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# Possible Measures for Mobility Benefit Districts in Swedish Cities?

MBD15, WP2 report of Learning Cases in Stockholm and Sweden



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## Summary - how parking and mobility measures have worked

The purpose of the report is to show how certain types of measures for sustainable mobility and parking have worked in a handful of Swedish cases. The measures are governance, co-creation, public participation, using parking fees to finance local mobility services, limits to and charges on street parking and, finally, low parking requirements on housing estates. We call these measures MBD elements since they are examined from the perspective of being implemented together in a near future, in the creation of so-called **Mobility Benefit Districts (MBDs)**. The following is a summary of lessons learned from studies at KTH and Trafikutredningsbyrån (TUB) until now.

When it comes to **governance**, we believe that the most important lesson is that this can work well between municipalities, parking companies, developers and mobility providers in the planning stage for new residential areas and buildings. However, we have not seen any case where MBD elements have been effectively supported by governance in already built-up residential areas, nor in newly built ones after the first couple of years have passed since being moved in. The challenge is therefore to achieve long-term governance of programs such as green parking standards and mobility benefit districts, as well as of their constituent elements.

**Co-creation** (incl. two-way communication and trials) occurs very sparingly in the studied Swedish cases (although it can of course occur for other types of measures than those concerning mobility and parking). In one of the cases, the rental apartment building (with 30 apts.) in Västerås, pre-occupancy co-creation/communication involved two steps. The first was that those who queued up for an apartment were asked to indicate their interest and commitment to sustainability issues. Who was given an apartment was then based partly on the degree of sustainability interest. The second step was more formal co-creation, that is, designing details in their own apartments and common areas in dialogue (online and via physical meetings) with the developer. Our conclusion is that this form of co-creation contributed to the residents of the Västerås building living and traveling more sustainably than average and that their small carpool (including ridesharing within it) still exists about three and a half years after moving in.

**Public participation** is also a rare element of parking and mobility measures in Swedish municipalities. Our lesson here is based on the two city districts NDS (Royal seaport) and Gamla stan (Old town) in the heart of Stockholm. We have found that in the planning stage, participation did not take place to any sufficient degree. In Gamla stan it was only after that strong parking measures were implemented and residents started protesting that a participation process between the municipality and residents got underway. Therefore, public participation around mobility measures in Stockholm and other Swedish cities can be seen as reactive rather than proactive, and residents as well as officials can be seen as (only) potential dialogue partners and activists 'on standby'.

**Investment in local mobility services** is the element on which we have the most data in the Swedish learning cases. The mobility service that municipalities or developers most often invest in is carpools, the second most common is bicycle pools. Our conclusion is that these pools have the potential to become permanent and well-used if the operator has a sustainable business model and if they are launched and operated in a way that is adapted to the local context and residents' needs, which has been the case for a couple of the

residential buildings and neighbourhoods we studied. Other buildings and residential areas show a sample map of pitfalls for the introduction of well-adapted and viable vehicle pools.

As far as we know, **earmarking part of the parking fees to finance mobility services** has never been applied in Sweden. The state and municipalities have legislation and guidelines that, in simple terms, state that the purpose of parking rules and charges is to regulate traffic rather than using the revenue for measures that supplement – or create alternatives to – motoring and parking.

**Charges for on-street parking** as well as a **limited provision of street parking** have been applied to a large extent in our studied Swedish cases. It therefore seems likely that these measures can play an important role as elements of possible, near-future MBDs in larger Swedish cities.

The measure which unites all the cases was that they (were selected by us because they) involved **low parking requirements** on the housing estate.

## 1 Introduction – overview of six cases

The Swedish learning cases were selected to reflect the MBD elements as they occur in a Swedish context. We have chosen six cases, i.e. city districts or individual residential buildings. Some individual buildings have rental apartments, and other buildings are owned by the residents together, so called home-owners associations, hereafter abbreviated HOA. Below is an overview of the cases and some of their features in two tables, as well as a map of their approximate locations in Sweden.

Case name	No of flats	Car sharing scheme	Distance to town centre	Car dependency	Assessment of Local Mobility setting
Gothenburg House (HOA, City of Gothenburg)	133	Yes 2019-2023 (ended, was for residents only)	2,5 km (by boat) to the centre of Gothenburg	Low (but might be increasing currently)	Public transport and cycling quick to city centre.
Haninge House (HOA, Haninge municipality, Stockholm county)	85	Yes (residents only)	0,2 km to the centre of Haninge	Low	Walking quickest to local shops. Public transport quick to Stockholm City. Car quickest elsewhere.
NDS Royal Seaport (district, City of Stockholm)	3 000*	Yes (for all who sign up as members)	4 km to the centre of Stockholm	Low	Public transport and cycling quickest to most parts of Stockholm inner city.
Old town district (City of Stockholm)	Appr. 2 500	No	0,5 km to the centre of Stockholm	Low	Walking and cycling quick to town centre. Public transport quicker than driving.
Västerås House (rental)	30	Yes (residents only)	2 km to the centre of Västerås	Intermediate (Limited services nearby)	Cycling quick to town centre. Driving quicker than public transport.
Älvsjö House (HOA in the city of Stockholm)	157	Yes 2019-2023 (ended, had open access)	8 km* to the centre of Stockholm	Low, but currently increasing	Public transport and cycling quickest to most parts of Stockholm inner city.

Overview of cases and a few of their features. (\*In 2024, approximately 3,000 apartments were completed of those planned to be built in NDS from around 2005. There are also parts of the area with older housing.)

The below table shows for each MBD element in what learning case(s) it is represented. However, it is not yet the case in Sweden that a “portion of parking revenue finance mobility services”.

