



THE CIVITAS INITIATIVE  
IS CO-FINANCED BY THE  
EUROPEAN UNION

# PARKING STANDARDS AS A STEERING INSTRUMENT IN URBAN AND MOBILITY PLANNING

How to make parking standards more sustainable



European Platform  
on Sustainable Urban  
Mobility Plans

## IMPRINT

### About

This publication has been developed within the framework of the Park4SUMP project, funded under the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement no 769072

Park4SUMP is a project under the CIVITAS Initiative. Read more - [civitas.eu](https://civitas.eu)

### Title

Parking standards as a steering instrument in urban and mobility planning  
How to make parking standards more sustainable

### Author(s)

Dr. Jürgen Gies (DIFU), Analysis WP leader of Park4SUMP

Martina Hertel (DIFU), Analysis WP leader of Park4SUMP

Susan Tully (ENU), internal quality control for Push&Pull and Park4SUMP project

### Acknowledgement

This publication is made possible thanks to the contributions made by organisations involved in the Park4SUMP and the Push & Pull project, all of whom are credited for their Respective contributions.

Also special thanks to the ECF for making reference to their recent report on Parking, Respective regulations for off-street bicycle and car parking in Europe.

### Disclaimer

The views expressed in this publication are the sole responsibility of the authors named and do not necessarily reflect the views of the European Commission.

### Copyright

All images in this publication are the property of the organisations or individuals credited. The content of this publication may be replicated and built upon.

Cover picture: Freiburg Vauban © FGM-AMOR / Harry Schiffer

**February 2021**



## TABLE OF CONTENTS

1. Introduction .....	5
2. Background .....	7
3. Current common practice in European Cities .....	11
3.1 Excursus: Lifecycle of a Household - how much parking is needed?.....	14
3.2 Excursus: Multiple use of shared parking spaces.....	14
4. Importance of regulation as a steering instrument for urban and transportation planning .....	16
5. Steering and design via standards in practice .....	18
5.1 London: Maximum Standards instead of minimum standards.....	19
5.2 Freiburg: Deviation from standards to develop a car-free neighbourhood in Vauban.....	20
5.3 Zurich: Restrictive standards for new developments .....	21
5.4 City of Mainz: Lower minimum requirements for car parking due to public transport bonus .....	23
5.5 Graz: Mobility contracts .....	23
5.6 Bulgaria: Minimum standards for bicycle parking .....	24
6. Examples for new developments: Standards to support liveable neighbourhoods ...	27
6.1 Darmstadt: Lincoln .....	27
6.2 Freiburg: Dietenbach .....	28
6.3 Zurich: Sihlbogen .....	29
7. How to deal with standards of the past? .....	31
7.1 Nottingham: Workplace Parking Levy.....	32
7.2 Zurich: 'Historic compromise' to freeze the number of parking spaces.....	32
7.3 Umeå: Green Parking Pay off and other developments.....	34
8. Improved Parking standards as part of the parking management strategy and its integration in SUMP - Key findings and outlook.....	37
9. List of References .....	39



Figure 1: Typical residential housing with parking aside.  
Source: Photo by Martina Hertel, Difu



# 1. Introduction

One of the fields of activities within Park4SUMP is parking standards. Parking standards are also known as parking requirements or parking norms. In this paper we focus on parking standards for new developments. New development is a broad term. It refers to new residential areas, but also to areas with mixed use of residential and commercial space, which is increasingly the focus of new urban expansion projects. Parking standards for purely commercial areas will not be considered in this paper.

Parking standards for new development regulate how much (car-)parking space is built. Parking standards were designed to instruct developers to build parking lots in relation to:


- The number of apartments (or size of apartments)
- The number of new offices/shops/workplaces etc.
- Regulations for malls, business areas, recreation areas etc. vary significantly

High requirements to build the fixed standards affect construction and maintenance costs of (new) buildings, create land use conflicts and severe environmental problems. Most countries have so called “minimum requirements”. That implies building developers can build more if they want. Fixed maximum car parking allowances limit how much parking is provided in new buildings in order to reduce costs and deal with all other named problems.

Approximately 80% of all journeys begin and end at the home, so that the availability of parking facilities at the home is of particular relevance for the choice of mode of transport. In addition, parking is a cost factor in housing construction and parking requires space,

which not only reduces the area that can be built on, but also takes up space for stay and play.

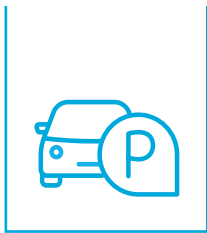
If your own car is the closest means of transport to your home, it is often the first choice. In this case a car needs additional parking spaces - at the workplace, at shopping centers and leisure facilities.



Summing up, there are a number of good reasons to consider parking standards. In the following, the basics of these standards will be developed and good practice examples will be presented. Parking standards are an extremely important steering instrument within urban and transportation planning!



**Figure 2:** A typical residential street outside the city centre in a German city, cars instead of citizens.  
*Source: Photo by Jürgen Gies, Difu*



## 2. Background

The private car as a status symbol, and especially as a means of leisure transport for wealthy sections of the population, has been spreading since the 1930s. In Germany, the “Reichsgaragenordnung”, which was intended to create parking spaces for cars and contribute to their spread, dates from this period. After the 2nd world war in most western European countries parking requirements were introduced because the car became a “must-have”. With the increasing prosperity of the population as well as the trend for suburbanisation the number of cars exploded.

