EJTIR

Issue 18(4), 2018
pp. 340-359
ISSN: 1567-7141
http://tlo.tbm.tudelft.nl/ejtir

The importance of institutions and policy settings for car sharing – Evidence from the UK, Israel, Sweden and Finland

Nihan Akyelken[1]
University of Oxford, Oxford, United Kingdom.

Moshe Givoni[2]
Tel Aviv University, Tel Aviv, Israel.

Marja Salo[3]
Finnish Environment Institute, Helsinki, Finland.

Andrius Plepys[4]
Lund University, Lund, Sweden.

Jáchym Judl[5]
Finnish Environment Institute, Helsinki, Finland.

Karen Anderton[6]
University of Oxford, Oxford, United Kingdom.

Sirkka Koskela[7]
Finnish Environment Institute, Helsinki, Finland.

The rapid growth of cities requires effective management of transport demand and restructuring of transport systems to address the needs of growing urban populations in an environmentally, socially and economically sustainable way. In recent years, car sharing has emerged as an alternative to owning cars in cities, which has potential to bring environmental gains and address social considerations. There is a sizeable academic inquiry about the social and environmental benefits of car sharing and the barriers to its introduction and provision in different empirical contexts. However, most research on the determinants of its uptake and the ease of provision remains limited to investigating consumer demand and how to realise the benefits of car sharing. Drawing on cases from the UK, Israel, Sweden and Finland, this paper focuses on the institutional and policy settings to understand the systemic barriers for car sharing services in diverse urban contexts to expand knowledge on the challenges to and the challenges that emerge from car sharing schemes.

Keywords: *car sharing; transport governance; institutions; sustainable mobility*

[1] A: 1 Wellington Square, Oxford OX2 7LF United Kingdom T: +44 1865 286 949 E: nihan.akyelken@conted.ox.ac.uk
[2] A: P.O. Box 39040, Tel Aviv 6997801 Israel T: +31 152 788 546 E: givonim@post.tau.ac.il
[3] A: P.O. Box 140, Helsinki FI-00251 Finland T: +35 8400 148 572 E: marja.salo@ymparisto.fi
[4] A: P.O. Box 117, Lund 221 00 Sweden T: +46 46 222 02 26 E: andrius.plepys@iiiee.lu.se
[5] A: P.O. Box 140, Helsinki FI-00251 Finland T: +35 8295 251 227 E: c.g.chorus@tudelft.nl
[6] A: South Parks Road, Oxford OX1 3QY United Kingdom T: +44 1865 286 949 E: karen.anderton@ouce.ox.ac.uk
[7] A: P.O. Box 140, Helsinki FI-00251 Finland T: +35 8400 148 572 E: sirkka.koskela@ymparisto.fi

1. Introduction and theoretical framework

Among the key challenges for sustainable cities are the increasing levels of car ownership and dominating preference for the private car (Hickman & Banister 2014). Policy circles have started to recognise car sharing as a potential tool to address these challenges (Plepys et al. 2015). There has been significant investigation relating to the impacts of car sharing, to the portrayal of users' characteristics and to understanding the barriers to uptake in different contexts, most of which focused on individual motives and feasibility of the system from a consumer demand perspective (e.g. Cervero et al. 2007; Clewlow 2016; Efthymiou et al. 2013; Fellows & Pitfield 2000; Martin et al. 2010; Prettenthaler & Steininger 1999; Schaefers 2013; Shaheen & Cohen 2012; Truffer 2003). Recent studies have also focused on socio-demographic drivers of car sharing, with a particular emphasis on peer-to-peer services and free floating services (e.g. Prieto et al. 2017; Becker et al. 2017). These studies provided insights into the uptake of the practice from a travel demand perspective. However, the broader policy and institutional contexts have not been investigated adequately from a sustainability perspective. The discussions around the policy contexts, in which the systems operate, remain limited to individual case studies that mainly focus on the barriers and supporters for the potential uptake of services and monitoring the impacts (Bardhi & Eckhardt 2012; Shaheen et al. 2004).

The increasingly blurred divide between the public and private sector roles in transport planning requires new understandings of the varied ways through which new practices, such as car sharing, will physically shape cities, as well as the role of the state in urban governance (Legacy 2017). The changing role of non-state actors, such as private firms in the mobility industry, raises different concerns over feasibility and acceptability of transport policies associated with car sharing. Formulating viable interventions in the transport policy domain should therefore deviate from a linear approach and entail clear understandings of the acceptability and feasibility of policy suggestions (Givoni et al. 2013). The private sector is increasingly active and involved in initiating new transport services, as opposed to just operating them in response to demand from public institutions, and with high levels of dependence on state actors these services are largely public-private partnerships (Dowling & Kent 2015). Policies for car sharing should therefore be situated in a theoretical framework, whereby their relations to existing institutions, policies and transport systems can be analysed to evaluate their viability (Feitelson et al. 2013).

Drawing on these theoretical premises, we look at several distinct cases from institutional and policy perspectives with a view to evaluate the role of car sharing services in different transport governance contexts. We are particularly concerned with whether car sharing systems are aligned with different configurations of governance and policy settings and if they are expected to bring sustainability benefits. Specifically, we ask how the existing institutions would respond to a policy strategy aimed at car sharing. We start on the premise that the transport governing bodies, especially at the local level, are finding it difficult to establish a clear approach for dealing with the shared economy innovation in the field of passenger transport. As a result, we hypothesize that there is a mix of accept/reject strategies amongst the examined cases. Whilst proponents recognise the potential benefits, the nature of the ownership models necessitate that several negotiations are required to bring schemes to fruition. There are also potential unintended impacts that need to be better understood as they may have adverse implications for sustainable transport policy.

The research is based on case studies in four countries, where a qualitative exploration is mobilised with the main foci of the analysis being the existing institutional structures, the ownership of key elements of the required infrastructure for car sharing (e.g. parking space), and the existing and available policy interventions. Highlighting the contexts and complexities in the four case study examples, the article argues that in understanding the sustainability benefits of car sharing, the focus and emphasis should be placed on governance arrangements.

2. Car sharing and low carbon mobility futures

A commercial car sharing scheme is defined as a formal undertaking provided by a private operator for short-term usage of cars, whereby users pay registration and usage fees. One of the key messages from the studies assessing the environmental impacts of car sharing is that it has the potential to promote giving up car ownership or reducing the travel mileage of private vehicles (Cervero et al. 2007; Le Vine & Polak 2017; Shaheen & Chan 2016). In essence, the desired goal of car sharing is to support the shift towards reducing private car trips by moving people towards public transport and non-motorised transport modes (Katzev 2003). Some have also emphasised its role in promoting wider mobility choices (Cervero & Tsai 2003). More recently, policy and market dynamics in which car sharing systems take place have attracted attention in the context of governance and political economy of the sharing economy (Le Vine & Polak 2015; Morgan & Kuch 2015; Akyelken et al. 2018).

Policy settings that enable low carbon mobility are framed through different future scenarios in the extant literature. It helps to see if and how car sharing can be positioned in these future scenarios to be able to frame the investigation into the compatibility of car sharing with current transport systems. The existing studies on the policy drivers of car sharing systems can be narrated through the technological fix approach and decoupling scenarios (Givoni 2013). The technological fix approach enables mobility with lower emissions and rests on technological developments, such as ultra-low or zero-emission vehicles (Givoni 2013). The policies that would mobilise the technological developments towards a low carbon mobility future would focus on investing in research and development activities to produce affordable zero emission vehicles, subsidising vehicle purchases and other measures on increasing fuel efficiency (Hickman & Banister 2014). While the agency mainly lies with the private sector, the public sector could also support it by complementary measures, such as establishing low emission zones and adopting CO2-based vehicle and fuel taxation (Kivimaa & Virkamäki 2014).

