



White Paper

Shared Mobility – Part 1 (of 2): Car-sharing

Current State and Mid-term Perspectives of Car-sharing

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Pre-amble

Shared mobility is one of the most discussed topics when it comes to the future of personal mobility and transportation. This public awareness goes hand-in-hand with large investments in shared mobility start up's and technologies, which amount to € 42 billion worldwide (s. also Exhibit 1).

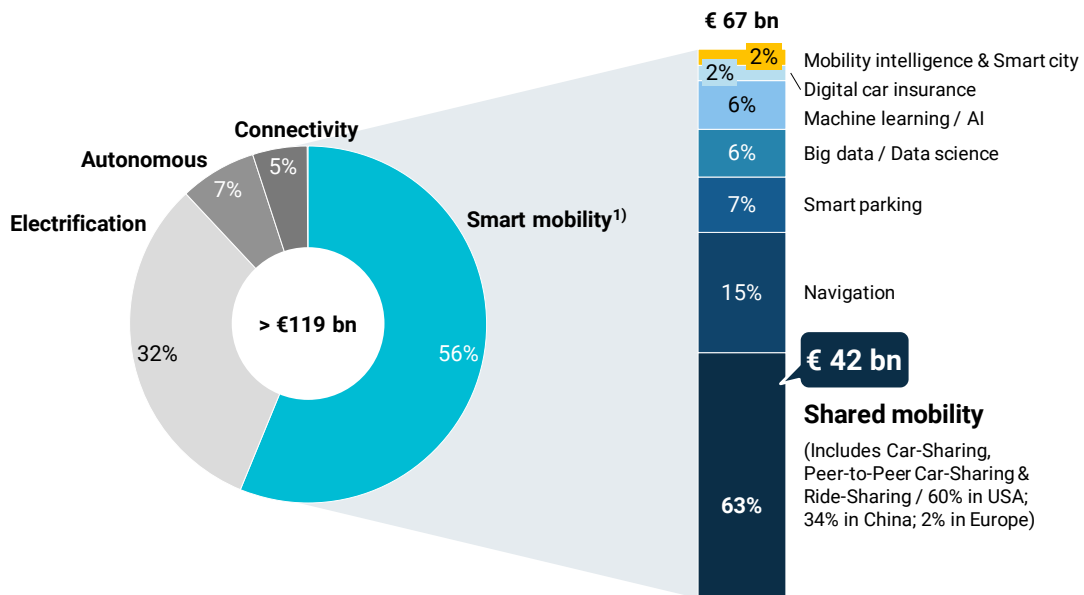


Exhibit 1: Overview investments in CASE automotive business models and technologies

Source: Strategy Engineers.digital market insights // CASE = Connectivity, autonomous, smart mobility, electrification

¹⁾ also referred to as mobility as a service (MaaS)

Car-sharing with leading players like Car2Go and DriveNow, who announced to join forces earlier this year, ride-sharing with Uber and Didi Chuxing, ride-hailing and aggregation of taxi services are the most prominent business models in shared mobility drawing the vast majority of investments.

As an automotive management consulting firm, we have had the opportunity to dig deeper into the shared mobility space in several projects. Thus, we want to share our lessons learned on the current state and long-term perspectives of shared mobility. We do this in two consecutive white papers.

The **first part** – that you currently have in front of you – is focused on the **current state and mid-term perspectives of car-sharing**:

- » Different business models in car-sharing
- » Operational models and profitability thresholds in car-sharing
- » The role of electric vehicles in car-sharing
- » Competitive landscape
- » Mid-term market development

The **second part** will reflect our view on the **long-term future of shared mobility** and its implications for today's players:

- » Today's four dominant shared mobility business models
- » Anticipated changes in business models due to autonomous vehicles to come
- » 2 strategy case studies of leading players
- » Long-term impact of shared mobility on the installed base of passenger cars
- » Recommendations

We hope that you will find the insights and future hypotheses helpful in your daily work and wish you enjoyable reading.