MBD element	Learning case(s)	Comment
Low parking requirements	All Swedish learning cases	See the sections on all cases, except ...
Limited provision of on-street parking in area	Most Swedish cases	See sections about the Västerås and Gothenburg houses, as well as the Royal Seaport/NDS and Old Town districts, City of Stockholm
On-street parking charges implemented in area	Most Swedish cases	See especially subchapters about NDS, Old Town and the Haninge house
Communication, information and trials	Only the Haninge house	See subchapter about the Haninge house
Investment in local mobility services	Most Swedish cases	See sections about the NDS district and Västerås, Haninge and Älvsjö houses
Portion of parking charges financing mobility services	<u>None</u> of the Swedish cases	
Public participation and co-creation (e.g. through participatory budgeting)	Old town and the Västerås house	See subsections about Old Town and the Västerås house
Governance issues of MBD15 interest		See subsection about the NDS district, City of Stockholm

Mobility District elements and from what cases we learnt about them.

A main MBD15 learning case in Stockholm is the Royal Seaport (in Swedish: *Norra Djurgårdsstaden - NDS*). Supplementary cases in the City of Stockholm are Old Town (in Swedish: *Gamla stan*), the Älvsjö house (HOA On Track). Another supplementary case in the County of Stockholm is the Haninge house. In addition, there are also two cases in mid to west Sweden, the Gothenburg house and the Västerås house. When relevant and informative we will also refer to a residential area (Bäcklösa) in the City of Uppsala as well as two of the so called ‘*Stockholm houses*’ (in Bandhagen and Farsta). For all the (rough) locations of these cases see map further below.

### 1.2 Motivation of the selection of the Swedish cases

The Gothenburg house case we present here based on its subsidized car sharing system, with its specific advantages and drawbacks that appeared during the studied three-year-period.

The Haninge house also presents learnings around its long term and quite stable car sharing system. In this case, there are also learnings about the MBD element “communication, information and trials”.

The NDS - Royal Seaport district (City of Stockholm) illustrates governance issues in the Swedish context, as well as a few innovative measures such as on street parking for car sharing cars.<sup>1</sup>

The Old town district (Stockholm) specifically presents lessons about the MBD element "public participation and co-creation", as well as about liveability and the use and parking of private cars, also in relation to acceptability and governance aspects.<sup>2</sup>

The Västerås House (rental) offers long-term parking only at a longer distance and higher cost than average, as well as some participation and co-creation during the planning and construction phases.

Finally, the Älvsjö House (HOA in the city of Stockholm) illustrates certain long-term success factors versus pitfalls for vehicle sharing schemes as well as parking regulations. One pitfall for the recently dismantled carpool was that it was open to anyone who signed up as a member.



Map. Learning cases in Sweden and Stockholm

<sup>1</sup>The City of Stockholm's sustainability positions regarding street parking have slowly moved forward over time in Stockholm. Zero point five (0.5) in number of parking spaces/newly built apartment was quite radical in 2010. It can also be considered quite radical that the city redefined street to plot of land in NDS and obtained 35 carpool spaces there.

<sup>2</sup> It has shown that residents do not only want land in the inner city to be freed up for greenery and outdoor 'seats'. In Old town inhabitants and smaller local businesses demand – through their village community - commercial and public service facilities as well as generous parking times for building renovators as well as dog resting yards and other things they think contribute to liveability for inhabitants.

## 2 Descriptions of the cases

The six Swedish cases are presented below in alphabetical order.

### 2.1 The Gothenburg house

The house is an apartment building named “Brf Lindholmospiren” (“Brf” means HOA / homeowners association / condominium). It is located approx. 3.5 km from Gothenburg's city centre, adjacent to an area with workplaces (Lindholmen Science Park) and a large shopping area. Residents are of several nationalities with mainly white-collar jobs in companies in Gothenburg. The Gothenburg house has 133 condominium apartments, was built by Skanska Sverige AB, and move-in took place during the period Nov 2018 - Jan 2019. The house attracted our interest because of the special car-sharing pricing at the start (see chapter 4 below).

### 2.2 The Haninge house (Greater Stockholm)

The Haninge house is an apartment building named “Brf Blicken”. It was planned and built by *Riksbyggen* and is still administrated and managed by Riksbyggen in a contract with the HOA board. We selected this house for a long-term study within the framework of a previous research project by KTH and Trafikutredningsbyrå (TUB). The selection criteria were that the association should be in a good public transport location, which could create conditions for living without own car, and that it should be in the right phase in terms of time to be able to be followed during the planning and construction process, moving in, and for some time afterwards. For developers and municipalities, it was thus possible to adapt parking availability and mobility services, also on a research basis. Below is a brief description of the condominium association (HOA) and which parking solutions and mobility services that are/were offered.

The HOA was the first stage in an ongoing larger urban development project (Haningeterrassen with approx. 600 apartments) in Haninge municipality. The association has 87 apartments with an average apartment size (2-5 rooms, plus kitchen and bathroom). The property lies on top of an underground bus station and right next to the Handen commuter train station. This means that access to public transport is good, especially for travel into central Stockholm by commuter train, a journey of about 25 minutes. HOA Blicken is also within walking distance to the centre of Haninge with a range of services, e.g. stores, pharmacy and a public library.

As the Haninge house lies on top of a bus terminal, it is not possible to build underground garages under each residential building. Instead, parking for the entire Haningeterrassen uses a common parking facility. The parking facility was not ready at the time of moving in in September 2018, but the households in Blicken initially had access to a temporary surface parking lot with 40 parking spaces (parking fee SEK 500/month). In December 2019, the parking facility was completed and the parking fee there was SEK 1,000/month).

The following mobility options have been available in the Haninge house:

- An electric car pool by the provider OurGreenCar, with two cars only for residents in, subsidized by the developer and where residents pay an hourly fee for use (upon moving in SEK 69/hour, previously SEK 49/hour). Provided by OurGreenCar. Membership was included in the fee (at least)

until the end of 2023. This carpool is still working well, and the HOA Board has decided to continue with it beyond the stipulated five years (that ended 2023/2024).>

- A bicycle pool with two electric bicycles and two electric cargo bicycles financed by the building operator (from May 2019). The bikes were stolen in 2020 and have not been replaced, which means that there is no longer a bike pool in the property. The bicycle pool is free for three hours per day and then it costs SEK 10 per hour.
- A free monthly pass (or travel fund with the equivalent amount) on public transport.
- Meeting with a trained travel coach who answers the residents' questions about the services and helps residents get started.
- Mobility evening with the opportunity to try pool cars and bicycles, meet taxis, rental car suppliers and travel coaches, etc.
- Try-out offer with a discount on taxis and rental cars.

