said they are waiting for the car to stop working to then not replace it. All interviewees who did not own a private car stated they will not buy one if their current routine or living place does not change.

4.6.3.5 Users' future expectations on the development of the sector and opinion on the type of vehicles used in the service

Thirteen out of 15 interviewees were only using one of the two types of carsharing and most of them did not know about the other, although Barcelona users would not have free-floating carsharing in their city.

Possible improvements to the service were quite different between these two groups. Most free-floating users complained about the limited area of use, which excludes many peripheral residential areas where some of them live. Some of them would like to increase this area to the Madrid outer ring road (M-40). Some other users complained about the electric vehicles' range which sometimes had a low charge level. They suggested the possibility of having charging towers at places around the city to recharge them. Other users also suggested the possibility of having exclusive parking spaces for these vehicles to help find it more easily, since the time spent looking for a space often resulted in extra costs. In addition, several users would increase the types of car available to choose between different numbers of seats and asked for lower prices.

Most station-based carsharing users would have preferred to also have hybrid or electric vehicles or in general to have more options with respect to the vehicles available. In addition, some of them also complained about having to return the vehicle to the same place, somehow asking for a free-floating model. Almost all of them then complained about the high costs of booking the vehicle especially considering that during the most of the time it was parked. However, all of the interviewees of both types were largely satisfied with the service and with how it worked.

The opinion of all free-floating carsharing users on the electric vehicles was positive given the related environmental friendliness and none of them would have preferred the vehicle to be a petrol one. Only a couple of interviewees expressed indifference in this regard. It was the first time than any of these interviewees had driven an electric vehicle and they were positively surprised about the performances, the low noise and automatic features of the vehicle. Some of them stated they were

first suspicious about the technology but then changed their mind, while others said they started using the service expressly as they were curious about it.

Users were then asked whether they would be prepared to pay slightly more for an electric shared vehicle compared to a conventional one. The majority of them said they would accept a small increase in price given the pro-environmental advantage. Furthermore, five users said that although they prefer the electric vehicle they would not pay more for it, while two interviewees said they are completely indifferent and would just go for the cheaper one.

Sustainability and pro-environmental aspects were the first advantages of the electric vehicle cited by almost all of the people interviewed. Moreover, the possibility of not having to pay for fuel and the lower noise was appreciated. On the other hand, many users expressed concerns regarding the battery effective range, charging time and life, while the noise factor could be also a risk for pedestrians. Lack of infrastructure especially in country areas was also mentioned as a constraint of electric vehicles.

Finally, users were asked whether they would consider an electric vehicle for their next purchase. The majority of the free-floating carsharing users stated they would consider it, although some of them expressed concerns about the high cost involved. Two of them said a hybrid vehicle could be a good midway solution at the moment. Moreover, some of them stated the vehicle constraints to be still quite significant especially in relation to the lack of infrastructure. However, many of them stated that after having tried the electric vehicle thanks to carsharing, they would consider it for future purchases. Those who do not have a car and do not want to buy one stated they would not be interested in it even if electric.

4.6.4 Stakeholders' interviews analysis

4.6.4.1 The current development of carsharing, the opinions of stakeholders

According to the interviewed business and association stakeholders, there has been a great focus on carsharing in Spain in recent years. However, this great dissemination is **limited to few cities**: principally Madrid and Barcelona, while Bilbao, Palencia and Seville also have one company actively operating. In particular for the case of free-floating one-way carsharing service, there has been rapid development with three companies having arrived in Madrid since 2015, while a fourth company is about to enter in 2018. Station-based roundtrip carsharing was the first model to arrive between 2005 and 2010. Most of the companies stated that the first years were not easy due to the lack of knowledge and habit among the population. Especially Madrid companies stated that the arrival of the free-floating companies also helped them in the process of making people aware of and used to the service since this business model implied much more intensive vehicle presence and marketing. Some companies claimed there is still much to do at societal level to make citizens and authorities aware of this service. This is still sometimes confused with carpooling online platforms (e.g. BlaBlaCar) or traditional car rental. In fact, it is classified as car rental service at a legal level.

In relation with the type of service, stakeholders of both free-floating and station-based carsharing stated the two models are rather different in terms of structure, travel type and range. Free-floating carsharing targets specifically within-urban mobility allowing users to move from point A to B within a restricted area, which is mainly the central area within the M-30 in the case of Madrid. They need to be able to freely park on the street, which in Madrid that is only possible for electric vehicles.

Hence, these companies have a fleet entirely consisting of battery electric vehicles (BEVs). This type of service also needs a high presence of vehicles, evenly distributed throughout the area. This implies a need for a high number of vehicles, about 500 per company, and employees reallocating vehicles and recharging them. Conversely, station-based carsharing is less demanding in terms of vehicles and human resources. This model targets longer journey, mainly outside the city centre and the vehicle has to be returned to a same station. The length of these trips does not permit, according to the companies' representatives, electric vehicles to be used, meaning a poorer long range performance, longer charging times and lack of infrastructure. Hence the fleet of these companies ranges from diesel and petrol to natural gas and hybrid electric vehicles, although some companies also have a minority of battery electric vehicles.

Therefore, the **free-floating and station-based services are rather different and could even complement each other** according to the same stakeholders. A business offer mixing the two modes is indicated as possible and already existing in other countries. Both carsharing modes are highly dependent on the quality of public transport which is supposed to be the main alternative mode of their users in the city. However, station-based carsharing companies stated that their service, since it is directed to outside urban journeys, have less of a risk of competing with mass transit, in particular with taxis.

4.6.4.2 Facilitation of carsharing: contribution, political measures and social characteristics

Carsharing providers highly rely on how the service can contribute to urban mobility to draw political and social attention. According to them, **the benefits of carsharing are threefold: Economic, social and environmental**. From the economic perspective, which is said to be the most important for users, there is the consideration that a private vehicle implies a series of costs that are not worthwhile for a person who does not need to drive more than 15,000 km per year. Using carsharing, the sum of purchasing, insurance, maintenance and parking costs is replaced by a single rate directly proportional to the use. Moreover, this rate represents, net of provider profits, the real costs of driving, while private vehicle users otherwise tend to identify driving costs with the fuel costs. This is one of the most cited aspects by stakeholders in influencing users' behaviour: having a direct idea of the cost of driving helps when comparing the private vehicle to other alternative modes, in particular public transport. Hence it "destroys the inertia of having a car and help users toward a mobility based on an efficient mix of modes", increasing the use of mass transportation. Therefore the use of carsharing results in the social benefits of reducing the need for having and buying private cars, leading to a smaller number of cars on the streets and the urban spaces allocated to them. The reduction of private car based mobility also results in environmental benefits connected to air quality, noise and climate change. In smaller sized cities, carsharing can contribute to mobility also playing a role to connect rural areas to the main cities in the cases where it may be more efficient than a public service based on buses due to low demand levels.