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1. Business Models in Car-Sharing

Four different car-sharing business models have evolved over time

Car-sharing is a short-time car rental, usually charged by the minute. Since the early 1990s, different car-sharing business models have evolved (see Exhibit 2). There are two well-established types of car-sharing, namely free-floating and station-based car-sharing. While station-based car-sharing means that the shared vehicles need to be picked up and returned to predefined stations, the more flexible free-floating model gives the user the ability to take and leave cars anywhere in the business area of the car-sharing operator (CSO). Hence, some CSOs have started to spread free-floating car-sharing in combination with their existing station-based service, to increase their customers' flexibility. Today, car-sharing fleets comprise mainly combustion engine vehicles with a growing trend towards electrification.

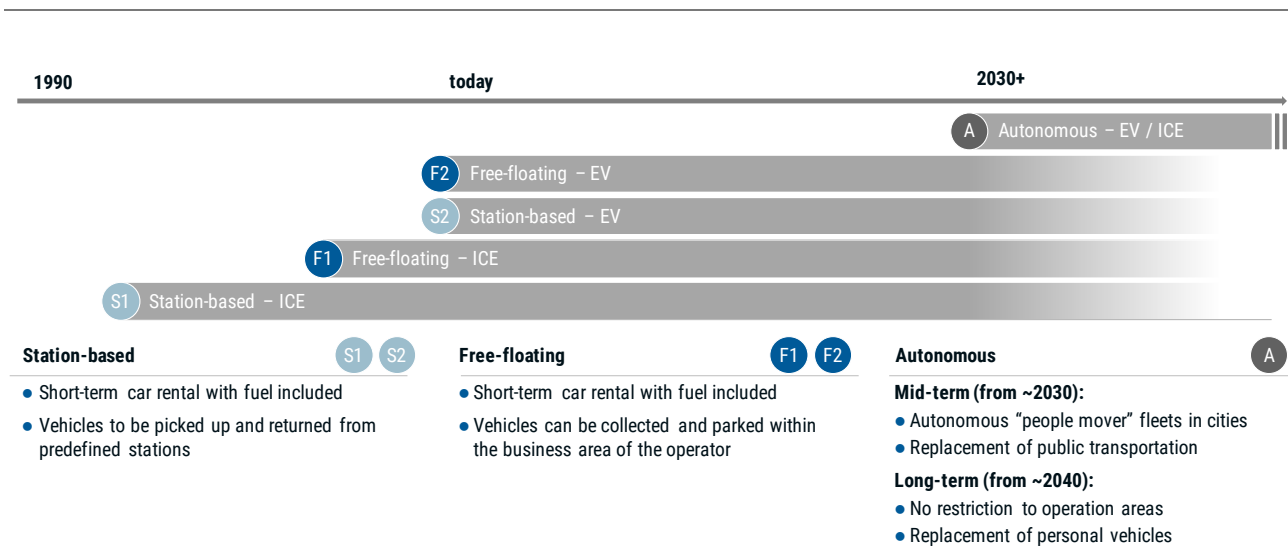


Exhibit 2: Overview car-sharing business models; Source: Strategy Engineers

Within the next decade and autonomous vehicles (AVs) to come, current car-sharing models are expected to converge. AVs will most likely be used first as so-called "people mover" fleets, which will initially operate in highly controlled environments and slowly replace public transportation. Beyond 2040, shared AVs will no longer be restricted to operation areas. They will have the ability to be exactly where individuals need them and whenever they want to be driven, instead.

2. Operational Models and Profitability Thresholds

Each car-sharing model results in different vehicle usage patterns

The use case of station-based car-sharing is rather for longer and well-planned rides, as an alternative to rental cars or car ownership. In contrast, free-floating cars are mostly used for short one-way trips instead of taxis or public transport. Therefore, vehicle utilisation of station-

based models is higher, while average prices are lower compared to free-floating models (see Exhibit 3).

In order to be profitable despite low utilisation, free-floating CSOs employ a higher member to vehicle ratio (M:V ratio) than station-based CSOs. To reach high M:V ratio, free-floating car-sharing requires a critical population of at least 300,000 citizens, while station-based services are already attractive for smaller to medium-sized cities with population above 100,000 citizens.