European cities were not built for cars so all new buildings and all new developed areas had to provide sufficient off street parking space. Each new apartment should have its ‘own’ parking space. Office buildings, shopping centres and other points of interest (restaurants, cinemas, sports locations etc.) should provide enough parking spaces for customers, deliveries and employees. The idea was to keep the streets free for the flowing traffic and “prevent that a (new) location, for example an office building, generates parking problems in its vicinity, for example residential areas” (Mingardo 2016: 16). So, the parking standards were fixed in local, regional or sometimes national regulations in almost all European countries. The most frequent rule was and still is “one car parking space per apartment”. In rural and suburban areas the rule was, and still is, much higher: housing has an average requirement of 1.5 car parking spaces per household.

But by providing more and more parking spaces at the starting point of the journey the demand for parking increased at the end of the trip as well – at city centres, in shopping malls, in business parks and so on. Parking spaces in commercial properties depend on the square metres and the type of use. Instead of satisfying the demand,

the pressure to provide more and more parking spaces increased. More and more space – on-street and off street - was built or dedicated for parking but the pressure didn’t reduce.

The most frequent rule was and still is “one car parking space per apartment”.



Figure 3: Historical market dominated by cars instead of people. Source: Photo by Martina Hertel, Difu



**Figure 4:** Shopping centres and leisure facilities become traffic generators. *Source: Photo by Martina Hertel, Difu*



**Figure 5:** If on-street parking is free or cheap and readily available, nobody uses off-street parking. *Source: Photo by Martina Hertel, Difu*

So, the space consumed by car traffic and car parking became greater and greater. This has led, and continues to lead, to a problem, especially in cities, where space is scarce. Parking spaces cost and compete with other land uses. When too many parking spaces are built, they attract traffic. Shopping centres and leisure facilities become traffic generators, which, in addition to the environment problems, cause traffic jams and noise.

In the case of residential buildings, the obligation to build parking spaces for cars leads to higher construction costs and makes housing more expensive. Using less space for permanent parking saves space for other uses. Once a parking lot is built – especially off street – it is hard to change its use or initiate a transformation for other purposes!

The recent ECF-report comes to the conclusion: “There is consensus among

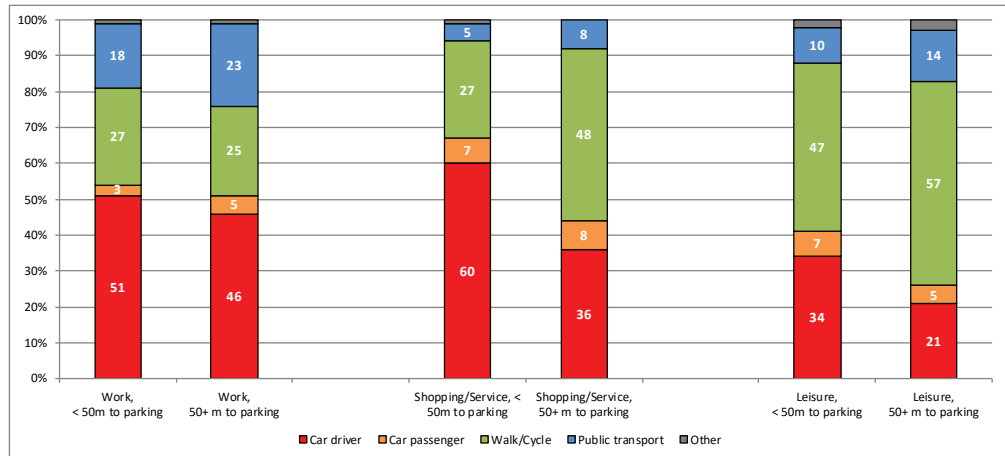
academic researchers that car parking availability induces car ownership and car use. Households own more cars, use them more often and drive them further if there is good access to off-street parking.” (Küster / Peters 2018: 6) Several studies show that the number, location, distances and comfort of parking spaces influence the attractiveness of private car use (for example Christiansen et al. 2017). It may lower the attractiveness of active transportation modes such as cycling and walking and the use of public or shared transportation.

There is a correlation between the availability of a parking space at a short distance and car ownership and car use, but there is no causation because of self-selection (Christiansen et al. 2017: 1493). For example: People who are willing not to use a car live in areas where they have good access to alternative modes of transport. New developments promoting alternative modes





**Figure 7:** French quarter in Tübingen, Germany, public space for people and not for cars.  
Source: Photo by Jürgen Gies, Difu



**Figure 6:** Car parking regulations across Europe (see foot note for comment on the regulation in France!).  
Source: Own presentation according to Christiansen et al. 2017: 4192

of transport are an offer to rethink mobility behavior and maybe nudge a change of routines.

As stated above the high requirements to build the fixed standards affected construction and maintenance costs, created land use conflicts and severe environmental problems. Three options for municipalities – if regulated on a local level - are possible to address these problems:

- Abolish the parking standard (no minimum requirement for car parking) in order to reduce building costs, examples are Berlin and Hamburg
- Permit developers to lower the minimum requirement for car parking if alternatives are available, for example if the development is in an area of good public transport accessibility – best practice from Vienna and Munich is available

- Fix maximum car parking allowances – limiting how much parking is provided in new buildings, examples are Zurich which has the most advanced approach of maximum parking standards for housing and Central London where the change from minimum to maximum standards took place in 1976 before being extended to the whole city

Experience with all three options – in various forms – show that parking standards are an extremely important steering instrument within urban and transportation planning!