The facilitation of carsharing mainly involves certain **specific policy measures and some favourable geographical and social conditions**.

With respect to policy, some key measures have been identified by stakeholders. First of all, **free parking** on the streets is fundamental to free-floating carsharing as it is structural to its business model. However, station-based carsharing operators also said it would be important to have stations on the streets to **increase visibility and accessibility**. Another important factor is the accessibility for shared vehicles to restricted areas which is normally granted only to electric vehicles and public

transport. On the other hand, higher restrictions on private vehicles access are also seen as positively influencing people to opt for not having a private car and rely on public transport and carsharing.

There are then policies which might help further the development of this service. Most of the service providers referred to the **lack of legal recognition of the specificity of their service and its contribution to mobility**. At a national level, service stakeholders request the introduction of a specific label for carsharing distinguishing it from car rental, while its positive impact on mobility could be recognised by reducing tax rates to 10% as is the case for public transportation service. An important aspect highlighted by both carsharing providers and the authorities is the **integration of carsharing services with public transport to increase visibility and facilitate modal shift**. In this sense, a key feature could be the development of hubs, stations where it is possible to switch between public transport and shared modes, bicycle and car. Some station-based carsharing providers also referenced the German Carsharing Act (Carsharinggesetz – CsgG), which requires each municipality to a public or private carsharing service operating with specific parking for it. A first signal in this direction however comes from the administrative side, where a focus on carsharing is in the mobility plans of Madrid and Barcelona, and they consider how it can be improved and managed.

Moving on to **geographical characteristics, density of population** seems to be an important factor valued by providers, although other models aimed at connecting small villages and medium sized cities are possible. Another important factor is the presence of good quality public transport which facilitates living without a private vehicle. Another important advantage for this service is the possibility to mix the demand of corporate and private users. In fact, private users tend to use more the service at weekends and in the evening, while corporate users use it during working hours. Hence all the areas where there is a mix between working activities and residential locations are key features to carsharing companies.

With regard to social characteristics, **cultural factors** have been the most cited by stakeholders. In particular, the feeling towards the ownership of a car and the symbolic value attached to it are seen as the main barrier to behavioural change towards shared mobility. On the other hand, the tradition of moving a great deal with many extra work activities has been cited as positively impacting carsharing usage. With respect to the new generations, an important role is given to the perception that owning a car is not considered as important as it was in the past compared to connectivity and accessibility needs. Moreover, a positive attitude towards technology is recognised as helpful in the usage of a mode based on an app control system, with semi-automatic and electric vehicles. Carsharing providers stated they do not have a specific profile of user they want to target. Even if the majority of their users are aged between 25 and 45 years old, many of them are over 45. Moreover, users coming from medium-highly educated and medium-high income classes are the majority, but their users have been far more in line with the rest of the population in recent years. Furthermore, people tend to subscribe in key moments where they find themselves without a car, when it is broken or about to be replaced. In general, carsharing users are people who were not previously using a car intensively.

When it comes to the **electric vehicle, the opinion of different stakeholders tends to diverge**. All stakeholders agree when it comes to seeing the electric vehicle as the future of urban mobility and of carsharing of all types. However, most of the station-based carsharing providers assert it is not a viable option now as the current technology does not guarantee the range and the performances they need, which is averagely between 60 and 80 km per booking. The main problems they relate to

this type of vehicle are low ranges, long charging times, the high cost and the lack of existing infrastructure, especially in outer areas. With respect to the high cost of electric vehicles, it has been said that the investment provides a return from a use over 15000 kilometres per year. Most station-based companies have hence opted for hybrid or natural gas vehicles as an intermediate point between environmental friendliness and performance required. However they claim that these vehicles are not always exempted from urban mobility restrictions as electric ones are. Some of them stated electric vehicle could be more useful for predetermined journeys than those of a bus. Given the shorter range of trips (5-15 km) and the parking facilities, free-floating operators have hence opted for these vehicles. Electric vehicle carsharing has the advantage of allowing people to experience electric vehicle and consider them as a possible alternative. Compared to conventional vehicles, electric ones have the advantage of the lower noise and of being more environmental friendly, hence positively considered by the Public Administration (PA) and environmentally concerned citizens.

4.6.4.3 The relation between carsharing and other transport modes

For most stakeholders, **public transport and carsharing are deeply interconnected and should be somehow part of a single offer**, even if managed by different operators. The main contribution of carsharing according to the PA and public transport related associations is the positive impact it can have on public transport. The number of vehicles in the streets is a problem affecting most urban areas in Spain and the reduction of them is in the core of the mobility agendas of most cities. Carsharing, in exchange for a higher price per kilometre gives door-to-door solutions which facilitates citizen independence from private vehicles. In the opinion of stakeholders from different groups, station-based and free-floating carsharing can complement the offer of public transport especially when a vehicle is needed to carry packages, when the public transit timetables do not cover the journey or when the location is poorly connected. Most carsharing providers reported studies stating that carsharing users use public transport twice as much on average compared to other citizens²⁷. PA considers public transport to be the main tool to solve transport problems of congestion, parking space and air quality, because of the size of its impact on urban mobility. The relative impact of carsharing is limited, as it services a lower number of users than public transport, but is considered to contribute to the transition to low carbon mobility.

Much attention has also been given to the **relation with private vehicles** which are considered by business stakeholders to be the main competitor of their service. As already mentioned, carsharing providers consider the level of 15,000 kilometres per year to be the cut-off point of private vehicles being more efficient than carsharing in economic terms. They also state that the great majority of citizens living in urban areas drive their car for less than that amount and are hence potential candidates to be carsharing users. Most the stakeholders said carsharing helps users to avoid buying a car or at least to reduce the number of cars per household. This is said to be an important aspect as owning a private vehicle tends to influence people to use the car more than they need to, given the high price they have to pay to buy and maintain it. Although most citizens own a car, the majority of stakeholders expressed their conviction that the private vehicle is losing its symbolic value especially among young people who now have new ways to gaining their independence, one of which is the access to a shared vehicle.

