

Car-Sharing reduces the burden on both cities and the environment – the environmental impacts of Car-Sharing use

In this fact sheet, we have itemised analytically the various individual impacts of Car-Sharing and supported them with the research findings from scientific studies and customer surveys in several Car-Sharing countries. Overall, the research results make strikingly clear that the mobility service of Car-Sharing renders a noteworthy and environmentally friendly contribution to traffic reduction. In collaboration with the “eco-modes” (bus and train, cycling and walking), Car-Sharing can be integrated as an appropriate and purposeful urban car component.

Car-Sharing vehicles are appropriate to the purpose of the particular journey

In Car-Sharing, smaller and newer vehicles are used than are found in the average household, creating fewer health-damaging emissions and, in comparison, using less fuel per kilometre driven, which is directly reflected in lower average CO₂ emissions.

The majority of the vehicles used in Car-Sharing fleets are superminis or small family cars. In Germany, for example, 70% of the vehicles in Car-Sharing fleets are of these classes. This fleet breakdown corresponds to the needs of customers and to journey purposes and is supported by user fees graded by vehicle size. Most journeys are short and are made alone or by two people. For this, a small car is generally sufficient. For longer journeys or for journeys with a large amount of luggage or with several people, providers have a selection of larger vehicle models available which can be chosen specifically according to comfort level and purpose of the journey. Thus through his or her vehicle selection, the customer can make a conscious choice to save fuel and to reduce CO₂ emissions.

When purchasing a personal vehicle, different criteria are used to make the decision. Here, the annual holiday journey or infrequent family weekend excursions determine the choice of vehicle. As a result, unnecessarily large petrol-guzzling vehicles end up being used for day-to-day journeys.

Car-Sharing vehicles emit fewer pollutants and use less fuel

Car-Sharing vehicles are also newer on average than most personal vehicles meaning that improvements in engine technology, in fuel efficiency and in emission levels are on the road faster in Car-Sharing vehicles than in private cars.

Thus each kilometre driven in a Car-Sharing vehicle results in fewer health-damaging emis-



Fig. 1: cambio Germany receives the first 50 of a total of 300 Ford Fiesta ECOnetic with CO₂ emissions of 98 g CO₂/km (Source: Ford/cambio)

sions and less fuel used. Table 1 shows the difference between the specific CO₂ emissions of several Car-Sharing fleets in comparison to personal cars by country (new or existing vehicles). The difference of approximately 20% through Car-Sharing vehicles is a direct benefit

C-S provider or country	Specific CO ₂ emissions of C-S fleet	Number of vehicles in C-S fleet	specific CO ₂ emissions of the national vehicle fleet	...% lower consumption	Comparison year	Source
Mobility, Switzerland	151 g/km	2,200	183 g/km (new cars only)	17.5% (total 1,510 t in year)	2008	Mobility 2009
various, Germany	148 g/km	1,042 (included in the study)	176 g/km (new cars only)	16%	2003	Knie, Canzler 2005
cambio, Germany	129 g/km	575	165 g/km (new cars only)	21.2%	2009	cambio Journal 19/2009; German Federal Bureau of Statistics 2009
cambio Belgium, Belgium	117 g/km (Flanders) 120 g/km (Brussels) 122 g/km Wallonia	248	155 g/km (new cars only)	21.3% - 24.5%	2008	Information by e-mail, Taxistop
4 providers, Italy	127 g/km	236			2008	momo survey
various, Great Britain	110 g/km		171 g/km (assuming the replacement of personal cars after 6 years)	36%	2007 (2001 in some cases)	Carplus 2007

Table 1: comparison of specific CO₂ emissions of Car-Sharing fleets with personal vehicles by country

to people's health in urban centres as well as to the global climate. In the emissions comparison in Table 1, it should be noted that because of an unavailability of information, often the newest models of private cars are compared with the entire Car-Sharing fleet (with cars of various ages). A comparison between all new vehicles would make the differences even more striking.

Alternative drive systems in the fleets

To date, vehicles with particularly low emissions or climate-friendly drive systems have been introduced into Car-Sharing fleets in only a few cases. Where special systems are employed, they are primarily CNG systems – where several Italian Car-Sharing providers are pioneers – or

hybrid vehicles. This brings added benefits particularly to urban environments.

Electric vehicles are still rare in Car-Sharing. An exception is the provider in the French city of La Rochelle. This city has long been known for the support electric mobility receives from its local administration. In 1999, within the framework of the European project LISELEC, electric Car-Sharing vehicles were introduced.

Some of the reasons alternative drive systems haven't been used more often in Car-Sharing to date are:

- The often significantly higher purchase cost of vehicles with alternative drive systems are difficult to reconcile financially within the Car-Sharing fee structure (lower fees for smaller cars) given the relatively short lifespan of vehicles used in Car-Sharing.