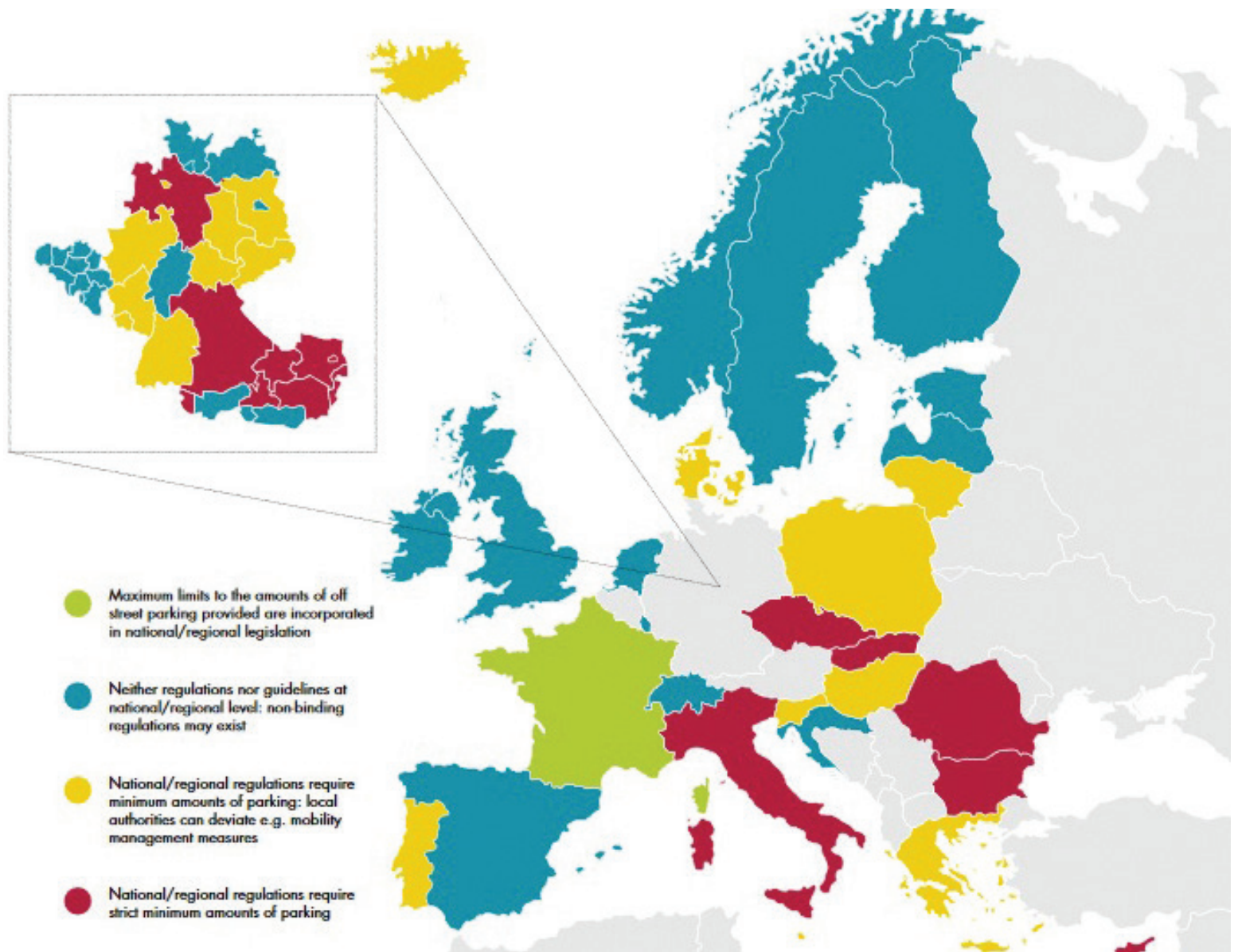


Figure 8: Car parking regulations across Europe (see foot note for comment on the regulation in France!).

Source: Küster / Peters 2018: 27

<sup>1</sup> It is important to notice for France they have a so called "roofed minimum" instead of maximum for housing. The national law says that local authorities can fix maximal norms for any construction, but housing. For housing local authorities can set up minimum if and as they want, but not above a certain limit. The regulation is multilayer. At first different kinds of housing are concerned, e.g.: Social housing, Student housing, Housing for elderly. For those housings, limit applies differently in different areas: Wherever you are, minimums fixed by local authorities cannot be above 1 place per housing. In a 500m radius around train / metro / tram station with a sufficient public transport quality (the "sufficient quality" being defined locally), minimums fixed by local authorities cannot be above 0,5 place / housing, for those housings. For any other housing, in a 500m radius around train / metro / tram station with a sufficient public transport quality (the "sufficient" being defined locally), minimums fixed by local authorities cannot be above 1 place / housing. The constructors are allowed to build more than the frame set up by the law. Even if this frame is a good incentive to build less car parking close to public transport infrastructure because constructors for housing often tend to stick to minimums, it is not a maximum and has never been. The authors thank Olivier Asselin (City of Lille) for this information.



### 3. Current common practice in European Cities

Parking standards for new development regulate how much parking is built – the legal framework can be national, regional and local regulations. Most countries have minimum requirements, but building developers can build more if they want. “Shoup (1999 and 2005) and Litman (2006) have discussed at length the problems related to parking requirements, the most important being the fact that “... urban planners neglect both the price and the cost of parking when they set parking requirements, and the maximum observed parking demand becomes the minimum required parking supply” (Shoup, 2005: p. 580).“ (Mingardo / van Weeb / Rye 2015)

Although introduced for an understandable reason, the minimum standards push up the cost of buildings and create urban areas that are dominated by car parking – space for cars, not for people.

Regulations for minimum and maximum parking standards can be used for different purposes. “Minimum parking standards are usually used when the local authority wants the project developer of a location to provide enough parking capacity in order to satisfy the demand generated from that specific location. The objective is to prevent that a (new) location, for example an office building, generates parking problems in its vicinity, for example residential areas. On the other side, maximum standards are mostly used in central areas, usually well served by public transport, and are meant to restrict the number of motorists entering the location.” (Mingardo / van Weeb / Rye 2015).