A challenge for Riksbyggen and Haningeterrassen is that there is no room for more parking spaces on the property. If the demand for parking in the earlier stages is too high, there is a risk that not all of the planned housing in Haningeterrassen will be built.

For more information on the parking and mobility services, see Johansson, Henriksson & Envall (2019).

### 2.3 NDS – Royal Seaport district, City of Stockholm

Norra Djurgårdsstaden (abbr. NDS; branded in English as the Royal Seaport) is described as one of Europe's largest urban development areas. It is planned to include 12,000 new homes and 35,000 workplaces. Former industrial land is being transformed into a “green and vibrant” part of Stockholm, a sustainable urban district with schools, preschools, parks. A significant part of NDS is completed, with further developments coming. NDS is located 3-4 km to the northwest of central Stockholm (midpoint Sergels Torg). Travelling by bus (No 75) and underground (Red Line to Ropsten) takes around 15-25 min including walking. Travelling by car from the city centre to NDS takes 10-30 min depending on time of day.



Figure 1. Map of the NDS development site. Blue areas are those completed where around 7 000 people live in approximately 3 160 apartments. Pink areas are under construction. Yellow and grey areas are under planning.



Figure 2. Aerial photo of the Brofästet block located next to the Husarviken canal. Photo: City of Stockholm, E. Cung Dinh.

The NDS development has been guided high ambitions in terms of climate and sustainability. These ambitions have changed over time from less to more determined. So far parking and mobility have been implemented in a site-specific manner including 0,5 parking spaces per flat (Brofästet and other completed blue areas). Future developments will be guided by a mobility score guideline (Mobilitetsindex) to push developers and zoning towards sustainable mobility. The mobility score includes amongst other things that developers are required to take greater responsibility for shared mobility services such as car-sharing and increased standard of cycle parking. It also gives developers freedom to reduce costs for garage construction and replace it with more ambitious shared mobility services and sustainable mobility offers.

The mission for the area is defined by the City of Stockholm’s Programme for Sustainable Urban Development revised in 2021<sup>1</sup>.

Table 1. Overview of our understanding of Mobility Benefit District elements implemented in study area.

Elements	NDS study area	Comment
Lower than usual parking requirements or flexible parking requirements	Partly	Not lower than usual parking requirements. (early phases 0,5 spaces per flat). Future phases apply flexible parking requirement (mobility index). Developers has so far <u>not</u> chosen to add mobility services above a certain threshold in order to lower parking supply under 0,5 spaces per flat.
Limited provision of on-street parking in area	Partly	Parking bays on most streets. Less on-street parking in area than traditional inner-city

		areas. Future areas planned with less on-street parking.
On-street parking charges implemented in area	Yes	On-street parking is priced so that residents owning cars in practice need to have another primary parking location. On-street residential parking discount is not available in area (in contrast to almost all other districts in Stockholm).
Communication, information and trials	Yes (mainly directed at developers, real estate owners and larger companies/premise tenants)	Extensive activities led by the City Council to push developers to implement sustainable solutions, including a competence program that is mandatory for developers, a dialogue on the Mobility Index which applies (instead of the standard flexible parking requirement), and the NDS Innovation programme.
Investment in local mobility services	Limited	Indirect by reserving land for car sharing services. Car sharing operators can lease these parking bays from city council's parking company (141 EUR/month per space, .
Portion of parking charges financing mobility services	No	
Public participation and co-creation (e.g. through participatory budgeting)	Limited	Compulsory public consultation of detailed plans (only few details on mobility)

Car-sharing might be described as a key and so far only additional mobility service in the area in addition to public transport and cycle infrastructure. Car-sharing is operated by commercial companies such as Kinto, Aimo Share and Volvo on Demand. There is a total of around 30 car-sharing vehicles available (October 2024). The vehicles are station-based placed mainly at the 35 dedicated on-street parking bays provided by the city.

Table 2. Location and number of dedicated parking bays provided by the city administration by a specific process.

Location (street)	No of bays	Charging facilities	Comment
Settergatan	6	Yes	Kinto.
Jaktgatan	15	Yes	Volvo on Demand, Aimo
Slåttervallsgatan	7	Yes	Volvo on Demand, Aimo
Lövängsgatan	7	Not available	Kinto, Volvo on Demand
<b>Total</b>	<b>35</b>		

Cost of parking a private vehicle is relatively high in NDS. The location and regulation of surrounding areas mean that there is very limited opportunities to find cheaper parking within walking distance.

Table 3. Parking prices across a few Learning Cases and lowest cost for parking a private car.

Learning case	Lowest practical monthly price for parking a private car	Type of parking with lowest price	Typical price for private parking bay (per month)	Daily price for on-street parking	Discounted residential parking permits	Comment
Norra Djurgårdsstaden, Stockholm	110 – 135 EUR	Private underground garage, city-owned surface car park	110- 217 EUR	15 EUR (weekdays) Sundays free of charge.	Not available	Limited possibility to find cheaper parking outside the neighbourhood.
Lincoln, Darmstadt	60 -105 EUR (until 2023 some free parking available)	Above-ground car park close to flat (60 EUR).	Not available	7.50 EUR	Not available	To some extent possible to park cheaper outside the neighbourhood (Selzer 2022). On-street parking in area to large extent free of charge until 2023.

Below is a table describing car-sharing vehicle supply in the MBD learning cases per 1000 inhabitants.