According to existing studies on the policy support for car sharing, there are three ways, through which car sharing can be mobilised as a tool for sustainable urban transport in the technological fix approach. First, it is suggested that car sharing companies tend to use vehicles with emissions lower than average cars (Harmer & Cairns 2012). The use of car sharing services could also be compatible with a focus on promoting low emissions vehicles (Cervero & Tsai 2004). Secondly, although car sharing does not require advanced technological tools, these systems become more accessible and convenient through the use of communication technologies. Finally, the potential uptake of the autonomous vehicles (AVs) in the future is largely framed around the sharing debate: in theory, shared AVs are expected to bring environmental benefits by decreasing the number of cars on the streets (Fagnant & Kockelman 2014). However, this evidence is based on several assumptions made by the agent-based modelling community, hence has the potential to overestimate the benefits.

Another low carbon mobility pathway is described as enabling growth with less mobility through efficient means of transport. Drawing on the use of the term decoupling in transport policy and research (Tapio 2005), this path implies to move from globalisation to glocalization, where mobility of goods, services and people occur over shorter distances (Givoni 2013). In short, the aims would be to decouple economic growth from transport growth. Information and Communication Technologies (ICT) become a critical element in transport policy in this pathway, requiring integrated transport policies (Givoni & Banister 2010). The nature of car sharing may be relevant to this decoupling scenario, as the desired goal of car sharing is to reduce the number of owned cars whilst not necessarily curbing mobility needs, but rather consolidating them. The policy context in this pathway would be more broadly aligned with making the urban space more capable of addressing sustainability challenges in the long run. In a policy package, congestion charging schemes, environmental zones, city centre tolls and car sharing can be

employed as part of travel demand management plans with the aim of impacting on travel behaviour (Banister & Hickman 2007).

Some also point to the possibility of a future scenario whereby car sharing increases travel and acts to preserve the current high-carbon mobility. This could be the result of car sharing services increasingly used, to replace public transport and non-motorised transport, coupled with similar or higher levels of car ownership. There is also evidence that the AVs (especially semi-automated AVs) would be provided as a shared mobility service, and they could have the potential to increase the urge to drive. With constrained parking space, eventually higher levels of urban congestion can be expected (Grush et al. 2016). Moreover, also due to potentially increased empty running, it could well be that vehicle miles travelled increase with shared AVs (Chen et al. 2016).

Some of the adverse implications can also be relevant to the decoupling scenario if car sharing services start replacing public transport or active travel means. Moreover, creating a critical mass by focusing on higher educated and higher paid young professionals might lead to adverse social outcomes (Akyelken & Anderton 2015). The lifestyle changes that would follow the transition from owning to sharing should be carefully investigated by looking at their implications for car use and car ownership that may have rebound effects resulting in higher car sales or increased driving (Chen & Kockelman 2016; Skjelvik et al. 2017). Car sharing systems still entails car use and the more radical pathway to low carbon mobility would require a move away from car ownership, but also car use. These, in turn, show the importance of the role of policy and institutional environments or contexts, in which car sharing schemes operate, if they are to bring sustainability benefits.

3. Methodology

3.1 Research design

Mapping the existing systemic barriers for the broader uptake of car sharing services from an institutional perspective requires exploratory investigation of different policy contexts and an understanding of the institutional environments in which car sharing schemes operate. A multiple case study design, which allows for analysing the processual nature of the phenomenon (i.e. car sharing) in different policy contexts, is therefore an appropriate research strategy. This complements the existing studies that provide a comparative perspective of car sharing schemes through quantitative measures, focusing on determinants of consumer demand (e.g. Rhode & Hoffmann 2014). Multiple qualitative case studies also enable us to explore the institutional underpinnings of geographical differences and provides a broader analysis of the uptake and provision of car sharing schemes as well as major similarities and differences.

3.2 Case selection

In this study, the selected cases are the UK, Israel, Sweden and Finland. The varied nature of these cases, including different socio-demographic profiles, cultural and institutional contexts, wide-ranging history of public transport, mobility, and car sharing schemes and different urban settings provide us with useful lenses to analyse the impacts of the role of policy contexts. London (UK) is considered as the most advanced of the cases studied – in terms of the market size, the supply side (scale and scope of shared services) and a well-established and recognised governing body in the form of Transport for London (TfL). Tel Aviv (Israel) and Helsinki (Finland) are different in size and density, level of car sharing service provision, and transport governing bodies. In Helsinki the model is similar to that of TfL, in Tel Aviv most of the power lies at the national level with the Ministry of Transport. Finally, the case of Scania region, and the city of Malmö (Sweden) provides a regional, mostly rural market and governance setting and also a case where public transport (like in Helsinki) is considered well developed and is highly used. This is especially in contrast to Tel Aviv, which is the most reliant on private cars of all the

cases. In this region, there is a large share of non-residential users, who are mainly younger white-collar or academic workers and are largely more open to other non-traditional mobility solutions including car/bike sharing schemes. This diversity of cases is critical to support more general conclusions.

3.3 Methods of data collection and analysis

The data was collected through review of policy documents, qualitative interviews and workshops with key stakeholders in the policy and industry. In each case, key stakeholders were chosen by their relevance to car sharing solutions, their power to influence it and/or their interest in the expected benefits or side effects. The sampling strategy and methods of data collection were therefore determined on the basis of the current situation in the car sharing markets at the time of the research. Each case conducted interviews following specially designed sets of questions. The specific questions for the qualitative exploration in the selected countries concerned the existing institutional structure surrounding the car sharing systems, the (targeted) users, and the viability of policy interventions such as charging, pricing, use of technology, and travel demand measures in general that would have affected the feasibility of car sharing systems.

The fieldwork was conducted in the first half of 2015 (with the exception of the London case, where some of interviews were repeated between 2013 and 2015). Appendix A presents the list of data collection methods including interviews and details of the workshops in each case study country. The methodologies particularly focused on understanding whether the selected policies were acceptable to the local authorities and key operators in the market. The policies that were particularly present in the qualitative exploration concerned zoning, pricing and taxation, provision of parking space for shared vehicles, soft policy measures, such as providing school travel plans, encouraging public businesses to take up sharing practices and public ownership of shared mobility services (Akyelken et al. 2014). When analysing the interviews, themes relevant to research questions were identified by identifying the categories of different forms of compatibility of the car sharing schemes (Corbin & Strauss 2008). The case descriptions and analysis are largely based on the review of the policy documents and the interviews. The text does not refer to the specific participants due to anonymity requested by some of the participants. For consistency reasons, we have opted not to identify any of the interviewees.

The car sharing market is rapidly developing and going under significant transformations. The empirical research for this paper was conducted in 2013-15 and primarily focused on back-to-base car sharing services, a scheme, in which the users are expected to return the vehicle to the pick-up point. The insights obtained from the interviews and workshops may therefore omit the latest developments and concern a narrower range of services than what is currently available. However, our analysis particularly focused on the broader policy environments, which enabled us to shed light on how we position car sharing systems in different institutional and governance contexts rather than specifically addressing current governance issues in the selected countries.

4. Car sharing in the UK, Israel, Sweden and Finland

This section describes the cases in the selected cities and regions. All case descriptions focus on the transport system, relevant actors to car sharing schemes, the potential users and targeted markets, the synergies between car sharing and other shared mobility options and the key institutional and policy settings. Although similar questions were posed in all cases, differences emerged due to the varying importance of key elements of the car sharing systems, such as institutional collaboration in the UK and increased digitisation practices in Finland. This results in a different structure for each of the following sub-sections.

4.1 The case of UK

Although the public transport network in Central London is well-developed, transport will continue to be a significant issue in London given that the population is expected to reach 10.8 million by 2041, which would generate six million additional daily trips on top of the 2015 level of 26.7 million trips a day (Greater London Authority 2018). Amid the increasing challenges of population growth, congestion and air pollution facing transport policy, transport actors in London regard car sharing as a new urban mobility model alternative to private car ownership (Car Club Coalition 2015). London's car sharing market is currently one of the largest in Europe and is supported by advocacy organisations, such as Carplus (recently changed to CoMoUK), which defines itself as a non-profit environmental transport organisation to promote shared mobility services. Established in 2000 with stakeholders including operators, service providers and local authority partners (i.e. TfL), it also acts as an accreditation body for car and bike sharing companies in the UK.