Parking standards can be used by local authorities as minimum or as maximum.

A general movement away from minimum standards towards maximum standards is

increasingly recommended, but is still far from common practice in European cities.

“In most European countries parking policy is a local policy. Each city and town is usually free to set the objectives of the policy and to select the policy instruments to implement it. National governments usually provide guidelines, mostly on parking requirements, but rarely interfere in policy making. The main reason for this is the recognition that parking is a local matter and that local authorities will deal with it better than will regional or national government.” (Mingardo / van Weeb / Rye 2015)

City	Maximum parking standards for new development	Comments
<b>Sint-Niklaas</b>	All over the city	
<b>Freiburg</b>	We only have minimum standards	
<b>Rotterdam</b>	We only have minimum standards	
<b>Umeå</b>	We only have minimum standards	
<b>Vitoria-Gasteiz</b>	All over the city	have minimum and maximum standards for new developments although there are some exceptions
<b>Gdańsk</b>	All over the city	there are also some parts of the city where we have minimum parking standards
<b>Krakow</b>	All over the city and related to public transport accessibility	
<b>Reggio Emilia</b>	We only have minimum standards	
<b>Sofia</b>	We only have minimum standards	
<b>Lisbon</b>	All over the city and related to public transport accessibility	
<b>Trondheim</b>	All over the city	Maximum parking standards only for shopping areas, workplace, commerce; not for housing (=> Minimum standard)
<b>La Rochelle</b>	We only have minimum standards	[We only have minimum standards] We only have minimum standards (but the minimum standards can be reduced when related/nearby to public transport accessibility – will apply end of 2019)
<b>Tallinn</b>	Maximum standard for downtown	minor regulation for other parts of the City
<b>Zadar</b>	We only have minimum standards	
<b>Shkodër</b>	We only have minimum standards	
<b>Slatina</b>	We only have minimum standards	

Figure 9: Maximum parking standards for new development in Park4SUMP partner cities.  
Source: City analysis Park4SUMP (January 2019)

In the City of Tallinn, the capital city of Estonia, an intensive debate about how to deal with parking standards is ongoing prior to finalising of the Sustainable Urban Mobility Plan - SUMP (June 2020). The old part of Tallinn has been a UNESCO World Heritage Site since 1997. For the inner city a minimum and maximum parking standard set the ratio of 1.2 car parking spaces per household and compensation payment is possible, so a fixed number has to be built but the number cannot be exceeded. For the suburban areas and outskirts of Tallinn the minimum parking ratio is 1.2 car parking spaces, but the developer can build as much as they want. Modifications are discussed and standards may change in accordance with the development of the SUMP.

Cities that have introduced maximum parking standard “for all or part of their areas, like Krakow, Edinburgh, Amsterdam or Ljubljana have not found that it stops companies from locating in their area – in fact, quite the opposite – these cities economies continue to grow strongly. The City of Oxford, England, stopped allowing parking to be built with new buildings in its city centre in 1973, but it too remains a highly successful city economically, and one with a very sustainable transport system.” (Rye 2017: 28)

While a general movement towards maximum standards is frequently recommended minimum standards are introduced for electric vehicles / alternative fuel vehicles, for car

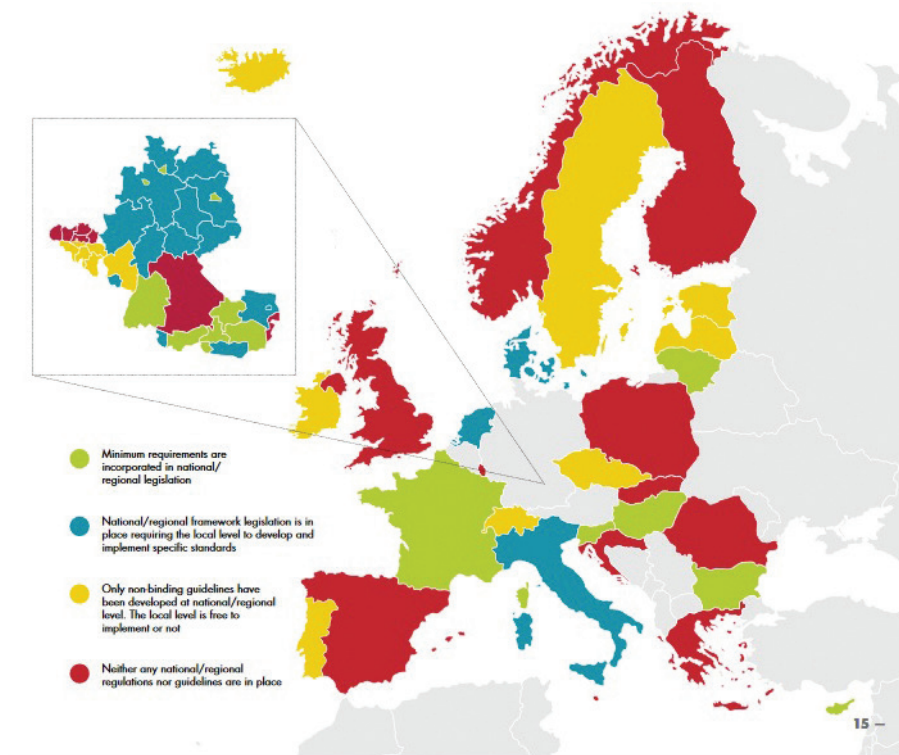


Figure 10: Bicycle parking regulations across Europe.  
Source: Küster / Peters 2018: 15

- Building costs **per** parking space (including cost for access) depending on property costs based on empirical values



- Plus: Annual operating costs between 2% and 8 % of the building costs

Figure 11: Costs of parking standards.  
Source: Martina Hertel, Difu and Martin Randelhoff, QIMBY.net

sharing parking and for bicycle parking. To promote the use of bikes there are also quality standards for bicycle parking established.