Table 4. Car-sharing vehicles per 1000 inhabitants in the Learning Cases

Operator, city/ neighbourhood	Car-sharing vehicles per 1000 inhabitants	No of station-based car - sharing vehicles	No of residents in city/ neighbourhood	Comment
Norra Djurgårdsstaden, Stockholm (2024)	4,3	30	~ 7000	4 B2C operators. MBD Learning Case
Lincoln, Darmstadt (2024)	2,3	7	~ 3 000	1 B2C operator plus tendered operator (same company). 5 vehicles available for local residents only. MBD Learning Case
City of Stockholm (2023)	1,6	1630	~ 989 000	10 B2C operators, 1 community-based car-sharing club
Aspern Seestadt, Vienna (2024)	0,9	11	~ 12.000	3 B2C operators, 1 community-based car-sharing club & individual P2P sharing via getaround platform. MBD Learning Case
Sonnwendviertel, Vienna (2024)	0,8	8	~ 10.000	2 B2C operators, 2 community-based operators. Additional B2C operator with around 20 cars operator 10 min walk away (ÖBB). MBD Learning Case

The results in the table may be used to feed into the oncoming design of living labs and prototypes of MBD in the project. Especially due to the challenge of providing parking spaces for a car-sharing expansion in Swedish dense urban area (considering the regulatory limitations that Swedish local authorities experience when it comes to using already built public streets for dedicated car-sharing parking).

#### 2.4 Old town district, City of Stockholm

Around 3,500 people live in Old Town, approximately 650 of them have a residential parking permit for Stockholm's inner city (includes the whole inner city, i.e. *Södermalm*, *Norrmalm*, *Östermalm* and *Kungsholmen*).

Around 2019, a proposal came from the consulting firm Tyréns to remove all parking spaces on *Skeppsbron*, the eastern shore quay of the island. An inhabitant managed to get that proposal tabled, in the traffic committee or equivalent, with the motivation that it needed to be investigated further. Around that time members of the civil network Old Town Community were in contact with the Slussen project (the complete rebuilding of the water locks between lake Mälaren and the Baltic sea, and all traffic between Old Town and *Södermalm*). Representatives of this project, as well as civil servant at the traffic office. That time the dialogue went well from the involved inhabitants perspective and led to some re-posting of parking signs on *Skeppsbron*. The re-signing meant that residential parking was allowed there, but only on evenings and weekends (for some of the parking spaces).

Around the turn of the month October-November 2023, the traffic committee introduced the so-called urban environment zone for Old town. Since then, some inhabitants have tried to work on that issue in various ways. They believe that there has been no dialogue between any of the citizen or interest organizations in Old town and representatives of the city, because the city has not yet wanted it. In March 2024, the environmental city councillor announced the news about the urban environment zone and sought contact with the so-called G6 group, consisting of six civil society organizations in the Old Town, the business association, the Old Town Community, *Stockholmsgillet* and others. But it seems that it has not yet developed into any dialogue. The first step of this dialogue took place on the 17 June 2024, in a meeting ("Dialogue about the urban environment zone!") organized by the city administration and open to residents and residents of the Old town as well as anyone who wanted to participate. At this meeting, a handful of the city officials who during the winter/spring worked on converting parking spaces in the Old town informed about what was planned and planned, and why. They were met with a lot of complaints and critical questions from the approx. 60 participants, but also with praise from a couple of people.

Wishes and demands of the various interest organizations include that they want to be able to sit down and discuss with politicians and civil servants. Secondly, they want a suitable residential parking just outside the Old Town. Before, they had resident parking in the *Katarina* garage, very near Old town. There they could park their cars for a fee that was only a few hundred Swedish kronor higher than normal residential parking, that is, in the order of sixteen hundred kroner per month. And then they want the parking lots to be "made more efficient and tailored to different needs of city dwellers" on *Skeppsbron*.

An interpretation is that inhabitants propose a place, for example a parking garage where a car can be resident-parked for several weeks without being used, and in addition keep having residential parking on specific streets of the Old Town much like before, for those

who use/park their car more often. (An additional complaint about the recent measures concerns the two so-called utility parking lots, with currently a total of about ten parking spaces set up at each end of Gamla Stan. Suppliers and craftsmen may stand there for a maximum of three hours, which they believe is far too short a time for e.g. craftsmen who need to carry out restoration work with heavy materials in the old buildings.) The civic organizations seem to advocate roughly the following three points:

- The parking lots need to be restored to the way they were before May 2024, and the city needs to take measures that create rotation on them (e.g. cleaning nights with no parking even on Skeppsbron)
- The city needs to start a dialogue with the six citizen/interest organizations as well as with the roughly 200 property owners and the tourist industry in the Old town.
- The city and the city's parking company (*Stockholms Parkering*) need to get the Katarina garage in order and reintroduce residential parking there

It should be noted that the city has offered parking spaces for residents in another nearby garage (*Gallerian*), but at the regular rate (not the resident parking rate with surcharge, as was the case in the Katarina garage). In the Old Town itself there is only one garage (at *Slottsbacken*) with about 20 spaces. Finally, Some inhabitants hope that the appeal they made to the Administrative Court about the urban environment will be heard.

An example of how residents travel is a family who have "very active kids", that play sports all over the city. Therefore, they think they need two cars, that they use extensively for chaufferring the children, even if they don't use them for daily commuting. They say that if the new parking regulations become permanent, they plan to move, and also to move an own company from the Old town.

Another example is man who cycles a lot, but sometimes drives a car and then "he doesn't want to have to have it parked in a suburb". The rules for driving in Old town has for several years been such that they need to phone a Stockholm city help desk and get a dispensation each time they want to drive to their gates, for example to drop off goods. This is a type of regulation that they accept as residents of a historic city center.

In 2024 the City of Stockholm finally responded to the residents' complaints through two public meetings between the city officials, one politician responsible for traffic and the inhabitants. Greger Henriksson (KTH) listened in on these two meetings and made some observations and notes.

## 2.5 The Västerås house

The Västerås house is designed to be a climate-positive and eco-friendly rental property, built with a cross-laminated timber frame, a pine panel facade, rooftop solar panels and a battery storage system. The developer, owner and real-estate manager, *ETC Bygg* intend to promote a "sharing economy model for sustainable urban living". In terms of mobility, the project provides a shared pool of electric cars and bicycles. Parking facilities are limited, encouraging residents to rely on the provided shared electric vehicles and bicycles instead.