	Station-based car-sharing		Free-floating car-sharing	
	Value	Details	Value	Details
Utilization [h per vehicle and day, %]	11.86 (49.4%)	The average time per ride is 6.7 h A vehicle is used in average 1.77 times a day	3.12 (13.1%)	The average time per ride is 40 min A vehicle is used in average 4.7 times a day
Daily mileage [km per vehicle and day]	115.6	The average mileage per ride is 65.3 km A vehicle is used in average 1.77 times a day	52	The average mileage per ride is 11.1 km A vehicle is used in average 4.7 times a day
Annual mileage [km per vehicle and year]	41,147	-	24,209	-
Replacement rate [life-time of vehicle within car-sharing fleet in years]	1.5	Holding time for station-based car-sharing companies ranges from 12 months to 2 years	1.5	Holding time for free-floating car-sharing companies ranges from 10 months to 2 years
Average member to vehicle ratio	76	-	175	-

Exhibit 3: Operating data per business model; Source: Strategy Engineers

To reach break-even, free-floating car-sharing operators require a vehicle utilisation rate of more than 10% a day

Considering the German car-sharing market, the break-even point for a single free-floating car-sharing vehicle is around 10% utilisation, which is equivalent to an average daily usage of ~2.4 hours (see Exhibit 4).

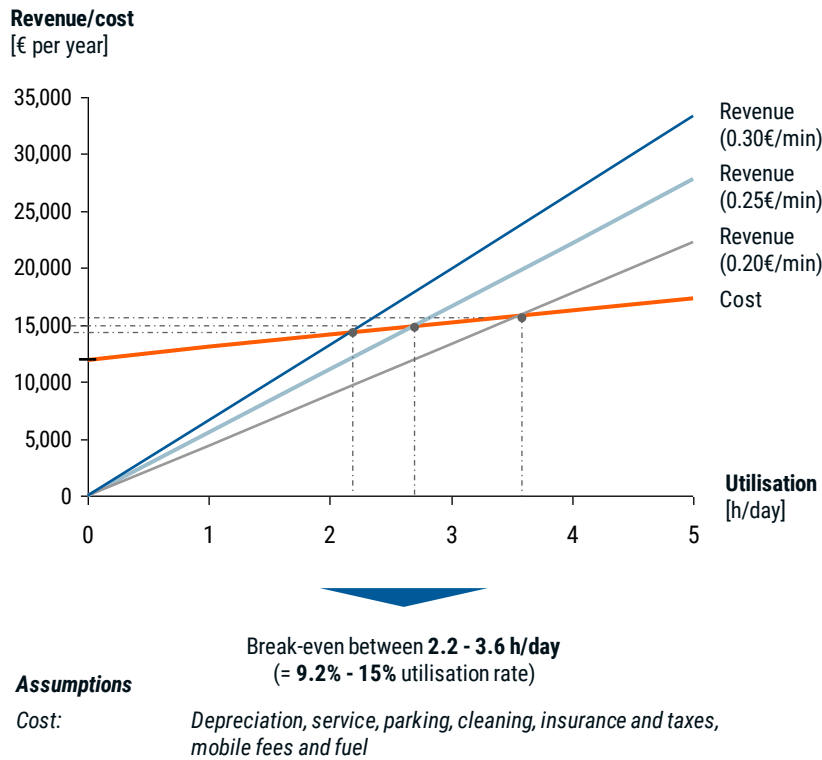


Exhibit 4: Revenue and cost per free-floating car-sharing vehicle (Germany); Source: Strategy Engineers

3. The Role of Electric Vehicles in Car-Sharing

From a total cost of ownership point of view, BEVs are expected to become a favourable technology for urban car-sharing from 2021 onwards

Due to high vehicle prices and immense costs for infrastructure, battery electric vehicle (BEV) car-sharing is currently not profitable without subsidization. The discontinuation of business by Autolib, as the largest European operator of a pure BEV fleet (~4000 cars in Paris), because of continuous losses serves as a real-life example. However, this will change with decreasing vehicle prices. Assuming BEV prices to decrease with declining battery pack cost, short-range BEVs are expected to become profitable for station-based car-sharing by 2021 and for free-floating car-sharing by 2024 (see Exhibit 5). Until then, increasing BEV shares for car-sharing fleets mainly depend on regional incentives.