The underground car park accounts for about 10 percent of building construction costs,

which is usually split between all residents. It does not take into account whether they own a car or not. So the underground garages are usually co-financed by all tenants or residents.

### 3.1 EXCURSUS: LIFECYCLE OF A HOUSEHOLD - HOW MUCH PARKING IS NEEDED?

The typical life cycle of a family implies different parking requirements over time. For example, with the arrival of children, a car may be purchased for the first time. If only one parent works one car may be enough. If both parents are going to work,

two cars may be necessary depending on the location of the workplace. After the children move out and the parents are retired, there may again be no car in the household. The right number of parking spaces for each apartment is therefore not easy to determine, which is why flexible solutions such as neighborhood garages are becoming increasingly important. The following figure shows another typical life cycle of a family.

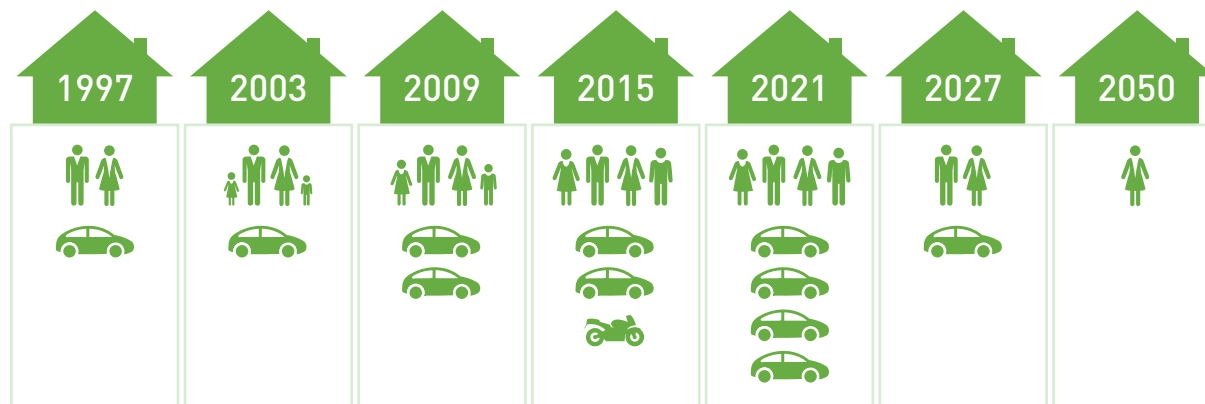


Figure 12: Varying parking space requirements in the life cycle of a residential building.  
Source: Geschäftsstelle Zukunftsnetz Mobilität NRW 2017: 17

### 3.2 EXCURSUS: MULTIPLE USE OF SHARED PARKING SPACES

In new urban quarters, there is a move towards shared parking replacing the idea that a parking space is permanently assigned to an apartment. The shared parking spaces are used by different target groups equally. Residents, employees and buyers all use the spaces, which ensure these are fully utilised. The individual parking space is thus used several times during a day. A prerequisite for this concept to work is the

shortage of parking space and its consistent management in public spaces. One example is in the so called Seestadt Aspern (City of Vienna, Austria) where short-term parking spaces are offered in addition to permanent parking spaces for residents. Streets, paths and squares in Seestadt are not designed for permanent parking of vehicles. There are stopping and parking facilities in the main access roads. They are designated as short-term parking and loading zones or as parking spaces for the disabled.

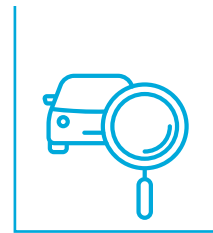


Figure 13: Shared Parking Garage in the Seestadt Aspern (City of Vienna, Austria).  
Source: © Daniel Hawelka

“On-street parking is designated as short-term parking and loading zones only or as parking spaces for the disabled.”

How to make parking standards more sustainable

IMPORTANCE OF REGULATION AS A STEERING INSTRUMENT FOR URBAN AND TRANSPORTATION PLANNING



## 4. Importance of regulation as a steering instrument for urban and transportation planning

Parking standards are an important instrument however some places are considering removing these. In Germany, the cities of Berlin and Hamburg have already abolished parking standards.



Figure 14: No On-Street parking in Freiburg-Vauban  
Source: Harry Schiffer, FGM AMOR






In Berlin the obligation to build parking spaces was abolished in 1997 and in Hamburg in 2014. The property owner or developer is free to decide on the number of parking spaces to be built. It is also possible to completely dispense with the construction of parking spaces. For Berlin, it was shown in 2009 that the abolition of the parking standards had not resulted in an inadequate construction of parking spaces, which had been feared. The construction of parking spaces in Berlin has developed according to the city area and the price segment of a project. At the top end of the market, more parking spaces are built because they are a selling point. The lifting of the parking space construction obligation makes the implementation of mobility management more difficult and reduces the city's influence on the creation of parking spaces. Mobility management schemes saw the investor offer for example cheap tickets for public transport, car sharing and bike sharing instead of building parking spaces, but these can no longer be a requirement on the developer. In addition, there is no revenue from the compensation payment that is common in other German cities when the required parking spaces are not built.

Until the end of 2013, Hamburg's building regulations required developers to provide evidence that a ratio of 0.8 parking spaces per residence (or 0.6 in central districts with multi-storey residential buildings) had been met. The evaluation report after the abolition of the parking space construction obligation came to the conclusion that an average of 0.52 spaces were realised in central urban areas and of 0.57 in the rest of the city. The evaluation report concluded that an appropriate level of parking spaces was being built even without the obligation (Gertz 2018: 20).