- Developer – ETC Bygg

- Building occupancy since – June/July 2021
- Parking type – 13 spaces according to building permit, 5 surface + 8 purchased in parking garage.
  - The five surface spaces are on-site with charging stations (only for those residents who need to charge electric cars).
  - The eight purchased spaces are in a parking garage owned by the City of Västerås stad, 200 m away – not dedicated.

A certain form of co-creation took place between the developer and potential tenants. The first aspect of co-creation was that those who heard about the project (e.g. via ETC's newspaper or the municipal housing queue *Boplats Västerås*) contacted the company and queued up for an apartment. ETC Bygg then asked them to indicate their interest and commitment to sustainability issues in questionnaire. 130 individuals or households filled in the questionnaire and queued to sign a lease in the house. Who was offered an apartment in the initial occupancy was based on the degree of sustainability interest persons indicated in the questionnaire. This queue still exists and people who are first in it are offered contracts when an apartment becomes available (telephone conversation with architect Hans Eek at ETC Bygg, 7 April 2025).

The second aspect of co-creation was that ETC Bygg encouraged the tenants to form their own local tenant association, which they did. This local association has a formal (regarding e.g. rent level) and more informal dialogue with ETC Bygg about management of, and measures on, the property. One measure that has been taken is that two of the residents have the role of gatekeepers, which gives them a small reduction in the rent (telephone conversation with architect Hans Eek at ETC Bygg, 7 April 2025).

Our conclusion is that this form of co-creation contributed to the residents of the Västerås building living and traveling more sustainably than average and that their small carpool (including ridesharing within it) still exists about three and a half years after moving in.

For more information on the carpool and the context of the Västerås house, see Johansson, Henriksson et al (submitted 2024).



Picture. Parking space at the Västerås house - only for charging electric cars.

## 2.6 The Älvsjö house, City of Stockholm

The apartment building is named “Brf (HOA) On Track”, and was planned and built by Bonava, but is no longer administrated or managed by them. This planned HOA house was also selected within the framework of the previous research project by KTH and TUB. The criteria were the same as for the Haninge house (see above). Below is a brief description of the HOA and which parking solutions and mobility services that are/were offered.

The Älvsjö house is an HOA with 157 small apartments (1 – 3 rooms, plus kitchen and bathroom) built by Bonava in Älvsjö. Bonava marketed the apartments to young adults who were going to buy their first apartment. The apartments are located a few hundred meters from the commuter train station and it is walking distance to the center of Älvsjö, where there is a range of services and a bus terminal. The range of public transport is very good and it takes about 10 minutes to travel into central Stockholm by commuter train.

HOA On Track was built in stages and occupancy was between December 2017 and September 2018. HOA On Track has a total of 38 parking spaces, of which 15 are in garages under the building and 23 are surface parking along the commuter rail track. During the earlier stages (Dec 2017 – Sept 2018) there were only the garage spaces. The surface parking was only completed in September 2018. Parking in a garage costs SEK 1,200/month and parking on a plot of land costs SEK 600/month.

The following mobility services are/were offered in the Älvsjö house:

- Two car pool cars (one car before Sept 2018, then two cars) initially provided by Sunfleet, and since 23 September 2019 by ‘M’, and later by Volvo on Demand. The cars were parked in the garage before September 2018 and then moved out to the lot parking on the estate. Membership in the car club is included in the fee for 5 years. The subscription was

appropriately included for accommodation in On Track (the price per hour was SEK 110 with 300 free km).

- Bicycle pool with 2 electric bicycles (of the Rawbike type) and 1 electric bicycle. It cost SEK 10/hour to rent the bikes. The bikes in the bike pool were stolen in 2019 and have not been replaced. There is no longer a bicycle pool in the association.
- A free annual pass with SL for households that do not rent or queue for parking. The offer went to first-time buyers only.

One pitfall for the recently dismantled carpool was that it was open for anyone who signed up as a member, not only residents in the house or town block. It seems that this contributed to that the HOA (board) lost the spirit of it. Our conclusion is that something like a Mobility Benefit District could have provided conditions to maintain a vehicle pool in the Älvsjö case. For more information on the carpool and the context of the Älvsjö house, see Johansson, Henriksson & Envall (2019); Johansson, Henriksson et al (submitted 2024).

### 3 Key actors of the implementation in City of Stockholm (NDS, Älvsjö and Old Town)

Key actors include the City of Stockholm (politics and administration) with its planning law and statutes, project developers (with contracts for building on land owned and regulated by the city). The city-owned parking corporation (Stockholm Parkering AB) has a key role for leasing dedicated car-sharing parking bays to operators. Stockholm Parkering will in future phases construct and own multi-storey underground garages.

Developers include private companies such as JM Einar Mattsson, HSB, Oscar Properties, Riksbyggen and Stockholmshem, a publicly owned housing corporation.

Our interviews indicate that at least for NDS the city administration has found it challenging to engage the public transport administration (Trafikförvaltningen) during the implementation. Trafikförvaltningen is the public transport operator in the area. It is governed by a regional parliament separate from the City of Stockholm politics.

### 4 Socioecological effects on car ownership, car use and liveability in NDS and elsewhere

When it comes to the use of shared cars, the Swedish cases illustrate potential pitfalls as well as success factors in terms of how the carpools are provided and operated. In the Gothenburg house a specialized and relatively small company, *MoveAbout* delivered and operated the carpool. The carpool opened in February 2019 and was for the use of HOA residents only (i.e. not for other MoveAbout customers). In addition, it was free for each member household for up to ten hours a month. Through an interview (7/3 2024) with a MoveAbout employee, we learned that the initial pricing, including the ten free hours, lasted well over the first year. The use of the cars rose and became high during this period. The prices for using the cars later became more average, i.e. around € 9/hour (with the first 150 km free and each km above cost € 1.30). MoveAbout linked the free ten hours offer to the booking rule that the user could not have more than two current bookings. However, there were some problems among users and in the booking-system around enforcing this rule and charging for hours beyond the ten 'free' ones, which led to some 'extra work' for MoveAbout's staff.