²⁷ E.g. Carplus Annual Survey of Car Clubs



Therefore, **according to service providers, the advantages for users of carsharing compared to these modes are different.** With respect to public transport, the flexibility and the higher comfort of the mode stand out as the competitive advantage. It is therefore important for carsharing providers that the closest shared car is closer than other alternative modes, as its success depends on how easily it is found and how quickly it is booked. With respect to private vehicles, the advantages are mainly down to the avoidance of various costs related to private car and to the possibility of paying directly per use. Free-floating carsharing adds the easiness to find parking in city centres given the advantages of the cars being electric. In comparison to car rental, carsharing has the advantage of being less demanding in terms of booking and more flexible in terms of duration.

4.6.4.4 Business, political and association views on the future of mobility

When asked to consider the future of urban transport, **the topic of the self-driving car** was raised by almost all the stakeholders interviewed. PA stakeholders focused on the management and control needed to ensure security, while most of the business stakeholders mentioned the role carsharing can play in this context, since this vehicle could perfectly fit in the type of service they offer. Some stakeholders in this sense pointed out the competition there will be between existing actors and the communication sector (e.g. Google) which have already shown interest in this type of vehicle. A general opinion is that it will be crucial how this car is managed as it could also lead to more vehicles on the streets allowing access to people without a driving licence as well. Conversely, if combined carsharing, it could improve the service by allowing more people to be collected on the same route, thus facilitating the merging of the shared vehicle (carsharing) and shared trip (carpooling) concepts.

Another aspect pointed out by most of the stakeholders is **the importance of multimodality as a tool allowing people to opt for the best travel mode for each trip.** Citizens need to be offered a range of alternative modes including mass transport, shared mobility and bicycles which need to be available anywhere with a particular focus on the locations (hubs) where it would be possible to switch mode. This multimodality requires the integration of the different alternatives in a single system to simplify the selection process, for instance by unifying the way to access to each mode. Accordingly, full multimodality could be achieved only when using these alternatives becomes as easy and cheap as taking your own car.

A third aspect regarding social change was then identified. Most of the stakeholders were positive about the increasing independence of urban citizens with respect to private cars and argued that mentality change is fundamental to the success of any policy and option aimed at lower carbon intensity of urban mobility. However, this change entails costs that are hard to calculate and, hence a risk to stakeholders. To this end it will also be important to act on the environmental awareness of people's travel decisions.

When depicting future mobility, the PA also has a wider list of **objectives to be achieved in the interest of society.** One of these is the increased efficiency in providing a good quality public service. This requires the administrative and rate integration between different public transport authorities and possibly its opening towards private operators. Higher modal distribution and the reduction of the relative incidence of private vehicles are also considered short term objectives. These can be achieved through parking and access fees. In Spain, according to the stakeholders, such measures were introducing with the aim of providing a return on the investment in infrastructure. Hence, once this return is completed, this aim should be changed to use the rate as a mobility control tool. Moreover, it will be important to enlarge the area of action to the peripheral areas where public

transport may be lacking and parking is less problematic. Hence, it is therefore easier to drive private vehicles.

Central to the political agenda are the problems related to **air quality and climate change** given the problems related to health and the necessity to comply with the EU urban transport emissions targets. However, accessibility to public transport has to be granted to everybody regardless of the physical and geographical constraints. Moreover, given the dependence on public budgets, the administration also has to be responsible regarding the investments and be sure of the technologies they are opting for, limiting the possibility of investing in newest technologies.

When it comes to business stakeholders, the **environmental aspect of their service** is considered to be important especially when promoting their service to the PA, while it seems to be a less attractive topic among users compared to economic advantages. However, it is said to be central in the business visions and decisions. This is also proven by the high investment of free-floating companies in BEVs, while some of them also ensure the purchasing of 100% certified renewable electricity for the charging of vehicles. On the other hand, station-based carsharing drew the attention to the complementarity nature of their service with respect to public transportation and also stated that investing in the most environmental friendly vehicles could guarantee the service they provide, namely natural gas and hybrid vehicles matching highest EU emission standards.

There is no notable barrier expressed within the different stakeholder groups. Business stakeholders demand that the Pas should **support and create a favourable social environment** for their activities. However, carsharing does not seem to receive much opposition by any player and its positive reception also depends on the specific person in charge. Some categories, such as taxi operators, are more suspicious about private urban mobility alternatives and sometimes consider this service as a threat. Finally, the interest shown by car manufacturers and car rental companies, who own the great majority of the companies in this market, appears to be linked to the necessity to anticipate the foreseen social change to avoid the risk of being cut out by new players (e.g. communication services providers).

4.6.5 Discussions

Several insights can be taken from the interviews with both users and stakeholders. These can be related to its role in the transition to low carbon mobility, to the future perspective on the sector and to the criticalities that need be taken into account, from both political and social side.

First, **carsharing seems to positively contribute to the transition toward low carbon mobility** through three main channels: the reduction of car ownership, the diffusion of electro-mobility and the complementarity of public transport.

As envisaged by business stakeholders and expressed by users, both free-floating and station-based carsharing models seem to reduce the stated need for private vehicle use and ownership. Especially the possibility of reducing car ownership in households is important, as this is considered in the literature to be one of the main factors correlated to private vehicle use.

A free-floating carsharing specific advantage appears to be the one related to the involvement and diffusion of battery electric vehicles. On the one hand, this directly reduces local levels of both GHG emissions and local air pollutants. On the other hand, it allows consumers to discover this new technology and overcome potential barriers to the electrification of mobility. Moreover, electric

carsharing is perceived as being environmentally friendly by interviewed users which cited this as a factor for using this mode.

Conversely, the specific advantage of station-based carsharing seems to be related to the closer complementarity with public transport: this has been the main aspect cited by business stakeholders regarding this mode, and the interviewed users of this model also revealed a more public transport based mobility compared to free-floating carsharing ones.

Second, the **future potential of this mode is linked to an integrated multimodal accessibility issue**, namely: the integration with public transportation, the role in access-based multimodality and the future vision of autonomous mobility.

The future development of carsharing is closely linked to its integration with public transportation, to developing a unique network which can facilitate the use and the connection between both modes. This integration could imply the use of a single payment method, the inclusion of stations and car parks in the public transport information system and the contribution of carsharing to the low efficiency public transport lines. This aspect has been primarily raised by carsharing operators and seems to be reflected in public administration and sectoral pressure group opinions. Directly connected to integration is then the facilitation of multimodality and the specific places where modal shifts are possible in order to make it easier to avoid own vehicle use. According to users, the most valued factors of carsharing in fact are connected to its simplicity and immediateness making it more convenient compared to its alternatives, rather than economic or other advantages. In the same way, access-based mobility is likely to be more successful than private vehicle based mobility only if it is seen as more convenient in these terms.