C-S provider or area	Number of C-S customers who have given up (at least) one car	Number of C-S customers who did not carry out a planned car purchase	Each C-S vehicle replaces ... personal cars	Study year	Source
4 (in some cases 5) providers in Great Britain				2008	Myers, Cairns (TRL) 2009
Existing customers	40.3%	25.8%	14		
New customers	37.9%	24.2%	9		
customers from 2 C-S "mobility point" stations in Bremen, Germany				2005	Free Hanseatic City of Bremen 2005
Private customers	30%	55%	9		
Business customers	21%	67%			
Various providers, Germany	16%	33%		2003	Maertins 2006; Knie, Canzler 2005
Mobility, Switzerland	26.3% (private motor vehicles in 520 households) 5.3% (business vehicles of 142 commercial C-S customers)			2005	Swiss Federal Office for Energy 2006

Table 2: survey results on car ownership in households of Car-Sharing customers

- Without financial project support, the relatively tight budgets that most Car-Sharing providers work within don't allow them to act as testing grounds for not-yet-fully-developed vehicle technology, thereby taking over the manufacturers' financial and availability risks.
- Alternative drive systems may be seen as barriers by inexperienced Car-Sharing customers who may fear being billed for any mistakes they make (for example in tanking up/recharging). This constraint exists even if fears are not based in fact but only the customer's perception.

Each Car-Sharing vehicle replaces at least four to eight personal cars

Customer surveys show again and again that Car-Sharing participants own a below-average number of personal cars in comparison to other households. While some households had no car

available to them before becoming Car-Sharing customers, the overwhelming majority are households which, either directly before or after becoming Car-Sharing customers, got rid of a personal car or decided against a previously-planned vehicle purchase because of Car-Sharing. Note that it is not necessarily the household's only car that is given up; it may also be the second or third. Table 2 presents some research findings.

Reducing parking pressure – everybody benefits

Even if the research cited in Table 2 does not prove definitively that Car-Sharing participation is the actual catalyst for the "car diet", it is a fact that, statistically, the average Car-Sharing household possesses fewer cars than comparable population groups.

From customer surveys, it has been statistically determined that, in general, each newly-purchased, normally-used Car-Sharing vehicle replaces at least four to eight personal cars, and in some cases even more.

The reduction of car ownership through Car-Sharing leads to a decrease in pressure on parking in neighbourhoods in which a particularly high number of Car-Sharing customers live. This choice by Car-Sharing participants benefits everybody, most of all their car-dependent neighbours.

In calculating the space that would be required to park each of the four to eight cars that are replaced by each Car-Sharing vehicle, you find that 36 to 84 m² of public street space is freed up.¹ If you consider the fact that cars also require parking spaces in more than one location each day, the amount of reclaimed public space increases even more.

The “unbought” personal cars play a role not only in saving space in cities. Raw materials and energy are also saved when fewer vehicles need to be built. Assuming a car with an average lifespan, approximately one fifth of the emissions and climate damage it is responsible for are caused during the production process of the car – before a single kilometre is driven.

Car-Sharing creates potential for better quality of life and urban form

The problem with the space gained through Car-Sharing is that the theoretically freed-up parking spaces are rarely actually visible. They are immediately occupied in densely built neighbourhoods through increased car ownership by other residents, by commuters who work there, or visitors, all of whom are pleased if they have to circle the block one time fewer in search of a parking space. Decreased parking pressure, which occurs gradually with each new Car-Sharing participant generally isn't noticed in casual observation, but rather only by systematic observation.

Theoretically, the space freed up by Car-Sharing could be employed for other appropriate urban uses. It could be made available for non-mo-

torised modes (cyclists and pedestrians), or local planners could designate this space for reorganising squares and street space and thus improving the quality of life in the neighbourhoods.

A nice example of positively re-purposing land can be seen in the southern German city of Freiburg. In the newly-developed neighbourhood of Vauban, residents made a conscious decision not to own personal cars but to use Car-Sharing instead. There, car-free households can meet the legal requirement of one parking space per newly-built flat through the purchase of a property share. While car-owning households must purchase a car parking space in a central community garage, the land of the car-free households is green space and play areas that are used by all residents of the neighbourhood.

Cost transparency decreases distances driven

The high initial costs of a personal vehicle seriously – and understandably – reduce the willingness of car drivers to choose the most appropriate mode of transport for each individual journey. The depreciation of a new (or like-new) vehicle is seen as unavoidable, leading to the attitude: “since I've paid for the car, I should use it as much as possible”. Such an attitude blinds car owners to the specific strengths of other modes of transport for certain journeys at certain times and inhibits an optimised and efficient use of all transport modes.



Fig. 2: new urban development of Freiburg-Vauban: in this neighbourhood, car-free households are overwhelmingly able to meet their car needs with Car-Sharing; the land set aside for their legally-required parking spaces is used as green space and play areas (Source: Willi Loose)

1 12 m² is required for an on-street parking space; in the calculation, the space required for the Car-Sharing vehicle is subtracted. For parking spaces in private yards or in neighbourhood garages, even more street space is required to allow access to sealed-off spaces.