MoveAbout's original agreement was with the developer Skanska. The cost for them per pool car parked and used in the HOA was in the order of € 900 per month, a cost that the developer paid until November 2021. Through the interview (7/3 2024) it became clear that this agreement and several similar ones were not sufficiently profitable for the company, which to some extent seems to have contributed to MoveAbout being sold to a new owner around the turn of the year 2023-2024.

The interview (7/3 2024) also revealed that already in the fall of 2021, the HOA board was surprised that the contract between Skanska and MoveAbout was about to expire, and the carpool would thus end. Eventually, the HOA board and MoveAbout negotiated a one-year extension for 2021-2022. When this period, as well as the 5-year period stipulated in the building permit, was about to end, a new agreement was discussed, with new conditions and pricing. MoveAbout presented two options for a new agreement, one with still 10 hours of free use and one with booking fees for all use. However, the HOA board chose to turn down

both options and therefore the car pool in Gothenburg House ended at the beginning of 2023. According to board members, one reason behind this decision was the limited budget space the HOA had to purchase optional services. For more information on the carpool in the context of the Gothenburg house, see Johansson, Henriksson et al (submitted 2024).

In other cases of carpools in new HOA:s with flexible parking standards and mandatory car sharing schemes, e.g. in the Älvsjö HOA, we have seen a similar patterns of the schemes not continuing after the stipulated five years.

In the Haninge house (HOA), the developer Riksbyggen chose to procure a so-called closed car-sharing, available only to households in the HOA, from the time the house was moved in (2018). The carpool provided the HOA with two (and later three) electric cars, that after a couple of years reached a stable and comparatively high level of use. It was initially, in line with conditions issued in the building permit, subsidized by the developer. The residents pay an hourly fee for use (€ 6/hour) to the provide, OurGreenCar. Membership in the carpool was included in the yearly fee to the HOA (at least) until the end of 2023. The carpool is still working well, and the HOA Board has decided to continue with it beyond the stipulated five years (that ended 2023/2024).

It should be mentioned that in the case of HOAs, the developer hands over the responsibility for the car-sharing agreement to the association and its board when it is established. This handover has been completed in the Haninge building and the HOA board has chosen to extend it with the same car-sharing supplier after the first mandatory five years (which was agreed between Riksbyggen and the car-sharing). Worth mentioning in this context is that OurGreenCar specializes in providing car-sharing to HOA:s with flexible parking standards, which so far appears to have been a functioning business model (see Kriukelyte & Johansson, submitted; DN, 2024). Regarding booking rules, conditions and customer service, we have found through the interviews with residents that they have worked relatively satisfactorily and have not changed very much during the first five years in the Haninge house. There have been problems with technology for booking, unlocking and charging the cars, but these seem to have been fixed continuously. The price per hour and km has been at an average level, which is probably connected to the fact that the electric cars belong to the category with a relatively low purchase price (see Table 2). There is also a profit-sharing agreement between the car-sharing company and the HOA, resulting in lower cost for the HOA the more the service is used. For more information on the carpool in the context of the Haninge house, see Johansson, Henriksson et al (submitted 2024).

Official statistics show that car ownership levels in NDS are 0,41 cars per household and 0,17 cars per resident in the area.

Table 5. Car ownership in NDS and other areas.

Area	Population	No. of households	Average household size (no. of people incl. children)	No of registered cars (owned by residents)	No of cars per household	Cars per inhabitant	Annual median income (year)
Norra Djurgårdsstaden, Stockholm	7 006	2 959	2,4	1 200	0,41	0,17	Ca 48 100 € (2022)
City of Stockholm <sup>2</sup>	~ 989 000	480 027	2,1	189 293	0,39	0,19	34 275 € (2022)
Aspern Seestadt, Vienna	~ 12 000 (2024) 13 452 (Oct/2022)	5 900 (no. of households in Oct/2022)	~2,3	n.a.	-	-	n.a.
Sonnwendviertel, Vienna	~ 10 000	4 265 (no. of residential units)	~2,3	n.a.	-	-	n.a.
City of Vienna (31.12.24)	2 006 134	966 695 (projection)	~2,1	572 951,9	0,59	0,29	30 837 € (2022)
Lincoln, Darmstadt	~ 3 000						
City of Darmstadt	Awaiting response						
Sundbyberg town centre (WP3 MBD Prototype)	18 564	10 300	1,8	4 471	0,43	0,24	Ca 38 200 € (2022)
City of Sundbyberg	55 912	26 917	2,1	12 901	0,48	0,23	34 532 € (2022)

We have also compared changes in car ownership between the Swedish case study houses that were moved in with car and bike sharing as compensation for a relatively high price and/or low availability of parking, see figure below. Decreased car ownership was seen in the houses in Haninge, Västerås and Älvsjö, and possibly also in the one in Gothenburg. No change was indicated in the residential area in Uppsala, nor in the two so-called *Stockholm houses* in Bandhagen and Farsta in Stockholm (otherwise not included in this report). There was plenty of free street parking in the immediate area in the housing projects in Bandhagen and Farsta but not in Uppsala.