Moreover, the foreseeable advent of the autonomous vehicle gives carsharing a new role of possible mediator. As it is currently seen by stakeholders, the main advantage of this new technology would be the possibility to share rides along the same route by different people and the initially high costs are likely to limit its diffusion as a private vehicle. Hence, carsharing services could be the channel through which this mode could enter in our mobility.

Third, **room for manoeuvre has been identified in order to move towards an integrated system for urban mobility**. From the political perspective there is need for dialogue between players in the sectors, as there is the risk that each party is waiting for the other to act. Several stakeholders stated the future development of the sector is highly dependent on the political measures taken by public administration, as the one referring to integration with current public mobility system. On the other hand, even though the public administration recognises the benefits of this service, it does not seem to consider it as a priority or a main objective given the lack of visible impact carsharing has on current mobility.

Both of the carsharing models also seem to have their limits. Given the type of trips targeted, free-floating carsharing runs the risk of competing with public transport in some cases, principally taxis, but also metro and bus. In fact, thanks to its practicality and affordability it might influence people towards using cars rather than public transport. This risk appears to be realistic given the answers given by carsharing interviewees on this topic. Hence, even if based on electric vehicles, this might limit other co-benefits of shared mobility such as the reduction of congestion and public space dedicated to cars. Moreover, it could limit the support by public administrations. On the other hand, station-based carsharing is limited by the apparent impossibility declared by stakeholders to switch to clean vehicles due to the type of journey it targets. This might affect the consideration public

administration and users have of this mode in relation to the environmental performance of the vehicles.

As an aside, the different development of carsharing in Barcelona and Madrid seems to reflect the specific mobility-related objective of each municipality. In Barcelona, the objective of reducing car use in the urban area which resulted in parking cost schemes in the city centre blocked the arrival of free-floating electric carsharing. In fact, this model needs to be able to park for free and it is likely that its car intensive approach meant that the authorities were worried about not being able to control the arrival of such operators. Conversely in Madrid, the specific objective of improving air quality indicators meant that the authorities welcomed the free-floating service, as it has helped to increase the share of clean vehicles on the urban streets and reducing emissions in the area.

Finally, the development of carsharing in Spain is still broadly limited to Barcelona and Madrid, with only a few more cities having such services operating. National recognition and inclusion in mobility plans as a tool to lower mobility emissions could possibly improve the spread to other cities.

4.6.6 Conclusions

In Spain, carsharing rapidly developed in the last three years, especially in Madrid that is now one of the cities with more users and shared cars in Europe.

We explored the current status of this sector through 28 interviews with carsharing users and experts from different Spanish cities. In particular, we focused with users on understanding how this mode is part of their usual routines, the reasons and factors motivating its use, the relation this mode has with public transport use and private vehicle use and ownership, and the opinion of users regarding the electric vehicles used by some operators. We explored with stakeholders current developments and the main issues of carsharing to understand which policies could facilitate its development, how it should be managed and the role it has to play in future urban mobility.

Carsharing is currently mainly covering users' journeys in the evening and at the weekend for leisure, while business stakeholders balance this private user demand by offering corporate services on weekdays. Factors influencing its use appear to be mainly related to its convenience with respect to other modes, in particular, the possibility of easily travelling directly to the desired destination, the immediateness when booking and the comfort during the journey. Economic factors were also shown to be relevant, in particular with respect to the avoidance of private car maintenance costs and generally the affordable price of the service. To a lesser extent, technological aspects related to the vehicle quality and the functioning of the entire systems were also cited. Moreover, environmental friendliness seems to also be positively evaluated for free floating carsharing. Carsharing seems to be complementing public transport use mainly for station-based users while most of the free-floating users actually reduced their use or only use it sporadically. Almost all users positively affirmed that carsharing can help them to reduce the number of cars in the household or to not to have to buying one. Moreover, all electric vehicle based carsharing users stated they had a positive feeling about the technology. Most of them prefer the service to be offered by these vehicles and could consider it as a future private vehicle, although uncertainty about the technology and the high costs are the primary limits in this regard.

On the stakeholder side, some policies were mentioned as possible facilitators of this mode. In particular, recognition of its status, the possibility to park freely in the streets and integration with public transport are the most demanded measures.



Furthermore, the advent of the autonomous vehicle is the topic driving much attention from both business and public administration stakeholders and it seems it could be a mode in which carsharing might play an important role.

This will require the different players in the sector to work together to develop mobility independent from private vehicle use where the specific mode people opt for is the most convenient depending on the type of journey. In particular, the integration between this mode and public transport offer could make it easier for people to avoid using their own car to move about in urban areas.



5. General discussion and conclusion

The objective of the Mobility case study was to understand **patterns of travel behaviours** in weekly routines across different European countries, -Hungary, Italy, Norway, Poland and Spain -, and to explore **solutions to promote modal shift towards sustainable transport**. A particular focus has been given to the development and potential improvement of **carsharing systems**, a service which could help to change the current paradigm of mobility based on private vehicles. We followed a common methodology across the countries in order to allow comparability between the situations in different countries based on a common survey questionnaire and a common in-depth interview guideline.

The surveys, representative at the national scale, helped us to identify the current transport practices of citizens. As showed by the survey results, **the destinations** are quite similar across countries. Trip to grocery/shopping is the one performed by the greatest share of the population while the trip to work is the most recurrent. However, these trips, as well as trips related to children school and activities, follow similar patterns across countries. Leisure trips, on the other hand, seem to show greater variability both in terms of population shares having recurrent activities and number of days per week. The **travel modes** used tend to vary more depending on the type of trip rather than across different countries. In particular, **public transport** seems to be used less for activities related to shopping and involving children. As some interviewees highlighted a drawback of public transport is the inconvenience when carrying shopping bags or other equipment.

With respect to **carsharing**, the survey showed differences in diffusion of the service between the countries, with a higher number of people in Norway and Spain compared to Hungary and Poland. The number of people in all the countries who have used these vehicles is limited given that the service is available almost exclusively in medium/big cities. Levels of satisfaction with the carsharing infrastructure are low in each country, while a relevant share of people stated that they were in favour of enforcing the speeding up of public transport and shared mobility through specific fast lanes.