The car sharing sector in London has increasingly gained recognition, starting with the Mayor's Car Club[8] Strategy published in 2008 (Transport for London 2008). The Roads Task Force report also listed car sharing services as a key tool for travel demand management (Transport for London 2013). The Road Task Force progress report published in 2015 had more explicit references to car clubs as part of promoting active travel and encouraging changes to travel behaviour (Transport for London 2015). TfL has been supportive of car sharing to reduce car ownership by providing guidance for car clubs.

London's complex governance structure is the main challenge for car sharing systems. While TfL is the chief institution that is responsible for transport system in Greater London, it only manages around 5% of the roads; the 32 different Boroughs regulate the rest. This implies that it is almost impossible to provide a London-wide strategy for car sharing companies, making all pathways to low carbon mobility difficult to realise due to the fragmentation of the local institutions and lack of joined-up policymaking. Because of the congestion charge, parking issues and importantly well-developed public transport, car ownership in Central London is already relatively low. The lack of affordable housing in Central London and availability of parking space outside the Central London render it easy to own a car in outer London: as confirmed by the interviews, this is an area that authorities think the operators should target (Car Club Coalition 2015).

Moreover, on the basis of the interviews and results from a Carplus survey, it is possible to say that the car sharing market could be considered exclusive given the user profile at the time; mainly mid-to-high income young professionals without children, living in Central London (Steer Davies Gleave 2015; Steer Davies Gleave 2016). The concerns over inclusion seem to have been picked up by the industry, as more recent Carplus surveys specifically refer to the slightly increased inclusionary trend of the car clubs (Steer Davies Gleave 2017). However, the evidence so far is very limited and not conclusive.

They key policy developments in London since 2015 are the establishment of the Car Club Coalition (CCC), and the promotion of "Car-Lite" design practices in new developments, which are defined as practices that reduce the need to own cars (Greater London Authority 2018). The CCC was established in September 2014 representing the car sharing operators, London Boroughs, the Greater London Authority (GLA) and TfL. The Coalition was formed on the belief that "car clubs can unlock a new model of urban mobility by offering an alternative to car ownership." (CCC 2015, p. 4). The car sharing strategy suggests key ideas to help grow the market, including developing supportive policies and making parking management easier. While

[8] In the UK context, car sharing generally refers to an arrangement where two or more people travel by car together, while the car clubs refer to provision of short-term access to cars by third party operators. In this paper, we use these terms interchangeably.

congestion charging and insurance are recognised to be significant challenges for the sector, the Action Plan produced by the CCC does not suggest any exemptions from congestion charging, which was what the operators had called for.

Finally, the interviews suggested that there are potential synergies between car sharing and bike sharing schemes in London. The London Cycle Hire (LCH) scheme was launched in 2010 and has increasingly taken a strong role in TfL's strategy (as part of the public transport system). Car sharing systems on the other hand are listed as a demand management measure and there is no binding regulation in place to increase their uptake. Most support remains limited to provision of guidance and information. One of the synergies is identified in developing multi-modal networks with the ultimate aim of encouraging cycling. In this respect, it has been suggested by a private operator that car sharing schemes can offer discounted membership to LCH users, who can use the services for the trips they cannot make using public transport or cycling, but without needing to own a car.

4.2 The case of Israel

The Israeli situation is similar to London in terms of the targeted market segment, which is the young urban population that face parking difficulties in the city as the main barrier for car ownership. The current public transport network in the Tel Aviv Metropolitan area is based on bus services and service taxis[9]. Aside from the service taxis, there is no public transport available during the weekends. Recently, the Tel Aviv Municipality started operating its own floating car sharing scheme within the city, although the actual operator (won through a tender) is the same car sharing operator as before. The evidence and description below, however, refer to the period before, when car sharing was offered through the one private sector company. The Municipality's motivation for promoting car sharing is to reduce congestion and relieve parking pressure in the city (if residents give up car ownership). Previously, when only the private sector operator offered car sharing, the general support for (private) car sharing did not translate into practical support from the municipalities, e.g. in the form of parking space provision.

Based on the interviews, the Ministry of Transport seems to be in favour of supporting any measure that will be "environmentally friendly" and help reduce congestion. However, the ministry did not form any official cooperation with the local authorities about car sharing policy. The Ministry views car sharing as a way to promote its green agenda and supports initiatives that could provide a 'last mile' solution, which is an option for those who enter the city and continue their journey to other parts of the city, thus eliminating entrance or movement of more cars during the day. Also at the national level it is important to note the widespread use of company cars in Israel for (primarily) financial and prestige reasons (see, for example, Cohen-Blankshtain 2008 and Shiftan et al. 2012).

Yet, there is a wide gap between the understanding and support for sustainable initiatives and real action toward promoting developments such as car sharing. The Ministry sees car sharing as any other entrepreneurial activity or car rental[10] and believes it is for the local municipalities to deal with. The problem is that the public transport system is centrally planned and operated under the national Ministry of Transport mandate creating a lack of coordination between the two bodies and a limited offering of car services in the Metropolitan area. Ideally, the Municipality would like to supplement its car sharing scheme with the public transport system, which is currently deemed insufficient and might hinder the scheme's success, but it has no mandate for it.

---

[9] "Sherut" that run along selected bus routes, and suburban rail.

[10] *Car sharing* differs from car rental services mainly in terms of its usage time and contractual agreement (Millard-Ball et al 2005). *Car rental* is generally used for longer trips and most rental firms have centralised facilities.

According to the private operator, the Municipality's support (e.g. parking provision) will allow for public perception and awareness to change positively. The company believes the benefits of car sharing will then become more popular, enabling it to spread. If car sharing and supporting policy measures prove to be successful in Tel Aviv, it could work as an example for other municipalities, as neighbouring cities tend to look for Tel Aviv to try initiatives first. This is already the case with the bike-sharing scheme (i.e. Tel-O-Fun), which was initiated by the Tel Aviv Municipality.

The main barrier, however, for extending car sharing services beyond the Tel Aviv Municipality (i.e. to the Metropolitan area of Gush Dan) is the existence of several (separated and independent) municipalities and the lack of central regional governance (of transport). The Municipality thinks Tel Aviv Metropolitan area should be part of one transport governing body (similar to TfL in London) and likewise the car sharing scheme, but the lack of coordination or lack of a regional plan might impede the success of such a programme.

Interestingly, the government decided in 2011 on the establishment of Metropolitan Transport Authorities but for political reasons, this decision has yet to be implemented[11]. Coupled with that, the relative disinterest of the Ministry of Transport in car sharing results in difficulties to expand car sharing across the Tel Aviv metropolitan area. According to the private operator, local municipalities are the major barriers to the growth of the sector. The political and legal battles within the local municipalities put a brake on the initiative as well as blocked any real support for the car sharing operator in the city in the form of parking space provision. With respect to the environmental benefits that might come from car sharing, the operator suggests that these are seen in Israel as "nice to have" but are not in themselves drivers for supporting the practices.

4.3 The case of Sweden

Municipal governments and public transport authorities in the southern Swedish region of Scania generally see car sharing as an additional - albeit still rather marginal - transport option that is able to reduce the number of cars on the streets (Malmö Stad, 2015a). However, while the reduction of traffic and parking needs is particularly relevant for city centres (Malmö Stad, 2015b), the demand for car sharing in inner cities is only a small part of the total car sharing market (SOU, 2013). In 2010, about 50-60% of car sharing demand in Sweden was among business users and the rest was among private consumers who use car sharing for longer out of city travels and weekend trips. Since then, with car sharing membership doubling every two years, it is estimated that the share of private consumers is slightly larger than business users (Trafikverket, 2013).

The main trends today are rapidly increasing membership (though not ridership mileage) and more competition among business providers of car sharing. In 2016, about one in four Swedish municipalities had at least one car sharing organisation operating (Trafikanalys, 2016). The profitability of car sharing enterprises remains very low and many face negative returns. The main challenge is to attain higher availability and reach economies of scale (Trafikanalys, 2016).