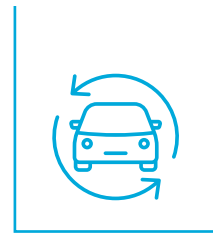
In Hamburg, there is still an obligation to build parking spaces for commercial projects. The financial impact has therefore been minimal as it is almost exclusively commercial projects where the compensation payment is applicable. In addition, several urban development projects with a reduced number of parking spaces and neighbourhood-related mobility measures are being implemented in Hamburg. The reduction in construction costs can be (at least partially) used to finance alternative mobility measures (example: charging infrastructure in HafenCity). Hamburg primarily uses these funds to finance Park and Ride spaces.

The setting of standards is an important steering instrument for the municipalities. There is also the option of a compensation payment where the developer has the option to pay for parking spaces instead of actually building the parking spaces. The



The setting of parking standards for new developments is an important steering instrument for the municipalities.

money is used either for financing parking spaces elsewhere or for alternative modes of transport. Consideration should be given to the extent to which maximum standards, which are widely regarded as state of the art, can provide an incentive for building developers to consider alternative mobility solutions for their projects.



## 5. Steering and design via standards in practice

Many municipalities are trying to manage mobility. Parking standards can be used flexibly and combined with other mobility concepts. Some good practice examples are presented below.



Figure 15: Pedestrian-friendly area in Freiburg-Vauban, Germany.  
Source: FGM-AMOR / Harry Schiffer



	Spaces per unit	Percent of spaces provided based on old minimum standard	Percent of spaces provided based on new maximum standard
Pre-reform	1.1	94%	N/A
Post-reform	0.63	52%	68%

Figure 16: Comparison of pre- and post-reform practice.  
Source: Own illustration based on data Guo 2016: 31

## 5.1 LONDON: MAXIMUM STANDARDS INSTEAD OF MINIMUM STANDARDS

In the UK parking standards are set by local authorities. In London the change from minimum to maximum standards first took place in the central area with the Greater London Development Plan in 1976. The 2004 parking reform extended this change to the whole city. London reversed its parking requirements, eliminating the previous minimums and putting new maximums on parking supply for all developments in the metropolitan area.

“Before the 2004 parking reform, roughly half of the 216 developments provided parking at exactly the minimum required level, and only 26 percent provided parking above that level. After 2004, only 17 percent provided parking at the previous minimum required level, and 67 percent provided parking below the previous minimum level. With the minimum but no maximum, most developments did

not provide more than the minimum required, whereas with the maximum but no minimum, most developments provided less than the maximum allowed.” (Guo 2016: 31)

“After the switch to parking maximums, one-quarter of all the developments provided no parking at all. Under the previous minimums, these developments would have been required to provide at least 30,154 parking spaces. Twenty-two percent of developments provided parking at the maximum cap level, but these developments account for only 4.2 percent of the housing units. In other words, the new maximum was not preventing many parking spaces from being built, but the previous minimum required many parking spaces that would not have been built.” (Guo 2016: 31)

Survey data shows a decline of parking spaces per unit from 1.1 (pre-reform) to 0.63 (post-reform).

“The number of parking spaces supplied after the 2004 parking reform fell by

approximately 40 percent when compared to the number of parking spaces that would have been supplied with the previous minimum parking requirements. This means that from 2004 to 2010, the new parking requirements led to a total of 143,893 fewer spaces. No other alternative explanations (car ownership saturation, development constraints, congestion charging, oil price spike, etc.) account for such a dramatic decline. Furthermore, almost all the reduction in parking supply was caused by eliminating the minimum standards, declining only 2.2 percent due to adoption of the maximum standards.” (Guo 2016: 34)

The survey also “found that the market actually provided more parking in areas with the highest density and best transit service than in the immediately adjacent areas with lower density and poorer transit service. Therefore, parking caps may still be necessary for an efficient parking market because the deregulated market appears to provide more parking in the densest and transit-richest areas, and does not take into account the high social cost of driving in these areas, which are often congested.” (Guo 2016: 34)

## 5.2 FREIBURG: DEVIATION FROM STANDARDS TO DEVELOP A CAR-FREE NEIGHBOURHOOD IN VAUBAN

Freiburg-Vauban is still regarded as a model for a new urban quarter based on sustainability criteria. The traffic concept focuses on the use of parking space. Parking was limited and separated from living not only spatially but also in terms of financial burden. Parking spaces were offered at actual cost without cross-subsidization from

house building and were in the form of multi-storey car parks (high garages) on the edge of the Vauban neighbourhood. However, driving on residential streets for loading and unloading is allowed. There are no public parking spaces in the residential streets and no parking spaces on private property. Residents of streets without parking spaces must purchase a parking space in one of the two car parks on the edge of the district. Along the main development axis (Vauban-Alley and others), parking space is managed. This is also where some of the vehicles of the car-sharing providers are located.

Most of the residential complexes along Vauban-Alley (see front cover) have no parking spaces; car owners must park their cars in one of the two car parks at the edge of the quarter. Residents who want to live there without a car must sign a declaration to this effect that they will not purchase a car. However, an area will be reserved to allow for an extension of parking in another private garage in the neighbourhood if necessary. Residents without a car finance this area with a one-off payment of 3,500 Euro. An association for car-free living was founded to administer the system.

The extension of the Freiburg tram to Vauban was completed in 2006. It connects the district with the city centre and the railway station in only 15 minutes. The integration into the cycle path network is also important for mobility.

With its limited parking and the separation of the costs of living from those of parking the car, the development represented a real innovation at the time. Vauban gained international attention as a result. The concept still works today.