The in-depth interviews helped us to understand the state of development of carsharing systems. We conducted interviews with end-**users** of the services and **stakeholders** (business sector, public administration and pressure groups). In each country, carsharing is increasing in terms of both number of users and companies/vehicles available. However, the way in which this service is being developed differs from country to country, especially in the prevailing business model. **Free-floating carsharing** (i.e. the vehicles are normally freely parked on the street of an urban area, where they can be booked) is dominant in Hungary, Poland and Italy, while **station-based carsharing** (i.e. the vehicles occupy a specific parking lot reserved for it) is dominant in Norway. In Spain, free-floating is dominating in Madrid while it is absent in other cities. These two models are rather different and seem to both have advantages and constraints. Station-based carsharing mainly targets trips outside of the urban area and is hence less in competition with urban public transport, meaning they are more complementary. On the other hand, some stakeholders in Norway and Spain were sceptical about the use of electric vehicle technology for the station-based system. They argued that it is still not ready for this service due to the high costs and the poorer long distance performances. Furthermore, free-floating carsharing electric vehicles have already proven to be a viable option with successful experiments in Spain, Italy and Hungary. They seem more flexible and adaptable to users' urban travel needs. However, some stakeholders expressed concerns about the number of vehicles

and the distribution efforts required to ensure they are available everywhere in the area. This might lower the scheme's efficiency and its environmental impact, particularly when the service is not provided by electric vehicles. Hence, from an environmental perspective, the main advantage of station-based carsharing is its complementarity with public transport, which helps households to avoid using or, in some cases, having their own vehicle. On the other hand, free-floating carsharing helps especially when it relies on a fleet of electric vehicles, by increasing their presence in the urban area and by allowing people to discover this technology. Free-floating carsharing based on conventional vehicles might also complement public transport, but given that they both operate within the urban area, they might also compete.

The **potential electrification of carsharing services** is seen as a foreseeable future development by business stakeholders and is highly rated by policymakers who consider electro-mobility an important asset in order to meet emissions limits.

The sector has so far been mainly driven by **private initiatives with some cases of public services** (e.g. Rome), **public-private partnerships** (e.g. Madrid) and **member-owned companies** (e.g. Oslo). Carsharing is mainly developed in medium-large cities where it can be more profitable for companies given the high density of population. However, certain stakeholders pointed out the potential of shared cars in rural areas where they could bring benefits by substituting public transit with low demand.

The service seems to be more popular among the medium-highly educated, between 25 and 45 years old. However, older users are also becoming quite common suggesting the possibility of a future widespread user base.

Most of the interviewed households in the different countries use this service mainly for leisure activities, especially at weekends and in the evening, to meet **casual travel needs**. In particular, the mode comes in handy to reach specific **destinations that are poorly connected by public transport** due to the very location or the timetables. However, there also seem to be people using this service on a more regular basis to commute to work. Some other uses are related to shopping and moving equipment where public transport might be inconvenient.

In most of the countries, users seem to choose this service mainly for its **flexibility and comfort** aspects, with carsharing seen as a practical solution. However, **the costs of the service** also seem to be an important factor for users. **Environmental concerns** related to air quality and global warming were mentioned as reasons by some, although they tend to be in second place. This seems to reflect what the survey revealed about factors affecting travel mode choice, where flexibility and comfort were considered fairly important in shaping the decisions, while environmental concerns were evaluated as less influential.

The experience was positively evaluated by the vast majority of people who were able to try electric vehicles through this service. Some of them even stated this peculiarity to be a relevant reason to join the service or at least a hint of curiosity. Many interviewees **preferred electric** to conventional vehicles. Some of them declared they would also be ready to accept a higher price for the technology, even if it seems that cost is likely to be an important factor for many of them when selecting the service.

Carsharing might help users to live without a private vehicle and seems to allow users to reduce their use of private cars. In the long run, this could help reduce the number of vehicles per household.

In order to enhance the diffusion and success of this service, we interviewed the main stakeholders in the urban transport system and we derived the following main conclusions.

First of all, **a system in which carsharing and public transport are connected and complement** each other would benefit a model shift towards sustainable transport. Indeed, it appears that in almost all the countries, stakeholders highlighted the importance of connecting carsharing services with public transport. In fact, local authorities seem to mainly rely on the public transit offer to reduce private vehicle use and consider the complementary aspect of carsharing positively. On the other hand, business stakeholders would benefit in visibility and gain new users from an integrated offer with public transport. This could be done by developing instruments such as mobile applications mapping the different services available allowing to use both public transport and shared cars. In some countries there are already similar measures operating (e.g. the common app for booking shared cars or other shared modes in Rome). More research is needed in order to analyse the most efficient tools on rates or payment system.

Second, a sustainable model shift must support the **switch from private car to carsharing use in contrast to the switch from other modes**, such as public transit, bicycle and walking. As some interviewees suggested, not all the trips that are now made by shared cars have replaced journeys by private car. They were sometimes done by public transport or were not performed at all. Defining specific measures and incentives to prevent this can make sure this service is correctly developed.

Finally, the diffusion of carsharing service might benefit from **a series of policies**. Business stakeholders draw attention to a series of measures which can help their activities. These are policies of parking facilitation, private car access restrictions and integration with other modes such as public transport and bike-sharing, as well as incentives for adopting electric vehicles and investing in charging infrastructures for electric carsharing.

To conclude, the future of carsharing will be certainly linked to **technological development**. The urban environment can be improved through the implementation of electric vehicles both with respect to local air quality and CO2 emissions levels. Furthermore, carsharing could reduce inequalities with respect to the access to electric vehicles as it enables the use of electric vehicles by people who otherwise could not afford to do so.