The Planning Authority and the Sustainable Development Unit of the city of Malmö acknowledges car sharing as a contributor to the politically shared vision of a sustainable urban mobility (Malmö Stad, 2015). The main regulatory means for facilitating car sharing in the city are parking allowances and differentiated parking fees for car sharing vehicles, and city zoning with car traffic restrictions/bans for non-car sharing vehicles (Region Skåne, 2013). The availability of public parking space in Sweden is generally rather limited in all larger cities due to the accelerating housing developments and increasing population density (SKL, 2013). Moreover, municipalities also require housing developers to provide a specific amount of parking space per

[11] This has only recently started to be implemented for three metropolitan cities, but not for Tel Aviv.

each housing unit (the so-called "parking norm") for all new buildings (Malmö Stad, 2010). According to a representative of the Traffic Unit at the city of Malmö, the parking norm requirement could be an effective measure to promote car sharing in city. Parking spaces add to the costs of real estate developers and if reduced could add to profit their margins. The developers could be exempt from this requirement if they facilitate better access to mobility means other than private car. Options, such as car sharing access point(s) near the property and/or public transport passage cards included in rental contracts, are being discussed as the potential options for exceptions. However, according to the planning departments at Lund and Malmö municipalities, the room for restrictive measures towards private cars in city centres is not large, as it could also restrict the access to local businesses.

According to car sharing businesses, such as SunFleet and MoveAbout Sweden, there are significant possibilities in cooperating with and gaining the support from local authorities regarding more lenient parking permits for their vehicles. Parking costs are an increasing burden for car owners in most Swedish towns, which often acts as a powerful tipping point to re-consider car ownership over other forms of car use. According to transport consultancy Trivector Traffic AB, important factors for the success of car sharing schemes are the right price for the solutions and the ease and transparency to understand a threshold for the clients to choose the right mobility solution between private car, public transport, car sharing or cycling. Another success factor is that commercial clients value environmental properties of the cars and high standard cars, which most business-to-consumer car sharing schemes tend offer due to lower cost of ownership and exploitation (i.e. higher fuel efficiency).

An important contributing factor to reduce the dependency on private cars in Sweden is a significant governmental subsidy to public transport, which is prone to an on-going long-term debate about the need to change the pricing systems of public transport to better reflect the actual costs (Trafikanalys, 2016). Although all political parties generally agree that public transport brings positive social benefits, the continuation of subsidising policies is considered counter-productive for cost efficiency and transport infrastructure improvements in Sweden (SOU, 2013). This might result in increased prices for public transport, which in turn will negatively affect car sharing, as car sharing is viewed as complementary to public transport. A cheap and accessible public transport system is pivotal for reducing private car ownership and complementing car sharing use, as car sharing alone cannot replace private cars due to higher marginal costs of travel.

According to the Sustainable Development Unit at the city of Malmö, a promising policy strategy could be promoting only environmentally-friendly vehicles in car sharing schemes, since this is positively viewed by all political parties and has a strong public support. According to transport consultancy Trivector Traffic AB and representatives of the car sharing sector, this is also likely to receive more interest from private companies to provide allowances and stimulate the use of car sharing among their employees due to positive environmental image and lower car ownership costs.

There is a strong shared consensus among the representatives of car sharing businesses that the national government must level the playing field for car sharing. For example, Sweden has differentiated value added tax (VAT) levels for different goods and services, including certain differentiation between different transportation modes (Skatteverket, 2018a). The VAT for public transport is set at 6%, for taxies - 12%, and for car sharing – at 25%, which puts the latter at a disadvantage.

Another example is tax-induced subsidies for the use of private cars on business errands. According to the national regulations, the employers must cover the costs of private cars used for business errands. The minimum levels of car allowances as well as tax-free share of the compensation are annually adjusted (Skatteverket, 2018b). According to the shared opinion of car

sharing companies and the representatives of Malmö City, in certain cases, the tax-exemption create sufficient incentive for the employees to use their private (especially older and depreciated) cars instead of other mobility options (e.g. public transport or car sharing).

According to the opinion shared among sustainable mobility experts, the consensus is that the most effective policy measures in promoting car sharing in Scania and Sweden in general are primarily parking-related allowances and taxation measures. Other potentially less effective, but feasible, measures include changes in mileage allowances and taxation of using private cars for business, integrating car sharing in route planning and public transport ticketing systems.

4.4 The case of Finland

The documentation on car sharing in Helsinki is limited to a report on the promotion of car sharing in the Helsinki Region (Toiskallio et al., 2013) and a study on potential and impacts of car sharing in the Helsinki Metropolitan Region and two other major Finnish cities (Voltti, 2010). However, the benefits of car sharing in Helsinki are recognised in the policy circle. The Helsinki Region Transport (HRT) System Plan sees car sharing as one of the resource efficient mobility concepts (i.e. as a means to supplement public transport system on trips where the use of a private car would otherwise be the most convenient option) (Helsinki Region Transport, 2015). However, no concrete action points are defined in the Plan except for the general note on the need for close cooperation of public and private parties to ensure smooth travel chains (Helsinki Region Transport, 2015). Taking into account that the Plan outlines the transport system as far as the year 2050, the role of car sharing is dealt with briefly.

The city has a key role as a facilitator for the sector (e.g. by providing the necessary parking bays). The population of Helsinki and the Metropolitan Region is expected to grow. According to estimations made by Statistics Finland (2016), Helsinki will have 720,000 inhabitants and the Metropolitan Region 1,300,000 inhabitants by the year 2030. The growing population puts more pressure on the transport system and demand for parking space. Based on our interviews with the Helsinki City Planning Committee members and the now approved Helsinki City Plan (Helsinki City Planning Department, 2016), the densification of residential areas and improving connectivity with sustainable transport modes (walking, cycling and public transport) will provide citizens with alternatives for private car use.

According to the interviews, some of the challenges for the uptake of car sharing in Helsinki, and Finland in general, are related to low population density, the current dominant role of the private car in the transport system, the financial conditions of owning and using private cars including related taxes and subsidies and trips to weekend houses often located outside the public transport network. An example of a financial incentive is the kilometre allowance, a tax-free compensation paid by employers to employees for using one's own car for work related trips (see Kivimaa & Virkamäki, 2014 for policy mix with support and barriers for low carbon passenger transport in Finland). This encourages the personal car ownership model instead of public transport or car sharing.

Currently, congestion charging is still under investigation in Helsinki. The effects of the proposed congestion charge were studied and modelled on the transport system in 2011 (Finnish Ministry of Transport and Communications, 2011), but at the time of the research there was no decision made on introducing the congestion charge. Parking policy and the availability of parking for private and shared cars affect the attractiveness of car sharing. Parking space is especially an issue in the city centre. The city has decided to gradually increase the price of residential parking permits in the city centre, which also apply for car sharing systems (City of Helsinki, 2014).

Nationally, the current four-year government programme adopted in 2015 mentions ICT and mobility with the aim of enhancing the operational environment for digital services in the mobility sector (Finnish Government, 2015). Should this help to allocate resources for research

and development, it could represent an opportunity for new ICT-enabled transport business models, such as car sharing. It is worth noting that the Finnish Fund for Innovation (Sitra) and the Ministry of Transport and Communications provide a programme to support development of mobility services and related ICT systems.

Finally, the digitalisation and integrated information on public and shared transport mode through applications like route planners help users to plan multimodal trips. The route planner of Helsinki Region Transport for public transport, walking and cycling has been a forerunner in Finland to help people find their way from A to B by combining several public transport modes. Very recently, several privately-owned companies, such as Kyyti Group Ltd and MaaS Global Ltd in Finland, started to operate as mobility brokers. Through their app-based services the companies sell multimodal travel packages. Part of their service is multimodal route planners including several modes of public transport and car sharing for instance (see for example whimapp.com and tuup.fi/en.com). Such emphasis on integration of ICT and car sharing into the wider transport network aims at increasing awareness of available multi-modal transport chains and services, and their uptake.