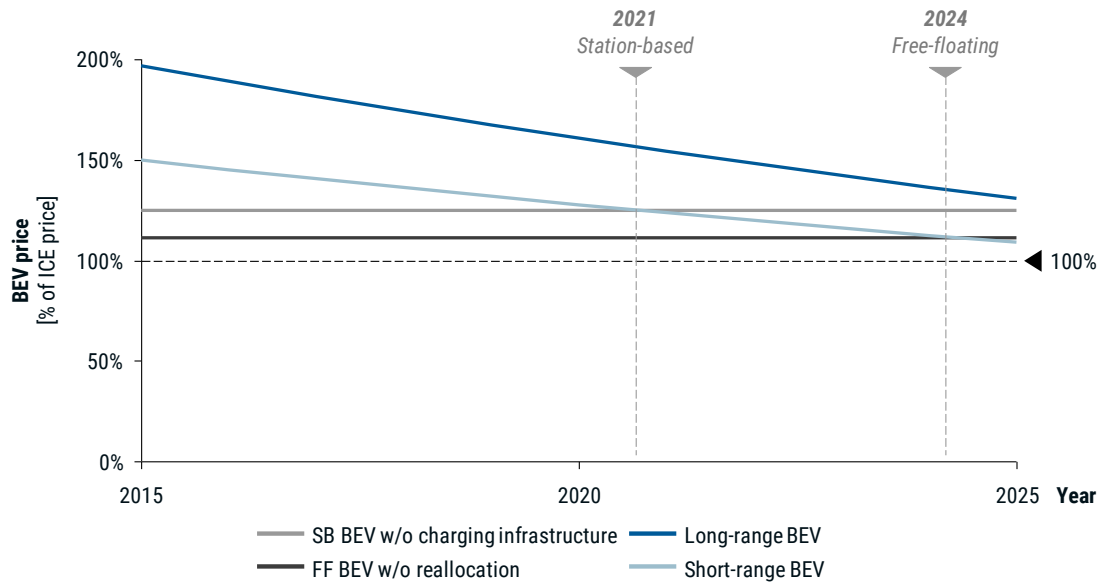


Exhibit 5: BEV price development vs. break-even of operating models; Source: Strategy Engineers

Compared to privately owned-vehicles, the number of charging cycles increases by up to 410% with free-floating car-sharing

Considering the vehicles themselves, the usage of BEVs for the purpose of car-sharing has an effect which must not be underestimated. Assuming an exaggerated scenario, in which free-floating car-sharing BEVs are charged after every ride, the number of charging cycles increases by up to 410% compared to privately owned vehicles. This indicates the importance of adapting key components to shared vehicle usage patterns (see Exhibit 6 for more details).