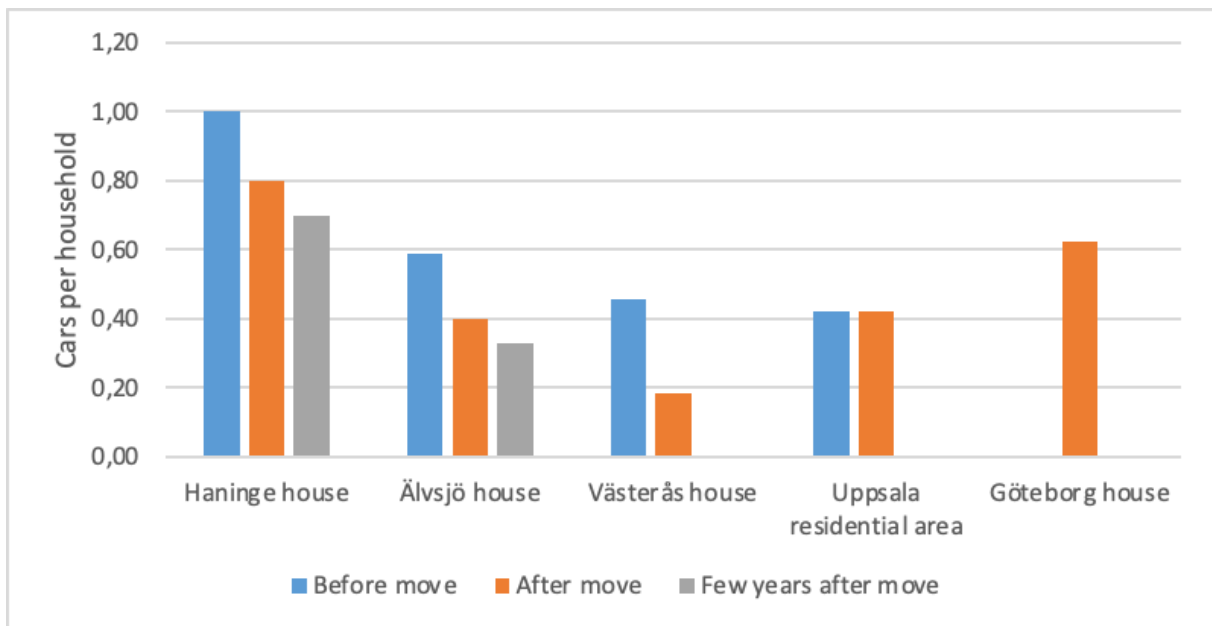


Diagram. Car ownership in the houses studied. Data from surveys.

Regarding parking price. In previous research TUB and KTH have used lowest practical price for parking a private car in area/ nearby ones home, sometimes complemented by lowest cost of parking a private car on public streets in neighbourhood. This as a way to describe that the price competitiveness for car-sharing may be very different in different neighbourhoods (think no of car-sharing trips that equal parking costs only per month). Areas that we studied before that looks really similar can have very different costs of private ownership in practice with monthly lowest parking costs being zero in one area and well over 100 euros per month in another area. See example in the below table, comparing houses (showing that residents in the Haninge house can quite easily can park for free.

Table 6. Off-street and on-street parking pricing and availability (years 2018, 2021-2023)<sup>11</sup>

House name	Price for private parking bay onsite (per month)	Price for cheapest on-street parking nearby (no of spaces)	Level of competition for lowest priced on-street parking in evening/ at night	Comment
Västerås House	Not available (1000 SEK approx.. 200m away)	700 SEK (16 spaces)	High (100 %)	Private bays available for monthly hire in multi-storey garage built by council by mandatory developer contribution (1000 SEK/month).
Gothenburg House	1400-1750 SEK	250 SEK evenings- and weekends (65 spaces)	Not known	Abundant priced off-street parking available in area in evenings and throughout weekends. Higher competition during office hours. Residents have not access to subsidised residential parking on public streets.
Haninge House	1000 SEK	Free (190 spaces)	Moderate (60 % occupancy)	Fees introduced on-street in January 2022 (500 kr/month) and removed again in December 2023 partly replaced by 2h time restrictions. Higher competition on-street during office hours.
Älvsjö House	600-1000 SEK	Free (at least 50 spaces)	Moderate (65 % in afternoon)	Walking distance to free parking areas 200-500 m. Free on-street parking eliminated around year 2020.
Uppsala neighbourhood	300-400 SEK	1020 SEK (19 spaces)	Not known but availability very limited	Very limited supply of on-street parking nearby. Eight month waiting time likely for accessing onsite private parking bay (300-400 SEK/month).
Farsta House	200-400 SEK	Free (150 spaces)	High (75 % at 7-9 pm)	Several years waiting time likely for accessing onsite private parking bay.
Bandhagen House	483 SEK	Free (357 spaces)	High (87 % at 7-8 pm)	Lower occupancy on-street during daytime.

We have earlier used the data on parking price to inform two discussions, i.e. what is the right price for parking and how does parking price affect car-sharing competitiveness (and car ownership levels).

Interviews with the city's experts were performed in March 2024, regarding the NDS city district. The experts interviewed included key staff responsible for the parking and mobility solutions in NDS. The interviewees expressed that they *"had struggled to find models..." for parking management that does not lead to subsidizing private garage spaces*". Our informants report that the city has devoted significant effort to substantiating the parking requirements that have been and will be set for NDS regarding housing, offices, and commercial spaces.

*"We discussed this quite extensively at the start [of the NDS project], about a fair distribution of costs [for parking garages]. It's absolutely not a fair distribution in the initial phases. There, half a parking space per apartment has been built, but all apartments share the costs. That's how it is."... "It will be somewhat the same [in future phases] too. - We have struggled to find models [to move away from] that. Unfortunately."*

If the interviewees were to start over again from scratch, they would like to *"find a model where those who use cars pay for their parking space, so it doesn't become a cost borne by everyone. But it's extremely difficult to find a model for that. - Yes. - It's difficult, it's extremely difficult. - It's not just a neighborhood issue [either], it involves national legislation, political will, and so on."... "Sure, other approaches could be tried if there were political acceptance for it"*.

Another point that the interviewees mentioned as something they would, in hindsight, like to have done differently is the *"business models for car sharing"* in the area. *"-But we don't have any control over that... Car sharing in Stockholm consists partly of large, expensive cars. This means car sharing isn't particularly affordable. It would be interesting if you discuss with car-sharing companies and their business models."... In the area, car-sharing usage has remained constant over the years and hasn't increased..."*

A challenge conveyed by informants is that it has taken about 7-10 years from the start of research and design until the city plans were legally ratified. Then, it takes another 3-4 years before the buildings are completed. Requirements set for mobility measures in land allocations, mobility indices, and planning documents risk becoming outdated and somewhat obsolete due to the long time between the city's requirements being set and residents moving in, given the rapid changes in this field.