5. Institutions, policies and transport systems

While significantly different narratives emerged from the same research foci, there are also several common barriers concerning how car sharing is placed within the existing transport systems in selected cities and regions. The implications of these are, in turn, reflected in the compatibility of the systems with their respective urban transport systems and eventually the provision and uptake of car sharing and its governance.

5.1 Compatibility with the existing institutions

There seems to be more evidence for institutional collaboration in the UK context to increase the uptake of car sharing (Akyelken et al, 2018). The existence of an accreditation system that also acts as an NGO (i.e. Carplus) strongly supports this view. Further strengthening the UK's advanced collaborative platform for increasing the uptake of car sharing schemes is the establishment of the Car Club Coalition in 2015. Although to different degrees, the cooperation between the public and private bodies in running a car sharing scheme seems to be a key challenge to the provision, and eventually the uptake of the scheme, mainly in Israel and the UK, but for different reasons. Despite the existence of a central transport authority that is in charge of the transport system in London (TfL), the lack of a centralised governance system for using London road networks is one of the most crucial challenges for parking and visibility of car sharing systems. The same applies to the Israeli case, where the Municipality is responsible for the car sharing scheme (and the service is run by a private operator) and there is no transport authority for the region to facilitate car sharing in neighbouring municipalities. The latter case is more of a political issue, however. According to the interviews conducted for the Israeli case, political disagreements and issues in this respect are not necessarily different opinions on car sharing or other transport policies, but they pertain more to general disagreements, such as political ideologies and therefore political rivalry.

Another institutional aspect that can be drawn from the cases is the uptake of the services by private businesses and key actors in the public sector. In the UK, it has been suggested that public businesses can be encouraged to use these services for their activities, which would act as a positive example for the employees and their respective Boroughs. Although this may also be suggested for the Sweden and Finland cases, the high capital costs of setting up a fleet of vehicles create a lock-in and can hinder the adoption of alternative mobility services, as does the kilometre allowance for business errands. Initiatives encouraging public businesses to use car sharing are also increasing within local and national authorities in Sweden. National governments in Sweden

and Finland have set tax-free mileage allowances[12], but many organisations in Sweden use larger compensation levels, which then are taxed as employment benefits. Nevertheless, many car owners see financial attractiveness in using their private for business trips. In Israel, it is not even mentioned, while company cars are indirectly encouraged. However, it also depends on the history of the organisations. Car sharing may be an attractive option to new businesses that do not currently have their own fleets, while it takes time for long-established organisations to learn and invest in the new practices.

5.2 Compatibility with the policy strategies

The place-specific policies in all countries seem to play a significant role in the provision and uptake of the schemes in different ways. The congestion charge in central London is said to be one of the largest cost items in the operators' budget. The kilometre allowances paid to employees for the use of private cars for business errands in Helsinki (and in Finland in general) tend to encourage use of private cars instead of public transport. The government support for company cars in Israel also has the potential to be working against car sharing, as those who have a company car do not pay the full marginal cost of driving and are thus less likely to use car sharing services. In Finland, the government initiative focuses on improving conditions for developing new service concepts making use of digitalisation for mobility. In Sweden, the significantly higher levels of taxation on car sharing schemes, more than taxi services, render the use of car sharing less attractive compared to other modes. It can therefore be argued that the policy context in terms of pricing, taxation and subsidies impose challenges specifically to the car sharing sector, but in different ways, instead of supporting (policies for) car sharing.

However, it should be noted that some of these policies are important to ensure that there is a difference between car sharing services and public transport given the ultimate aim of replacing car ownership by car sharing services without any negative impacts on the use of public transport. Moreover, it can be seen that in all policy contexts, the adverse implications of the sharing services are recognised and hence there is a cautious approach to the practice. So, while these local policies act as barriers to the broader uptake of the car sharing services, all cases studied in this paper support the view that priority should be to shift demand from private car to public transport and non-motorised transport. The role of car sharing should be seen as a supplementary service to public transport that provides access to car use when public transport is not available or insufficient, which contributes to reducing the need for car ownership. This requires supportive policies and optimal institutional settings.

Parking is clearly a policy area with significant importance to the effective delivery of car sharing schemes in all the case study areas and there are some common challenges of note. Scarcity of parking and pressure to increase parking provision was a common theme across the cases, whereby there is clear potential for car sharing to alleviate the need for private car spaces over the long term.

At the time of the research, in all cases, except Helsinki, there was also a disconnect between the local municipality with authority over parking space allocation, and the car sharing company, which presents challenges in turning this potential solution into a tangible one. In Sweden, it is clear that the links between parking policy, planning and housing development are being made, and the potential to integrate car sharing into this framework has been identified, as parking measures to regulate and reduce space over the long term are implemented. The discussion with the car club operators and the strategy plans for car sharing in London reveal that here the efforts made through the introduction of Car-lite planning are also likely to have more positive implications for parking management. The integration of car sharing into this can be seen as a

[12] For example in Sweden it is 1.85SEK/km (about 0.177 Euro/km) as of May 2018 (Swedish Tax Authority, 2018)

step forward, made possible through the acknowledgement of the importance of parking policy in delivering sustainable transport solutions and delivered through increased collaboration between relevant institutions. Yet London still faces the challenge of high car ownership and abundant (and cheap) parking space in the outer areas.

Whilst the importance of parking policy has been acknowledged across all case study cities, the role of the city in delivering or facilitating car sharing is markedly different. In Israel, support from the municipality in promoting car sharing, before launching its own car sharing scheme, did not extend as far as making the link with parking and this has been cited as a major challenge impacting the success of the schemes. Whereas in Helsinki, the city sees itself as the facilitator of car sharing, and it has an important role in providing space for parking. These differences in perception of the role of the city highlight how institutional proactivity influences the compatibility of car sharing with the existing policy settings.

5.3 Compatibility with the public transport systems

A key theme to emerge from the cases above is the extent to which existing car sharing services are integrated into or even seen as part of the public transport network. First of all, there are significant differences to note in the current status of the public transport network in the selected cities and regions. While public transport is well developed in central London, Helsinki, and Malmö, circular routes within outer London and Helsinki are still difficult to make via public transport, raising the potential for car sharing. The absence of public transport services at weekends in Tel Aviv also offers a potential for increasing the uptake of car sharing.

Integrating car sharing services into public transport systems entails two important aspects. First of these is the financial support of, and subsidies to, public transport. At the time of the research, the discussions around financial ownership of public transport were most prevalent in Sweden and the UK. Mainly due to stringent parking regulations and congestion charging, the consensus amongst the car sharing operators in London is that car sharing should be integrated into the public transport network and should therefore be exempt from congestion charging and receive parking discounts particularly in Central London. One of the key arguments made for it is that car sharing has the potential to complement public transport by providing services that are inaccessible by public transport services. The discussion over financial ownership of public transport in Sweden takes place at a broader level. The significantly high levels of subsidy for public transport shows that there is a clear cut difference between public transport and other modes of transport and it is even more unlikely for car sharing services to become integrated into the public transport system.

The second aspect of integrating car sharing into public transport systems concerns the perception of policymakers and local public authorities. In all cases, the local and national governments are generally in favour of increasing the uptake of car sharing services. Yet, how this is translated into the actual policy and eventually the provision and uptake of the scheme is unclear and conflicting policies hinder their development. While in Sweden and Israel these services are perceived to be just entrepreneurial activities, the UK policy discourse seems to recognise the mixed market nature of the car sharing market and aims to increase its visibility, while being suspicious of promoting it as part of the public transport system (Akyelken et al 2018). The efforts to form collaboration (i.e. CCC including the local authorities) and the recognition of issues regarding the visibility of car sharing (as can be noted in the Action Plan of the CCC) also support this claim. In Finland, stakeholders identified practical aspects of the integration of car sharing services in route planners, ticketing systems and mobility management activities at the time of the research, which have subsequently become emerging trends.