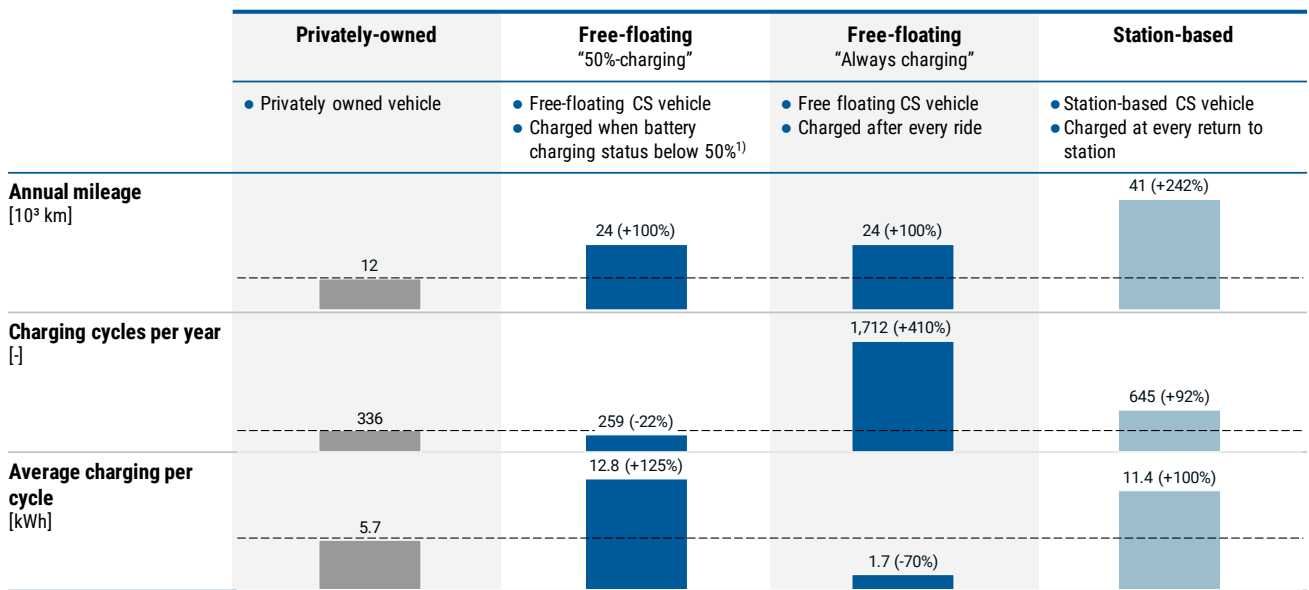


Exhibit 6: Implications on key components (BEVs); Source: Strategy Engineers, DLR

¹⁾Free-floating CSOs provide incentives to charge BEVs at a charging status below 50% // Always full charge assumed

4. Competitive Landscape

Car-sharing shows a fragmented landscape with no one-size-fits-all model becoming apparent

In recent years, various players ranging from innovative start-ups to established rental and automotive companies have entered the global market for car-sharing services (see Exhibit 7). Yet, no one-size-fits-all car-sharing model has been established to date. Instead, the market is still fragmented – one reason being cities, which regulate sharing individually and the car-sharing business being asset intensive.

















	CSO	Founded	Vehicles	EV Vehicles	EV Share	Members	M:V	Operating Region
Free-floating	Daimler's Car2go	2008	14,000	1,400	10%	2,970,000	212	
	BMW's DriveNow	2011	6,250	1,020	16%	1,000,000	160	
	Enjoy Fiat	2013	2,200	0	0%	350,000	159	
	Share'n go	2014	1,450	1,450	100%	50,000	35	
	BMW's ReachNow	2016	1,320	~130	10%	50,000	38	
Station-based	Microcity	2013	40,000	40,000	100%	NA	N/A	
	GoFun	2015	30,000	30,000	100%	5,000,000	167	
	EVCARD	2013	27,000	27,000	100%	2,570,000	95	
	Pandauto	2015	20,000	20,000	100%	2,100,000	105	
	Zipcar	2000	12,000	~200	<2%	1,000,000	84	
	DB Flinkster	2001	6,000	400	7%	315,000	53	
	Enterprise Carshare	2008	3,500	~100	3%	175,000	50	
	Zoomcar	2013	3,000	20	<1%	2,000,000 (including peer-to-peer members)	N/A	
	Mobility International	1997	2,950	35	1%	131,700	45	
	Cambio	2000	2,680	~50	2%	98,250	37	
	Stadtmobil	1999	2,300	62	3%	52,000	23	
Total Key Players			160,650	120,467	75%	13.9 mio	115	-

Exhibit 7: Global car-sharing market – Overview key players (February 2018); Source: Strategy Engineers