Fig. 3: Car-Sharing, the integrated car component of the "eco-modes" of transport (Sources: pixelio.de/Danny König, Felene, Peter Herlitz; bcs)

The cost structure of Car-Sharing is exactly the opposite of this, making it a perfect fit with the congestion-reducing eco-mobility modes: in Car-Sharing, apart from a small monthly fee, almost all costs are directly related to car use. User fees are generally divided into a kilometre rate and a time rate, and these are itemised in the monthly bill for each individual journey. This cost transparency means that no unnecessary kilometres are driven and the vehicles are rarely tied up unproductively meaning that Car-Sharing vehicles are much more efficiently employed than personal cars or even rental vehicles.

Car-Sharing changes attitudes to driving

Car-Sharing providers go one step further so that Car-Sharing is more than simply another way to access a vehicle, but rather it actively lightens the environmental and traffic load.

The mobility service Car-Sharing is designed Europe-wide as an integrated service which seeks collaboration with the so-called "eco-modes" (buses and trains, cycling and walking). This is shown, for example, by the fact that many Car-Sharing providers offer "package deals" with public transport providers and special rates

to regular public transport users. These are presented in more detail in momo fact sheet number.

The fee structures of Car-Sharing are generally tailored so that Car-Sharing use is less expensive than driving a new personal vehicle when the user drives fewer than 10,000 to 12,000 kilometres a year, although that applies only insofar as one does not need a car on a daily basis. For many private Car-Sharing customers, this supports an attitude to driving in which Car-Sharing use is combined with the so-called "eco-modes" for everyday transport.

The cost transparency of Car-Sharing and the consciously-set fee structures result in Car-Sharing participants considering which is the least expensive means of transport for each journey and destination. Here, the strengths of each individual mode of transport are shown to advantage. For most Car-Sharing participants, a car journey with a Car-Sharing vehicle isn't their first choice when other modes (public transport, cycling, walking) are available. In contrast to the personal car, Car-Sharing focuses attention on the other "eco-modes" and thus positively influences transport choices.

In some studies, a gradual attitude change could be seen: groups of customers could be identified who used Car-Sharing cars substantially more often in their first year of participation. Over time however, they learn to appreciate the strengths of the other modes of transport. Supported by the transparency of the costs for each individual Car-Sharing journey, this customer group's car use gradually flattens out at a lower level. This effect – which benefits both urban transport and the environment, and which can be seen over and over again – is known as the "learning curve of Car-Sharing participation".

For those who rarely use a car anyway, Car-Sharing can serve as an assurance of mobility that largely supports an environmentally-friendly attitude to transport and ensures that being car-free isn't seen as a limitation to mobility.

Car-Sharing reduces the CO₂ burden of transport

The greater reliance of Car-Sharing customers on the "eco-modes" as compared to non-Car-Sharing users helps relieve the burden on the environment and on city traffic. In Switzerland, a study looked at what impact this attitude to driving has on transport-related CO₂ emissions.

In the study, Car Sharing customers were asked about their last three Car-Sharing journeys and how they would have dealt with those needs if they had had no access to Car-Sharing. This research method has the advantage of touching very close to the real-world experience of the respondents and not overtaxing their memories. In some cases, respondents answered that they would likely have taken public transport or a taxi and in other cases, they would simply not have taken the journey. A portion of the respondents answered that they would have bought a(nother) car. In a complicated calculation, the potential relief to the environment and on the transport system provided by Car-Sharing (in Switzerland) was calculated.

Results show that each active Swiss Car-Sharing user emits 290 kg of CO₂ less each year because he or she participates in Car-Sharing than he or she would without Car-Sharing. An "active" Car-Sharing user is defined here as someone who used a Car-Sharing car at least once in the year the study was carried out.

Voluntary measures: CO₂ offsetting by the provider or the user

A few Car-Sharing providers and their customers are going one step further by offsetting the CO₂ emissions from their Car-Sharing use by investing in climate protection projects that help to avoid CO₂.

The Swiss Car-Sharing provider Mobility both offsets the CO₂ emission of its own work journeys and offers its customers a voluntary CO₂ offsetting option. Each kilometre driven is offset with a payment of 2 Swiss centimes (equivalent to 1.3 Euro cents) to the myclimate Foundation, which uses the money to finance certified climate protection projects in Switzerland and in developing countries. In 2008, voluntary CO₂ offset payments were made for 22.3% of the kilometres driven. All in all, 1,590 t of CO₂ emissions from Car-Sharing vehicles were offset with payments of 202,000 Swiss francs (equivalent to 133,150 Euro).

The German Car-Sharing provider "einfach mobil," which offers Car-Sharing in Marburg, Gießen and Kassel, has kept its entire Car-Sharing fleet carbon neutral since August 2007. Here, the decision was not left to individual customers however; the compensation payment is built into the standard Car-Sharing fees.

Car-Sharing benefits the general public

In this fact sheet, we have itemised analytically the various individual impacts of Car-Sharing and supported them with the research findings described above from scientific studies and customer surveys in several Car-Sharing countries. Overall, the research results make strikingly clear that the mobility service of Car-Sharing renders a noteworthy and environmentally friendly contribution to traffic reduction. In collaboration with the "eco-modes" (bus and train, cycling and walking), Car-Sharing can be integrated as an appropriate and purposeful urban car component.

To sum up: In a future-ready transport system, Car-Sharing contributes to the general good.

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Italy

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Spain

Sustainable and Save
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