6. Conclusions and discussion

In this paper, we aimed to provide a snapshot of the policy environments, into which car sharing services are being implemented in different countries. Whereas other studies have focused on the characteristics and benefits of such schemes, this paper examined the cases of the UK, Israel, Sweden and Finland in order to derive insights into the implications of different institutional contexts for the provision of car sharing services. The main insights from the cases have been grouped into five themes in terms of compatibility with the current institutional and policy settings and transport systems. Some overarching conclusions can be derived from these insights.

(i) Local institutional and policy contexts play a large role in the evolution and support of the car sharing schemes. The main policy implication is that the number of actors and the institutional settings that affect lobbying of the car sharing market play an important role in the provision of the services, at least in the UK and Israel. By establishing coalitions and new actors, such as civil society organisations to promote these services, cities seem to enable a strong base for negotiating contested issues, such as parking and pricing policies, as well as add legitimacy to the position of car sharing in the transport system as a whole.

(ii) The issues affecting the role of public transport on the provision of car sharing services are two-fold. First, the implications of integrating car sharing services into current public transport networks were discussed in terms of financial support. Second, the different policy perception of car sharing in the cases resulted in various challenges for such integration. It is important to have clear understanding of what these services are and their role in the respective transport systems. The synergies between the existing public transport networks and car sharing schemes can be identified. In doing so, these services become complementary to the existing public transport provision. But in some contexts, this synergy may not be felt and car sharing schemes may continue to compete with public transport services, especially if they are provided in the same geographical areas, such as dense city centres. Parking was highlighted again and again across the case studies as the linchpin to the set-up and success of schemes. Pressure for parking space was a common issue, but the key determinant as to whether this would render car sharing unworkable was related to institutional responsibility for parking policy. Where parking is not shared, or integrated, with other domains, such as planning and development, or is under different institutional jurisdictions, schemes found it very difficult to gain traction.

(iii) The current user profiles and target market segments across the cases offer insight into future uptake and social acceptability. While operators do not specify a target group, the commonality between all cases is that car sharing services are favoured mainly by young professionals living in central parts of the cities, raising issues around exclusivity, particularly in the UK and Israel. In Israel, it can be confirmed through prices, which are significantly higher than the alternative public transport travel options. In Sweden and Finland, there are no considerations of exclusion yet; the discussion remains marginal and has not been discussed from the point of view of exclusivity of car sharing services. Social inclusion / exclusion will be an important determinant in the shifting urban mobility landscape. It is important from institutional standpoints, but also in terms of understanding the linkages between existing transport systems and car sharing.

(iv) The role of private and public businesses is important in determining the uptake of service use. It is important, from a public transport perspective, that car sharing schemes focus on low density residential areas, which are not easily accessible by public transport, yet from a business (profitability) perspective it makes no sense to focus on these areas. While it is easier to target this in London or Tel Aviv, Scania and Helsinki have different patterns of density and different uses of private car, so a more limited number of user

groups can be reached where there is not the capacity to diversify the availability of car sharing. It might be that more cities may follow Tel Aviv and establish their own scheme, although there is a real risk that the new car sharing scheme in Tel Aviv will be negatively affecting public transport use.

(v) Finally, like any other (transport) policy, car sharing is not a silver bullet to solve cities' transport problems, but if it is a strategic policy measure in a 'policy package' it can make a contribution towards moving to low carbon, sustainable mobility. The main conclusion in this respect is that car sharing must be recognised as unique mode of transport, likely with some case-specific characteristics that can be aligned and adapted to fit in and support more general transport policy priorities and objectives (mainly at the regional/metropolitan level) in any particular context if local sensitivities and needs are considered in the governance arrangements.

Taking these issues into consideration, we conclude that the current institutions are struggling to determine how best to mobilise car sharing systems for sustainable transport systems, as they are privately owned. At present it is not really part of a conscious policy decision to advance to low carbon mobility via one or a combination of the paths discussed above. It is currently seen more as a useful innovation that has a large potential but has not been given enough attention to facilitate and ensure this potential is realised, especially outside city centres. Furthermore, the risk of car sharing services replacing public transport services and not (or not only) private car journeys and ownership has not been given proper attention. It is possible to argue that one of the reasons why local authorities do not fully conform to it is the unintended impacts on public transport use.

What these case studies have highlighted is that there are significant institutional and governance considerations that need to be addressed in order for car sharing to achieve its potential benefits. Consumer demand is often heralded (and studied) as the key issue that needs to be brought to bear for schemes to succeed or fail. As highlighted here, the reality is that within our urban areas, issues of density, social, economic and geographical contexts and perhaps most crucially institutional and policy configurations are much more important factors that need to be acknowledged and understood in the provision of car sharing services, if they are to bring sustainability benefits. Without addressing and understanding these issues further, city governments and car sharing companies alike are likely to continue to have limited success in the roll out of new sharing economy endeavours towards sustainability. More importantly, its synergies with the current transport systems should be carefully spelled out to ensure that car sharing services serve to promote sustainable mobility in the selected cases, and more broadly, and not further challenge it.

Acknowledgement

The research leading to these results received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement FP7-ENV-2012-one-stage-308376 *Servicizing Policy For Resource Efficient Economy (SPREE).* This document has been produced with the financial assistance of the European Union. The contents of this document are the sole responsibility of the SPREE Consortium and can under no circumstances be regarded as reflecting the position of the European Union. The authors of this paper acknowledge the support of all project partners and Sigal Hertshten for her work on the Israeli case.

References

Akyelken, N. et al., 2014. *Mobility Sector Report. Deliverable 5.1. SPREE Project*, Oxford.

Akyelken, N. & Anderton, K., 2015. *Mobility Sector in the UK*. Deliverable 7.1.4 *SPREE Project*, Oxford.

Akyelken, N., Banister, D. & Givoni, M., 2018. The sustainability of shared mobility in London: The dilemma for governance. *Sustainability (Switzerland)*, 10(2).

Banister, D. & Hickman, R., 2007. Looking over the horizon: Transport and reduced CO_2 emissions in the UK by 2030. *Transport Policy* 14(5), pp. 377-387.

Bardhi, F. & Eckhardt, G.M., 2012. Access based consumption: The case of car sharing. *Journal of Consumer Research*, 39(4), pp.881–898.

Becker, H., Ciari, F. & Axhausen, K.W., 2017. Comparing car-sharing schemes in Switzerland: User groups and usage patterns. *Transportation Research Part A: Policy and Practice*, 97, pp.17–29.

Car Club Coalition, 2015. *A car club strategy for London growing car clubs to support London's transport future*. Car Club Coalition: London. Available online at: http://content.tfl.gov.uk/tfl-car-club-strategy.pdf

Cervero, R., Golub, A. & Nee, B., 2007. *San Francisco City CarShare : Longer-term travel-demand and car ownership impacts*. University of California at Berkeley: California. Available online at: https://iurd.berkeley.edu/wp/2006-07.pdf

Cervero, R. & Tsai, Y., 2003. *City CarShare in San Francisco, California: Second-year travel demand and car ownership impacts*. University of California at Berkeley: California.Available online at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.361.492&rep=rep1&type=pdf

Chen, T.D. & Kockelman, K.M., 2016. Carsharing's life-cycle impacts on energy use and greenhouse gas emissions. *Transportation Research Part D: Transport and Environment*, 47, pp.276–284.

Chen, T.D., Kockelman, K.M. & Hanna, J.P., 2016. Operations of a shared, autonomous, electric vehicle fleet: Implications of vehicle & charging infrastructure decisions. *Transportation Research Part A: Policy and Practice*, 94, pp.243–254.

City of Helsinki, 2014. *City of Helsinki parking policy* (In Finnish: Helsingin pysäköintipolitiikka), Available online at: https://www.hel.fi/hel2/ksv/julkaisut/los_2013-1.pdf.

Clewlow, R.R., 2016. Carsharing and sustainable travel behavior: Results from the San Francisco Bay Area. *Transport Policy*, 51, pp.158–164.

Cohen-Blankshtain, G., 2008. Framing transport-environmental policy: The case of company car taxation in Israel. *Transportation Research Part D: Transport and Environment*, 13(2), pp.65–74.