References

- Bergen municipality (2018).
<https://www.bergen.kommune.no/omkommunen/avdelinger/bymiljoetaten/11008/11009> Published: 03.05.2018 | Last updated: 07.05.2018 Last accessed : 28.06.2018
- Figenbaum, E. (2018). Electromobility status in Norway Mastering long distances – the last hurdle to mass adoption TØI Report: 1627/2018
- George. C. (2017). User Adoption of Innovations in a Sustainability Transitions Context - A Practice Theory Analysis of Carsharing and Urban Mobility Behavior in Oslo . Master's Thesis Centre for Technology, Innovation and Culture Faculty of Social Sciences University of Oslo
- Graves-Brown, P., 1997. FROM HIGHWAY TO SUPERHIGHWAY: The Sustainability, Symbolism and Situated Practices of Car Culture. Soc. Anal. Int. J. Soc. Cult. Pract. 41, 64–75.
- Nordbakke S., Sagberg, F and F.A. Gregersen (2016) The end of passion? Changes in driving license rate and driving rate among young people. Institute for transport economics report: 1477/2016
- Oslo municipality (2018) Sak 216 Privat forslag fra Andreas Halse (AP) Sirin Hellvin Stav (MDG) og Sunniva Holmås Eidsvoll (SV) av 25.01.2018 - Flere delte biler i Oslo. [18/00218-4]
https://www.oslo.kommune.no/sru/mainframes.asp?lefturl=utv_list%2Easp%3Fmode%3Dcase&righturl=rightframes%2Easp%3Fbottomurl%3Dutv%255Fcaselist%252Easp
- SSB, 2017. "Dette er Norge 2017 – tall som forteller." URL: <https://www.ssb.no/befolkning/artikler-og-publikasjoner/attachment/317854?ts=15e7aefaba>
- SSB, 2018a. «Registrerte kjøretøy». URL: <https://www.ssb.no/bilreg>
- SSB, 2018b. «Folketall». URL: <https://www.ssb.no/befolkning/faktaside/befolkningen>
- SSB, 2018c. «Fakta om bil og transport». URL: <https://www.ssb.no/transport-og-reiseliv/faktaside/bil-og-transport>
- SSB, 2018c. «Rekordmange reiste kollektivt i fjor» <https://www.ssb.no/transport-og-reiseliv/artikler-og-publikasjoner/rekordmange-reiste-kollektivt-i-fjor>
- SSB, 2018d. «Kollektivtransport». URL: <https://www.ssb.no/transport-og-reiseliv/statistikker/kolltrans>
- toi.no, Institute for transport economics, breakfast seminar presentation
<https://www.toi.no/getfile.php/1345075/mmarkiv/Foredrag/VIBEKE%20NENSETH%20Frokostseminar%20Bildeling.pdf>
- Steg, L., 2005. Car use: lust and must. Instrumental, symbolic and affective motives for car use. Transp. Res. Part Policy Pract., Positive Utility of Travel Positive Utility of Travel 39, 147–162.
<https://doi.org/10.1016/j.tra.2004.07.001>
- Urry, J., 2004. The "system" of automobility. Theory Cult. Soc. 21, 25–+.
<https://doi.org/10.1177/0263276404046059>



Annexes

Annex I - Mobility Household Survey

M1. How many days in a week²⁸ do you typically travel (incl. walking) to the following locations?

ONE answer per row

		Number of days in a week							
		0	1	2	3	4	5	6	7
A	Workplace/university	0	1	2	3	4	5	6	7
B	Children's school	0	1	2	3	4	5	6	7
C	Location of children's activities	0	1	2	3	4	5	6	7
D	Grocery/shopping	0	1	2	3	4	5	6	7
E	Leisure activities (gym, sport, tours,...)	0	1	2	3	4	5	6	7

Ask only for M1 ≠ "0", i.e. only for applicable destinations

M2. Please select the area where are located the following places:

ONE answer per row

		Urban area	Periphery of the urban area	Countryside
A	Your home	1	2	3
B	Your workplace/university	1	2	3
C	Your children's school	1	2	3
D	Children's activities	1	2	3
E	Your usual grocery/shopping	1	2	3
F	Leisure activities (gym, sport, tours,...)	1	2	3

Ask only for M1A ≠ "0"

Trip to Workplace/University:

M3A1. Where do you normally²⁹ leave from, when you travel to the Workplace/University?

²⁸ Note for the interviewer: Typical day/week are to be referred to the most common day/week in a year, one can think of, according to her/his current situation.

²⁹ Please, refer to your most habitual departure location



1. Home
2. Workplace/University
3. Children’s school
4. Location of children’s activities
5. Grocery/Shopping
6. Leisure activities (gym, sport, tours...)

Ask only for M1A ≠ "0"

M3A2. Which of the following travel modes you usually use to perform the trip to the Workplace/University and how much time it takes?

Tick all that apply and mark the respective time, e.g. 5 min walking and 12 minutes bus to reach my workplace...

Travel Mode	Time (hh:mm)
1. Traditional car (diesel/ gasoline)	__:__
2. Alternative fueled car (Methane/ LPG)	__:__
3. Electric/ Hybrid car	__:__
4. Motorcycle/ Scooter	__:__
5. Carpooling ³⁰	__:__
6. Bus	__:__
7. Train	__:__
8. Metro/Tram	__:__
9. Bicycle	__:__
10. Walking	__:__
11. Other, please specify:	__:__
99. Not applicable	

Ask only for M1B ≠ "0"

Trip to Children’s school:

M3B1. Where do you normally³¹ leave from, when you travel to your Children’s school?

7. Home
8. Workplace/University
9. Children’s school
10. Location of children’s activities

³⁰ Carpooling defined as moving with a private vehicle but as passenger instead of driver.

³¹ Please, refer to your most habitual departure location



- 11. Grocery/Shopping
- 12. Leisure activities (gym, sport, tours...)

Ask only for M1B ≠ "0"

M3B2. Which of the following travel modes you usually use to perform the trip to your Children’s school and how much time it takes?

Tick all that apply and mark the respective time, e.g. 5 min walking and 12 minutes bus to reach my Children’s school ...

Travel Mode	Time (hh:mm)
12. Traditional car (diesel/ gasoline)	__:__
13. Alternative fueled car (Methane/ LPG)	__:__
14. Electric/ Hybrid car	__:__
15. Motorcycle/ Scooter	__:__
16. Carpooling ³²	__:__
17. Bus	__:__
18. Train	__:__
19. Metro/Tram	__:__
20. Bicycle	__:__
21. Walking	__:__
22. Other, please specify:	__:__
99. Not applicable	

Ask only for M1C ≠ "0"

Trip to the Location of the children’s activities:

M3C1. Where do you normally³³ leave from, when you travel to your Children’s activities location?

- 13. Home
- 14. Workplace/University
- 15. Children’s school
- 16. Location of children’s activities
- 17. Grocery/Shopping
- 18. Leisure activities (gym, sport, tours...)

Ask only for M1C ≠ "0"

³² Carpooling defined as moving with a private vehicle but as passenger instead of driver.

³³ Please, refer to your most habitual departure location



M3C2. Which of the following travel modes you usually use to perform the trip to your Children’s activities location and how much time it takes?

Tick all that apply and mark the respective time, e.g. 5 min walking and 12 minutes bus to reach my Children’s activities location ...

Travel Mode	Time (hh:mm)
23. Traditional car (diesel/ gasoline)	_::_
24. Alternative fueled car (Methane/ LPG)	_::_
25. Electric/ Hybrid car	_::_
26. Motorcycle/ Scooter	_::_
27. Carpooling ³⁴	_::_
28. Bus	_::_
29. Train	_::_
30. Metro/Tram	_::_
31. Bicycle	_::_
32. Walking	_::_
33. Other, please specify:	_::_
99. Not applicable	

Ask only for M1D ≠ "0"

Trip to the Your usual grocery/shopping:

M3D1. Where do you normally³⁵ leave from, when you travel to your usual grocery/shopping location?