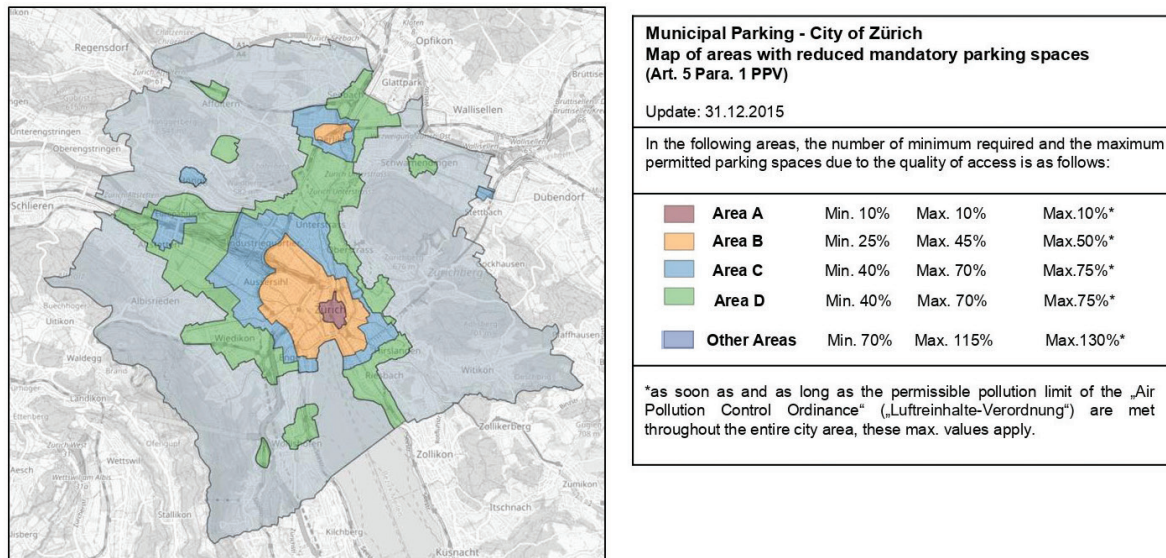


Figure 17: Minimum and maximum standards in different areas in the City of Zurich.  
Source: own representation, data-source: City of Zurich

### 5.3 ZÜRICH: RESTRICTIVE STANDARDS FOR NEW DEVELOPMENTS

A good practice example for the implementation of maximum parking standards is Zurich’s Hardbrücke railway station. The complex was opened in 2011 with a total of only 250 parking spaces, with over 65,032,128 m<sup>2</sup> of lettable space and the car park has provided a ratio of only 0.35 parking spaces per 92,903 m<sup>2</sup>.

The Ordinance on Private Car Parking (Parking Ordinance) of the City of Zurich was fundamentally revised in 2015 and regulates, among other things, the number of minimum required and maximum permitted private parking spaces for private cars. The number of parking spaces depends on

- the utilisation and use of the property (normal demand)
- the degree of accessibility by public transport, the centrality of its location and road capacity (quality of access)

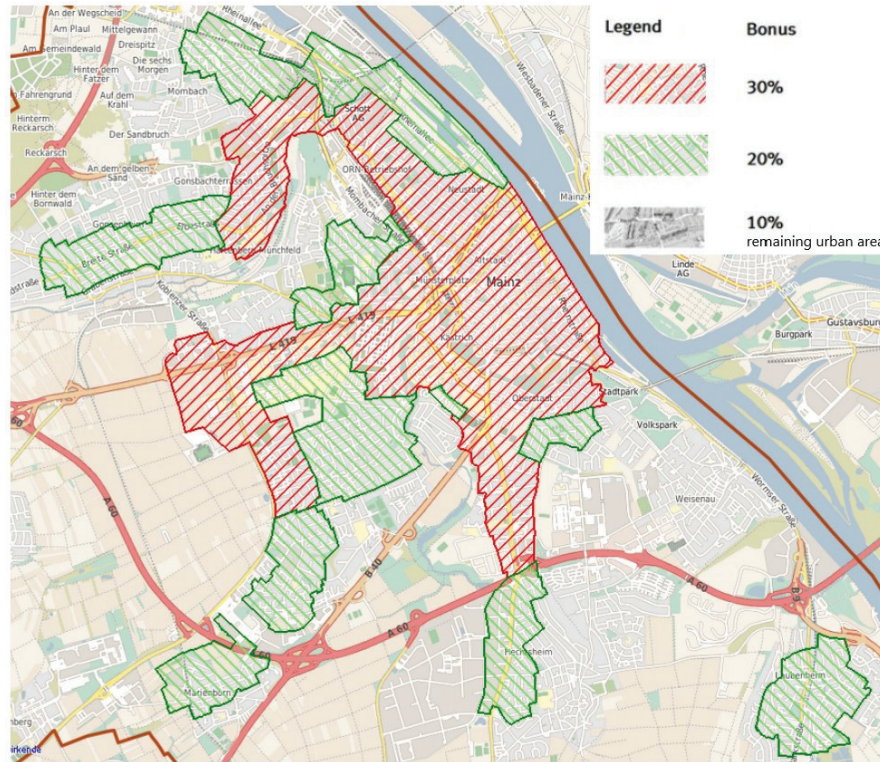
- compliance with the pollution limits of the Ordinance on Air Pollution Control
- the requirements of the protection of the local image

For residential use, the normal requirement is one car parking space per 120 m<sup>2</sup> floor area. However, based on the quality of infrastructure provision, the number of minimum required and maximum permitted parking spaces in different areas is set as a percentage of that normal requirement as shown in the following figure.