Corbin, J. & Strauss, A., 2008. *Basics of Qualitative Research*. London: SAGE Publications.

Dowling, R. & Kent, J., 2015. Practice and public–private partnerships in sustainable transport governance: The case of car sharing in Sydney, Australia. *Transport Policy*, 40, pp.58–64.

Efthymiou, D., Antoniou, C. & Waddell, P., 2013. Factors affecting the adoption of vehicle sharing systems by young drivers. *Transport Policy*, 29, pp.64–73.

Fagnant, D.J. & Kockelman, K.M., 2014. The travel and environmental implications of shared autonomous vehicles, using agent-based model scenarios. *Transportation Research Part C: Emerging Technologies*, 40, pp.1–13.

Feitelson, E., Givoni, M. & Matt, E., 2013. *Policy packaging and its applicability to servicizing: A summary of a concept. Deliverable 2.1. SPREE Project*, Tel Aviv.

Fellows, N.T. & Pitfield, D.E., 2000. An economic and operational evaluation of urban car-sharing. *Transportation Research Part D: Transport and Environment*, 5(1), pp.1–10.

Finnish Government, 2015. *Implementation of the government programme*. Available online at: http://valtioneuvosto.fi/en/implementation-of-the-government-programme.

Finnish Ministry of Transport and Communications, 2011. *Helsinki Region congestion charges – summary and conclusions*. Available online at: https://www.lvm.fi/en/publications_series.

Givoni, M., 2013. Alternative pathways to low-carbon mobility. In: Givoni, M. & Banister, D. (Eds.) *Towards Low Carbon Mobility*. Cheltenham: Edward Elgar, pp. 209–230.

Givoni, M. et al., 2013. From policy measures to policy packages. *Transport Reviews*, 33(1), pp.1–20.

Givoni, M. & Banister, D., 2010. The need for integration in transport policy and practice. In: In: Givoni, M. & Banister, D. (Eds.) *Integrated Transport: From Policy to Practice*. Abingdon: Routledge, pp. 1–11.

Greater London Authority, 2018. *Mayor's Transport Strategy 2018*. Greater London Authority: London. Available online at: https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf.

Grush, B., Niles, J. & Baum, E., 2016. *Ontario must prepare for vehicle automation: Automated vehicles can influence urban form, congestion and infrastructure delivery*. RCCAO: Toronto. Available online at: http://rccao.com/research/files/RCCAO_Vehicle-Automation_OCT2016_WEB.pdf

Harmer, C. & Cairns, S., 2012. *Carplus annual survey of car clubs 2011-12-London*. Transport Research Laboratory: London. Available online at: https://trl.co.uk/sites/default/files/PPR612.pdf

Helsinki City Planning Department, 2016. *Helsinki City Plan*. Available online at: http://www.yleiskaava.fi/en/city-plan/.

Helsinki Region Transport (2015). *A summary of the Helsinki region Transport System Plan 2015*. Available online at: https://www.hsl.fi/sites/default/files/uploads/hlj_2015_summary_0.pdf.

Hickman, R. & Banister, D., 2014. *Transport, Climate Change and the City*. London: Routledge.

Katzev, R., 2003. Car sharing: A new approach to urban transportation problems. *Analyses of Social Issues and Public Policy*, 3(1), pp.65–86.

Kivimaa, P. & Virkamäki, V., 2014. Policy mixes, policy interplay and low carbon transitions: The case of passenger transport in Finland. *Environmental Policy and Governance*, 24(1), pp.28–41.

Le Vine, S. & Polak, J., 2015. Introduction to special issue: new directions in shared-mobility research. *Transportation*, 42(3), pp.407–411.

Le Vine, S. & Polak, J., 2017. The impact of free-floating carsharing on car ownership: Early-stage findings from London. *Transport Policy*, https://doi.org/10.1016/j.tranpol.2017.02.004

Legacy, C., 2017. The post-politics of transport: establishing a new meeting ground for transport politics. *Geographical Research*, 56(2), pp. 196-205.

Malmö Stad, 2010. *Parking policy and parking norm for cars, motorcycles and bicycles in Malmö* (In Swedish: Parkeringspolicy och Parkeringsnorm för bil, mc och cykel i Malmö. September 2010). Malmö City Available online at: http://malmo.se/download/18.4027ea8b12af75326fc80003800/1383644417068/Parkeringspolicy+och+parkeringsnorm+slutligt+förslag+antagen+av+KF.pdf

Malmö Stad, 2015a. *RTI-plan – Regional plan for transport infrastructure in Scania 2014-2025* (In Swedish: RTI-plan - Regional transportinfrastrukturplan för Skåne 2014 – 2025. Malmö City. Available online at: http://malmo.se/download/18.5bb0a05f145db1bc43d6ac4/1401438553855/OP2012_planstrategi_antagen_140522.pdf

Malmö Stad, 2015b. Parking strategy (In Swedish: Parkingstrategi. Hyllie) Malmö City. Available online at: http://malmo.se/download/18.5f3af0e314e7254d70e3a17a/1440673319258/Parkeringsstrategi+Hyllie.pdf

Martin, E., Shaheen, S. & Lidicker, J., 2010. Impact of carsharing on household vehicle holdings. *Transportation Research Record: Journal of the Transportation Research Board*, 2143, pp.150–158. Available online at: http://sfpark.org/wp-

content/uploads/carshare/Impact_of_Carsharing_on_Household_Vehicle_Holdings.pdf

Millard-Ball, A. et al., 2005. *Car-Sharing: Where and how it succeeds*. Transit Cooperative Research Program: Washington, DC. Available online at: http://www.ccdcboise.com/wp-content/uploads/2016/02/Document-D1-TCRP-Car-sharing-Where-and-How-It-Succeeds.pdf

Morgan, B. & Kuch, D., 2015. Radical transactionalism: Legal consciousness, diverse Economies, and the sharing economy. J*ournal of Law and Society*, 42(4), pp.556–587.

Plepys, A., Heiskanen, E. & Mont, O., 2015. European policy approaches to promote servicizing. *Journal of Cleaner Production*, 97, pp.117–123.

Prettenthaler, F.E. & Steininger, K.W., 1999. From ownership to service use lifestyle: The potential of car sharing. *Ecological Economics*, 28(3), pp.443–453.

Prieto, M., Baltas, G. & Stan, V., 2017. Car sharing adoption intention in urban areas: What are the key sociodemographic drivers? *Transportation Research Part A: Policy and Practice*, 101, pp.218–227.

Region Skåne. 2013. Regional transport and infrastructure plan for Scania. Regional authority for Scania (In Swedish: Regional transportinfrastrukturplan för Skåne 2014 – 2025). Available online at: http://www.skane.se/Public/Protokoll/Regionala%20tillväxtnämnden/2013-12-06/06%20Länsplan%20för%20transportinfrastruktur%20i%20Skåne%202014-2025/RTI-plan%202014-2025%2020131129.pdf

Rhode, P. & Hoffmann, C., 2014. *Towards new urban mobility: The cases of London and Berlin*. LSE Cities: London. Available online at: https://files.lsecities.net/files/2015/09/New-Urban-Mobility-London-and-Berlin.pdf.

Schaefers, T., 2013. Exploring carsharing usage motives: A hierarchical means-end chain analysis. *Transportation Research Part A: Policy and Practice*, 47, pp.69–77.

Shaheen, S.A. & Cohen, A.P., 2012. Carsharing and personal vehicle services: Worldwide market developments and emerging Trends. I*nternational Journal of Sustainable Transportation*, 7(1), pp.5–34.

Shaheen, S.A., Schwartz, A. & Wipyewski, K., 2004. Policy considerations for carsharing and station cars: Monitoring growth, trends, and overall impacts. *Transportation Research Record: Journal of the Transportation Research Board*, 1887(1887), pp.128–136.

Shaheen, S. & Chan, N., 2016. Mobility and the sharing economy: Potential to facilitate the first- and last-mile public transit connections. *Built Environment*, 42(4), pp.573–588.