- 19. Home
- 20. Workplace/University
- 21. Children’s school
- 22. Location of children’s activities
- 23. Grocery/Shopping
- 24. Leisure activities (gym, sport, tours...)

Ask only for M1D ≠ "0"

M3D2. Which of the following travel modes you usually use to perform the trip to your usual grocery/shopping location and how much time it takes?

³⁴ Carpooling defined as moving with a private vehicle but as passenger instead of driver.

³⁵ Please, refer to your most habitual departure location



Tick all that apply and mark the respective time, e.g. 5 min walking and 12 minutes bus to reach your usual grocery/shopping location ...

Travel Mode	Time (hh:mm)
34. Traditional car (diesel/ gasoline)	__:__
35. Alternative fueled car (Methane/ LPG)	__:__
36. Electric/ Hybrid car	__:__
37. Motorcycle/ Scooter	__:__
38. Carpooling ³⁶	__:__
39. Bus	__:__
40. Train	__:__
41. Metro/Tram	__:__
42. Bicycle	__:__
43. Walking	__:__
44. Other, please specify:	__:__
99. Not applicable	

Ask only for M1E ≠ "0"

Trip to your Leisure activities location:

M3E1. Where do you normally³⁷ leave from, when you travel to your usual Leisure activities location?

- 25. Home
- 26. Workplace/University
- 27. Children's school
- 28. Location of children's activities
- 29. Grocery/Shopping
- 30. Leisure activities (gym, sport, tours...)

Ask only for M1E ≠ "0"

M3E2. Which of the following travel modes you usually use to perform the trip to your usual Leisure activities location and how much time it takes?

Tick all that apply and mark the respective time, e.g. 5 min walking and 12 minutes bus to reach your usual Leisure activities location ...

Travel Mode	Time (hh:mm)
45. Traditional car (diesel/ gasoline)	__:__

³⁶ Carpooling defined as moving with a private vehicle but as passenger instead of driver.

³⁷ Please, refer to your most habitual departure location



46. Alternative fueled car (Methane/ LPG)	—:—
47. Electric/ Hybrid car	—:—
48. Motorcycle/ Scooter	—:—
49. Carpooling ³⁸	—:—
50. Bus	—:—
51. Train	—:—
52. Metro/Tram	—:—
53. Bicycle	—:—
54. Walking	—:—
55. Other, please specify:	—:—
99. Not applicable	

Ask only for M1 ≠ "0", i.e. only for applicable destinations

M4. How many kilometers does the trip to the following destinations take?

ONE answer per row

		Distance in km	(Don't know / No answer)
A	Workplace/University	___ km	99
B	Children's school	___ km	99
C	Location of children's activities	___ km	99
D	Grocery/Shopping	___ km	99
E	Leisure activities (gym, sport, tours...)	___ km	99

M5. What importance do the following factors have in your decision between different methods of travel?

ONE answer per row

	1 Not at all Important	2	3	4	5 Very Important	Don't Know

³⁸ Carpooling defined as moving with a private vehicle but as passenger instead of driver.



A	Cost	1	2	3	4	5	99
B	Travel time	1	2	3	4	5	99
C	Comfort	1	2	3	4	5	99
D	Flexibility	1	2	3	4	5	99
E	Safety	1	2	3	4	5	99
F	Privacy	1	2	3	4	5	99
G	Air quality impact	1	2	3	4	5	99
H	CO2 emissions impact	1	2	3	4	5	99
I	Reliability	1	2	3	4	5	99
J	Availability of method	1	2	3	4	5	99
K	Reputation	1	2	3	4	5	99
L	Other, please specify:	1	2	3	4	5	99

M6. Do you commonly use any of the following modes?

ONE answer per row

	Mode	Never	Occasionally	Often	Always	Not applicable
A	Company car	1	2	3	4	5
B	Carsharing ³⁹	1	2	3	4	5
C	Peer-to-peer carsharing ⁴⁰	1	2	3	4	5
D	Bike-sharing ⁴¹	1	2	3	4	5
E	Private car rental ⁴²	1	2	3	4	5

M7. With regard to the following vehicles, did you benefited of any type of help or advantage ?

ONE answer per row

		Traditi onal car	Alternative fuelled car (LPG, methane)	Electri c car	Hybri d car	Bicycl e	Electri c bicycl e	Bu s	No , I di dn 't

³⁹ Carsharing: public or private service supplying cars, which are used for a short periods of time

⁴⁰ Peer-to-peer carsharing: carsharing or carpooling system based on an online service platform, (e.g. BlaBlaCar, Carpooling.com, etc.)

⁴¹ Bike-sharing: public or private service supplying bikes which are rent for a short period of time

⁴² Private car rental: private or company car, which is rent for longer period of time, e.g. a day or more

A	Financial subsidy	1	2	3	4	5	6	7	8
B	Tax reduction	1	2	3	4	5	6	7	8
C	Mobility improvement	1	2	3	4	5	6	7	8
D	Other, please specify.....	1	2	3	4	5	6	7	8

M8. What is your level of support for the following government actions that would influence your transportation system:

ONE answer per row

		1 Strongly Opposed	2	3	4	5 Strongly Supportive	Don't Know
A	Improving traffic flow by building new roads, and expanding existing roads.	1	2	3	4	5	99
B	Discouraging automobile use with road tolls, gas taxes, and vehicle surcharges.	1	2	3	4	5	99
C	Making neighbourhoods more attractive to walkers and cyclists using bike lanes, and speed controls.	1	2	3	4	5	99
D	Reducing vehicle emissions with regular testing, and manufacturer emissions standards	1	2	3	4	5	99
E	Making public carsharing and public transport faster by giving them dedicated traffic lanes, and priority at intersections	1	2	3	4	5	99
F	Making public transport more attractive by reducing fares, increasing frequency, and expanding route coverage	1	2	3	4	5	99
G	Reducing transportation distances by promoting mixed commercial and residential, an high density development	1	2	3	4	5	99
H	Reducing transportation needs by encouraging compressed workweeks and working from home	1	2	3	4	5	99

M9. Thinking about your daily experiences, how serious do you consider the following problems related to transportation to be?



ONE answer per row

		1 Not at all Important	2	3	4	5 Very Important	Don't Know
A	Traffic congestion you experience while driving	1	2	3	4	5	99
B	Traffic noise you perceive at home or doing your activities	1	2	3	4	5	99
C	Excessive presence of vehicles occupying urban spaces	1	2	3	4	5	99
D	Vehicle emissions, which impact local air quality	1	2	3	4	5	99
E	Accidents caused by aggressive or absent minded drivers	1	2	3	4	5	99
F	Vehicle emissions, which contribute to global warming	1	2	3	4	5	99
G	Unsafe communities due to speeding traffic	1	2	3	4	5	99

M10. How much are you satisfied with the following facilities where you live and conduce your activities?