The interviewed experts indicated that the city's officials wanted the goal of 100% fossil-free commercial and personal transportation by 2030 in the district to be removed. The informants do not believe this goal can be achieved at the neighbourhood level and that it needs to be a broader city-wide objective. However, the administration's input was not

heeded, and the goal remains. The informants feel that carbon-neutral transportation is not a neighbourhood issue, “It isn’t. It’s largely a national issue.”

Regarding liveability, we have seen in a seventh case, the suburb Bäcklösa<sup>3</sup> in Uppsala (otherwise not included in this report) a certain degree of so-called transport poverty, as well as a certain mismatch between the resources of the inhabitants on the one hand, and price, conditions of use and technology level of public transport bike and car sharing on the other. KTH’s ongoing studies have e.g. revealed obstacles for a large proportion of residents to be able to book and use the pool bikes, as well as to manage linked errands in the time frame of a single PT journey.

## 5 Acceptability of measures in NDS

NDS is a new development area that people are moving into. The residents have moved in under the existing conditions, but they can naturally compare their living situation to other places they are familiar with or have lived in. Generally, the new residents are satisfied with living in the area, according to surveys. However, complaints have surfaced about the lack of overnight street parking for residents and that, like in other areas of the city, residents do not have access to subsidized residential parking permits. Here, our informants point out that there are many limitations in Sweden on how parking fees can be charged, which restrict the goals set for the area’s planning.

The developers in the area have been perceived by our informants as somewhat critical of several of the city’s requirements across various fields. The city has held extensive dialogues and training sessions with developers. In terms of parking and mobility, there hasn’t been as much discussion with developers, except concerning parking spaces for retail, where the city has set a relatively low maximum of six parking spaces per 1,000 square meters—a limit developers have found too low. In the residential areas of the upcoming phases, most developers have been content to meet the basic requirement without further investing in additional mobility measures to reduce parking availability. Here, one could imagine that MBD could play a role if developers could see that it isn’t them who need to finance both mobility measures and garage construction from their budgets. If a larger portion of the costs were instead directly applied to car ownership, more developers might be inclined to increase investment in mobility services and provide fewer parking subsidies.

## 6 Governance Challenges and Solutions in NDS (and elsewhere)

There have been, and still are (spring 2024), complaints from residents who moved into the NDS area about the lack of good public transportation. Lack of coordination and separate ambitions between the two bodies responsible for urban development and public transport has led to complaints from local residents claiming public transport services not being delivered to the standard initially expected. We have also been told that there to some extent been a discrepancy between the public transport supply planned and residents’ expectations<sup>3</sup>.

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<sup>3</sup> Bäcklösa is a neighbourhood with 486 rental apartments, located 6 km from the centre of Uppsala. Public transport is quick to central Uppsala, but for many of the places the residents go for work etc. driving is in general quicker, but car ownership is on the other hand quite low among the residents. The neighbourhood was built and moved-in recently and is owned by municipal housing company Uppsalahem, that provide car and bike sharing for residents (only).

The city experts partly view these demands from residents as justified since public transport was not in place for the first residents upon moving in, but also as partly stemming from residents' expectations exceeding what was actually promised. A challenge that informants have observed in the development of NDS is that, as the primary party responsible for urban planning, the city does not control the expansion and quality of public transport.

*"The difficult part [of planning to meet the city's goal of 'Easy to Live Without a Car' is that we can't promise anything. We can only create the conditions for public transportation to arrive."*

*"We have tried to get SL [the public transport authority] involved in our focus group. But they haven't shown up. We've really wanted to establish a partnership with them so they can understand our ambitions. They were involved for the first two years. Since then, they haven't shown up. This dialogue has been very difficult to maintain with SL."*



Figure 2. These Stockholmers have waited 11 years for their new tram line. Article from Stockholm's main newspaper. February 2024.

The MBD project presented the city experts were with an alternative model for financing garages for privately owned cars. This model is based on allowing car owners to purchase their garage space, similar to how people buy condominiums in the area. This would mean that the capital for constructing the garage would be visible to the car owner and ideally be transferred from the developer's total construction cost.

*"We didn't dive deeply into it, but we know there are [such examples]..." "We didn't go further in that discussion. Then the question arises: are there regulations for that? The housing associations and property owners could sell their spaces. But we want shared-use spaces, so I don't know if Stockholm Parkering AB would be involved. Stockholm Parkering AB also has a mission to build parking, but they need a certain level of funding for it." "And we want shared-use parking. That benefit is lost if one owns their space. That's why we want a large garage. Shared-use isn't possible if everyone owns their space [in a smaller garage under the building]."*

There is a “lack of regulations and legal framework that prevents us from governing as we need to” to achieve goals such as carbon-neutral commercial transport and other targets. “How that regulatory framework should look is another question. But it is very difficult to manage because many actors, including small private actors, are involved.” The city experts mentioned several regulatory frameworks. This includes legislation regarding how municipalities may charge for parking on public streets and the practical limits for these charges to, as the legislation states, “organize traffic.” There are also rules for environmental zones, camera surveillance, various parking charges based on vehicle emissions/size, and possibilities to direct towards increased occupancy rates. “These are issues that we, as the municipality, don’t control but where we would need better regulations.” Furthermore, the municipality is not allowed to designate reserved areas for car-sharing parking on streets in existing areas without first changing the site regulations in the detailed plan, which is seen as a regulatory hindrance.

One interviewee views Stockholm’s approach to providing space for car sharing in new neighbourhoods and bicycle-sharing in general as successful and interesting to compare with other cities. Bicycle-sharing systems have been partially procured by the city, and spaces for car-sharing in NDS have been planned as kerbside parking areas in the street environment, which are then rented out to car-sharing operators via the city’s parking company.

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