Spot-light: Car-sharing in China

Another trend to be mentioned is China. As Exhibit 7 shows, 4 of the 5 largest car-sharing providers (in terms of fleet size) in 2018 are Chinese, all of such founded within the last five years. Reason for that is the strong subsidization of the industry by the Chinese government and several municipalities in the last years. As one of the first cities, Shenzhen introduced a program to integrate and apply car-sharing technology in 2014. Other cities, such as Qingdao, Shanghai, Beijing and Guangzhou followed this example, mostly focussing subsidies on electric vehicles. Besides those local incentives, the central Chinese government encouraged car-sharing e.g. by introducing guidelines to improve the credit system and the shared economy, in 2016. By that, China's car-sharing industry was sky-rocketing from 14,000 shared vehicles on the streets in 2015 to a total fleet of 200,000 vehicles in 2018, corresponding to a compound annual growth rate of 143%. However, due to a levelling of subsidies and stronger competition in the market, this growth is expected to slightly slow down with an estimated growth rate of ~40% until 2020. Afterwards, stereotype for artificially accelerated industries, a consolidation period is expected until 2025, shrinking the inflated competition to a healthy size.

5. Mid-term Market Development of global Car-Sharing

Although car-sharing will undergo substantial growth up to ~725k shared vehicles by 2025, it remains a niche service

Due to the substantial governmental-subsided growth in the last years, China is the largest market for car-sharing services today, followed by Europe and North America. Together, the three regions account for more than 285,000 shared vehicles (see Exhibit 8), but of which ~70% are located in China. Despite the Western car-sharing industry growing by 15 to 20% until 2025, the Chinese car-sharing market is expected to expand its leading position with an average growth rate of 25% per year (see Exhibit 8).

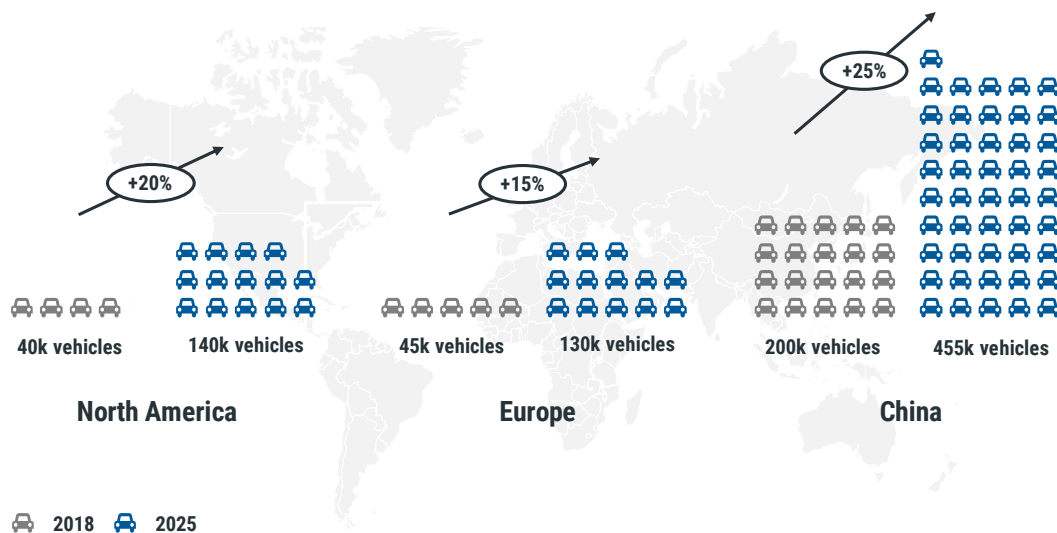


Exhibit 8: Largest car-sharing markets in terms of vehicles, 2018-2025;
Source: Strategy Engineers research based on Frost & Sullivan (2016)

By that the three regions will account for 725,000 vehicles in 2025. However, taking into account an estimated 100 million vehicles sold worldwide in 2025 and the low revenues for car-sharing providers per shared car, car-sharing is still expected to play a niche role within the automotive (mobility) industry. This might change with the introduction of autonomous vehicles. To read more about this change, take a look to the second part of the study.

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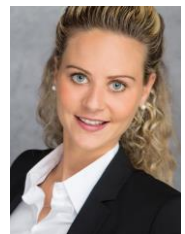
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