Shiftan, Y., Albert, G. & Keinan, T., 2012. The impact of company-car taxation policy on travel behavior. *Transport Policy*, 19(1), pp.139–146.

Skatteverlet, 2018a. *Value-added tax levels for goods and services* (In Swedish: Momssats på varor och tjänster). Skatteverket (Swedish Tax Authority): Stockholm. Available online at: https://www.skatteverket.se/foretagochorganisationer/moms/saljavarorochtjanster/momssatspavarorochtjanster.4.58d555751259e4d66168000409.html

Skatteverket, 2018b. *Daily allowances and mileage compensation* (In Swedish: Traktamente och bilersättning.) Skatteverket (Swedish Tax Authority): Stockholm. Available online at: https://www.skatteverket.se/privat/sjalvservice/blanketterbroschyrer/broschyrer/info/3156.4.84f6651040cdcb1b480009532.html

Skjelvik, J., Erlandsen, A. & Haavardsholm, O., 2017. *Environmental impacts and potential of the sharing economy*. Copenhagen: Nordic Council of Ministers. Available online at: http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A1145502&dswid=3552

SKL, 2013. *Parking for sustainable city development* (In Swedish: Parkering för hållbar stadsutveckling). Sveriges Kommuner och Landsting (SKL)/Swedish Association of Local Authorities and Regions: Sweden. Available online at:: https://www.sunfleet.com/media/1190/7164-920-1.pdf

SOU, 2013. *Fossil-free freedom on the way*. State public investigation (In Swedish: Fossilfrihet på väg. Statens offentliga utredningar) Swedish Parliament: Stockholm. p. 1061

Statistics Finland, 2016. *Population projection*. Available online at: http://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin/StatFin__vrm__vaenn/?tablelist=true, accessed: 8.5. 2018)

Steer Davies Gleave, 2015. Carplus Annual Survey of Car Clubs London 2014-15. Steer Davies Gleave: London. Available online at: https://como.org.uk/shared-mobility/shared-cars/why/

Steer Davies Gleave, 2016. Carplus Annual Survey of Car Clubs London 2015-16. Steer Davies Gleave: London. Available online at: https://como.org.uk/shared-mobility/shared-cars/why/

Steer Davies Gleave, 2017. Carplus Annual Survey of Car Clubs London 2016-17. Steer Davies Gleave: London. Available online at: https://como.org.uk/shared-mobility/shared-cars/why/

Tapio, P., 2005. Towards a theory of decoupling: Degrees of decoupling in the EU and the case of road traffic in Finland between 1970 and 2001. *Transport Policy*, 12(2), pp.137–151.

Toiskallio et al., 2013. *Promotion of car sharing in the Helsinki region*. Available online at: https://www.hsl.fi/sites/default/files/uploads/autojen_yhteiskayton_edistaminen_18_2013.pdf.

Trafikverket, 2013. *Proposal for national plan of transport system 2014-2025* (In Swedish: Förslag till nationell plan för transportsystemet 2014 – 2025) Swedish Transport Administration: Sweden. Available online at: http://www.trafikverket.se/contentassets/9e147d1421b14ee9ae83003c9f15617c/forslag_till_nationell_plan_for_transportsystemet_2014_2025_remissversion.pdf

Trafikanalys, 2016. *Swedish public sector transport statistics*. Available online at: http://www.trafa.se/kollektivtrafik/kollektivtrafik/.

Transport for London, 2008. *Mayor's Car Club Strategy 2008*. Transport for London: London.

Transport for London, 2015. *Road Task Force Progress Report 2015*. Transport for London: London.

Transport for London, 2013. *The vision and direction for London's streets and roads: Road task force executive summary*. Transport for London: London.

Truffer, B., 2003. User-led innovation processes: The development of professional car sharing by environmentally concerned citizens. *Innovation*, 16(2), pp.139–154.

Voltti (2010). *Potential and impacts of car sharing in the capital region, Turku and Tampere* (In Finnish: Autojen yhteiskäytön potentiaali ja vaikutukset pääkaupunkiseudulla, Turussa ja Tampereella). Finnish Transport Agency: Helsinki.

Appendix A: Methods of data collection

Israel: Personal interviews were preferred over expert discussions due to time availability. The scale of the market is also very small compared to its European counterparts that the sample is smaller than the other cases, but includes the most important actors that influence the car sharing market.	• Head of Research and Technological Development at the Head Scientist Office, Ministry of Transport • Personal Assistant to Vice Mayor of Tel Aviv, Transportation • Head of Energy, Fuel and Environment, Ministry of Transport CEO and Founder, Car2go
Finland: Interviews with company representatives from one organisation at a time were arranged to allow for confidential discussion. In addition to organisation specific discussions, a workshop involving representatives from public and private organisations was arranged. The number of participants is indicated	• Chair and Vice chair of the Helsinki City Planning Committee • Mobility management consultant from Motiva Ltd. • Head of mobility management, program director, and transport system planner from Helsinki Region Transport

at the end of the list. The participants included several start-up companies that employ digital technologies given the Government's focus on digitisation. Unlike the Israeli case, there were documents available that would broadly describe the market at the time of research. The documents reviewed include the Helsinki Region Transport Plan 2015 (Helsinki Region Transport, 2015), The City of Helsinki Parking Policy (City of Helsinki, 2014), Promotion of Car Sharing in the Helsinki Region (Toiskallio et al., 2013) and Potential and impacts of car-sharing in the capital region, Tampere and Turku (Voltti, 2010).	• Senior adviser/transport management from Sito Group Ltd. • Traffic engineer from the Traffic Planning Division of the Helsinki City Planning Department • Marketing and communications representative from City Car Club • Founder and CEO of Green Riders • Founder and CEO of Smart Travel • Partners (two representatives) in Weegos • Representatives of two start-ups working in mobility (Kyyti.net and PiggyBaggy) • Participants of the workshop included altogether 15 participants: 10 from public organisations (including national, regional and local levels); 2 participants from University of Applied Sciences; and 3 representatives from car sharing and mobility management companies.
Sweden: Information for the Swedish case was collected from personal interviews with the representatives of Lund Municipality, Skåne County Administration board, Transport Administration Board of Sweden SunFleet, Move About, and expert workshop involving Malmö City, Trivector and Skånetraffiken. The stakeholders were selected on the basis of their relevance to car sharing and public transport issues. The interviewed persons were those who were active in policy discussions and general public debates. The documents reviewed include plans and strategies at different scales of governance: *city level* (Malmö Stad 2015); *regional level* (Region Skåne, 2013); *national level* (SOU, 2013; Trafikverket, 2013; SKL, 2013).	• Expert workshop participants: Malmö City: sustainable development unit (Roland Zinkernagel), planning department/transport unit (Magnus Fahl); Lund municipality: development, transport and planning (Eva Dalman), traffic unit (Anders Söderberg). • Interviewees in personal communication: Mats Améen (Skånetrafiken, Region Skåne), Camilla Burén (Skåne County Administration Board), Andreas Åkerblad (Transport Administration Board of Sweden), Linnea Roddar and Olof Holmgren (SunFleet AB), Ulf Jacobsson (CEO Move About Sweden AB), Lovisa Indebetou, Pernilla Hyllenius Mattisson, Björn Wendle, Christer Ljungberg, Karin Neergaard (Trivector Traffic AB).
UK: The research on the UK employed both document review and in-depth interviews. The documents reviewed include the Road Task Force (Progress) Reports (2013, 2015); Mayor's Transport Strategies (2008, 2018); Carplus surveys (2015, 2016, 2017) and the Car Club Coalition Action Strategy (2015). An expert discussion was not feasible due to time constraints. However, the in-depth interviews with the key actors in the sector provided adequate information to map the broad institutional settings of the car sharing sector in London.	• Transport for London (TfL), A Senior Strategy Planner • Transport for London (TfL), A Senior Strategy Planner • Carplus (CP), Chief Officer • Private car sharing operator, Head of Locations • Private car sharing operator, Head of Business Services