ONE answer per row

	1 Very Low	2	3	4	5 Very High	Not applicable	Don't Know
Parking space	1	2	3	4	5	6	99
Public transport timetables	1	2	3	4	5	6	99
Public transport coverage	1	2	3	4	5	6	99
Bike lanes	1	2	3	4	5	6	99
Pedestrian lanes	1	2	3	4	5	6	99
Public shared-bikes	1	2	3	4	5	6	99
Public shared-cars	1	2	3	4	5	6	99

M11. Could you precise your municipality?

.....





Annex II - Interviews Guidelines

A. Households

a. Introduction

- Aim of this section: Warm-up the conversation, get basic information on the interviewee, on the specific shared mobility scheme and on the use he does of it.

- Outcome:
 - Introduce the interviewee to the ENABLE.EU project (not too much in detail to avoid influencing interviewee answers)
 - Collect basic information on the interviewee (Age, education, work, leisure, routine, household size, travel needs)
 - Describe a normal day from beginning to end where they use this mode.
 - How does the mode work?
 - How often do they use the mode?
 - How long have they been using the mode?
 - How did they get to know the mode?
 - What are the destinations and the occasions to use it?
 - For how many kilometres do they normally use the mode?

b. Factors and Lifestyle

- Aim of this section: Get insights of which factors possibly influence propensity to subscribe to a shared mobility scheme.

- Outcome:
 - What habits s-/he had before using this mode?
 - Why did they start using carsharing?
 - In which aspects do they see carsharing to fit with their travel necessities?
 - Which have been the motivations to switch to use this mode?
 - Possible motivations:
 - Economic reasons
 - Environmental attitude
 - Propensity for new technologies
 - Personal emotions (e.g. satisfaction for being a user, doing something good)
 - Others
 - Extra: high presence of vehicles, low price, etc.
 - What do you think would convince more people to join the group?

c. Relation with other modes

- Aim of this section: Get insights of how the scheme relates to other modes, in particular public transport. Are they complements or rivals?
- Outcome:
 - What are the complementary modes they use to satisfy their transport needs?
 - How do these other modes compare to carsharing?
 - How did their use of public transport change after joining the carsharing scheme? (Did it reduce or increase?)

d. Personal vehicle

- Aim of this section: Get insights on car use history and future willingness to buy a car from carsharing users.
- Outcome:
 - Do they own a car? Did they ever own a car?
 - Which factors affected their decision of not having, or not using, a personal car?
 - Do they plan to own a car in the future? Which factors would affect this decision?
 - In case they plan to buy a car in the future, what could make them rethink this decision?

e. Evaluation and Electric carsharing focus

- Aim of this section: Understand possibilities for improvement or implementation of an Electric carsharing scheme.
- Outcome
 - i. Electric carsharing users*
 - Outcome:
 - How could be the service improved?
 - Do they prefer the service being provided by electric vehicles?
 - What are the advantages of using electric carsharing?
 - compared to conventional carsharing?
 - compared to other transport modes?
 - What are the barriers/limits and disadvantages of electric carsharing?
 - Would they be willing to pay more, less or equal if the service was to be provided with conventional cars?
 - ii. Other users*
 - Outcome:
 - How could be their service improved?
 - What are the advantages and disadvantages of using carsharing?
 - Would they be willing to use the service if it were provided by electric vehicles?
 - What would be the advantages of having an electric carsharing service compared to the conventional one?
 - Would there be barriers/limits and inconveniences of it?

Would they prefer it?

- Would they be willing to pay more, less or equal than with the conventional carsharing?

B. Stakeholders

a. Common introduction

- Aim of this section: Warm-up the conversation, get basic information on the interviewee.
- Outcome:
 - Introduce the interviewee to the ENABLE.EU project.
 - Collect basic information on the interviewee (Time in the company/administration, role as stakeholder).
 - What is the current development of Electric carsharing system.

b. Facilitation of Electric Carsharing

- Aim of this section: Understand what factors and measures can facilitate the development and implementation of an electric carsharing scheme.
- Outcome:
 - What are (or would be) the motivations to implement and foster an electric carsharing system?
 - What are the main measures to develop in order to facilitate the implementation of an electric carsharing system? Or to improve it?
 - Do they think it is worth to count on this mode? Why or why not?
 - What are the features that can determine the success or failure of this system?
 - What is the contribution that this system provides (or could provide) in urban areas?

c. Relation with other urban modes

- Aim of this section: Get insights of how electric carsharing relates with alternatives transport modes
- Outcome:
 - How does this mode relates with private car ownership? What does (or would) it imply?
 - How does this systems relate to public transport? Did it increase or reduce public transport use?
 - How did (or would) urban transport change with the implementation of this system?

d. Stakeholders' specific questions

- Aim of this section: Get further insights on the topic by the point of view of the specific actor.

i. Policymakers

- Outcome:
 - Apart from the electric carsharing system, which measures have been developed to reduce carbon intensity of urban mobility? Which measures are planned to be developed?



- What are the costs and the benefits of an electric carsharing scheme?
- On which basis decision have been taken on this topic? (Convenience, environmental concern, financial balance)
- Which would be the direct and indirect benefits (e.g. health, congestion, etc.) of having a low carbon city/region/country (depending on the PM area of influence)?
- What is in their view the positions of pressure groups and service providers? What are the synergies and the contrasts with them?
- What is their vision on the future of electric carsharing? (will it increase, reduce?)
- What is their vision on the future of low carbon mobility in general?

ii. Pressure groups

- Outcome:
 - What are the groups you usually target?
 - What are the results they aim to achieve and the strategy to pursue them?
 - What is missing in the current situation of electric carsharing scheme?
 - What is in their view the positions of policymakers and service providers? What are the synergies and the contrasts with them?
 - What is their vision on the future of electric carsharing? And about low carbon mobility in general?

iii. Industry stakeholders

- Outcome:
 - Is the mode working completely on a commercial basis or it is financed partially from other sources (public support, private sponsorship, etc.)
 - Are there specific categories of people particularly targeted by the company offer? How? Why?
 - Does the company have any measure planned to provide a "Low Carbon" service? If not, why? (only for non-electric carsharing providers)
 - Does your service compete with other? Who? Does it occupy a niche in the sector?
 - What is in their view the positions of policymakers and pressure groups? What are the synergies and the contrasts with them?
 - What is their vision on the future of electric carsharing?