For low-car use, the minimum parking space requirement for residents and employees can be determined on a case-by-case basis dependent on the nature of the relevant mobility plan<sup>2</sup>. Elements of the mobility plan can be for example:

- Regulation of car ownership via a rental contract
- Carsharing offer
- Good conditions for bicycle parking
- Public transport ticket
- Measures of mobility management

<sup>2</sup> <https://www.eltis.org/discover/news/house-builders-no-longer-obliged-provide-car-parking-spaces-zurich-switzerland-0> <https://www.umea.se/download/18.65c1214d14f38ac155364e41/1446109860348/Good%20practices.pdf>



**Figure 18:** The different areas of the public transport bonus to lower requirement for car parking in Mainz.  
Source: Landeshauptstadt Mainz, Stadtplanungsamt

PT-Bonus	Only Bus		Only Tram	
<b>30%</b>	≥12 Departures / hour	and ≤ 10minutes from main station	≥12 Departures/ hour	and ≤ 15minutes from main station
	or		or	
	6 - 11 Departures/ hour	and ≤ 5minutes from main station	6 - 11 Departures/ hour	and ≤ 10minutes from main station or
<b>20%</b>	or		or	
	Walking distance to the Roman Theatre (600m)	and ≤ 10minutes from main station	≥6 Departures/ hour	and ≤ 5minutes from main station
	≥12 Departures/ hour	and 11 – 15 minutes from main station	≥12 Departures/ hour	and 16 – 20 minutes from main station
	or		or	
<b>10%</b>	6- 11 Departures/ hour	and 6 – 10 minutes from main station	6 - 11 Departures/ hour	and 11 -15 minutes from main station
	or		or	
	≤6 Departures/ hour	and ≤ 5minutes from main station	≤6 Departures/ hour	and ≤ 10minutes from main station
<b>10%</b>	All other public transport services (bus/tram) are within a 300 m radius of the public transport stops.			

**Figure 19:** Public transport bonus in the City of Mainz.  
Source: Own presentation based on „Satzung der Landeshauptstadt Mainz über die Herstellung und Bereitstellung von Kfz-Stellplätzen und Fahrradstellplätzen“ ([https://bi.mainz.de/vo0050.php?\\_\\_kvor=16807](https://bi.mainz.de/vo0050.php?__kvor=16807))



Figure 20: Campus Estate in the borough of Eggenberg in Graz.  
Source: FGM-AMOR

## 5.4 CITY OF MAINZ: LOWER REQUIREMENTS FOR CAR PARKING DUE TO PUBLIC TRANSPORT BONUS

Since 2015, the City of Mainz has been making use of the powers that the Rhineland-Palatinate State Building Regulations give to municipalities to determine the necessary number of parking spaces for new construction projects. The parking space statutes define a public transport bonus based on the quality of access. The public transport bonus is used to divide the city area. This regulation is intended to take account of the lower parking space requirements in areas with good public transport connections, and at the same time to contribute to reducing construction costs.

## 5.5 GRAZ: MOBILITY CONTRACTS

A mobility contract is agreed between the City of Graz, Austria and the company putting forward its development plans. This contract aims to reduce the motor vehicle traffic expected as a result of the construction project. Push & pull measures are agreed: car parking at a level which is significantly lower than the current standard is a key along with offers and information for easier use of public transport, walking and cycling, as well as car sharing and e-mobility.

A mobility contract contains:

- Limits for car parking space
- Optimal and sufficient space for bicycle parking
- Availability of electric vehicle car sharing
- For initial purchase: provision of annual public transport tickets

- Free provision of public foot and cycle path crossings of the site
- Provision of charging facilities for e-vehicles
- Construction of parcel boxes
- Organization of bicycle service days in the settlement, and installation of bicycle service lockers
- Mobility advice, dialogue marketing, provision of information packages
- Electronic displays for public transport departure times of the nearest stop(s)
- Evaluation report after implementation (biennial): implementation of the requirements, number of journeys ... => readjustments if required

In Graz, the first mobility contracts have already been signed in 2011. Since then, 33 such contracts have been concluded (status July 2020). One good example in Graz is the Campus Estate in the borough of Eggenberg. 386 apartments plus a student hostel have been built there.

The developer signed a mobility contract with the City due to excellent availability of public transport.

Furthermore, he provided shared mobility options as carsharing, implemented high quality bike parking facilities as well as delivery boxes for packages, provided annual public transport tickets and screens with dynamic public transport information in the staircases. And of course, the number of parking spaces required by law could have been reduced.

More information on the Graz Mobility Contracts can be found at the website <https://park4sump.eu/resources-tools/videos>.

## 5.6 BULGARIA: MINIMUM STANDARDS FOR BICYCLE PARKING

Bulgaria introduced minimum standards for bicycle parking. Along with Cyprus, France, Hungary, Lithuania and Slovenia it is one of the few countries in the European Union that have national regulations concerning minimum standards for bicycle parking in new buildings. The law regulating the size and set up of bicycle parking spaces came into force in September 2016. It only applies to urban areas.

As an innovative element two classes of parking spaces were introduced. Class 1 is long-term parking (e.g. in enclosed spaces, sheds, security controlled area, bicycle cages, bicycle rooms, etc.); Class 2 is short-term parking (e.g. in public, easily accessible open areas, covered or uncovered).

These classes provide a suitable mix of parking for a range of different types of building, with more long-term parking spaces in buildings where many people stay for longer periods of time (e.g. residential buildings, hospitals) and fewer in buildings with mostly transient visitors (e.g. cinemas, shops). (Küster / Peters 2018: 25)

Only a few Countries in the European Union have already introduced minimum standards for bicycle parking.”



BUILDING TYPE	REGULATION PARKING SPACES	CLASSIFICATION
Hotels	1 space per 10 rooms	- Class 1: 60% - Class 2: 40%
Hospitals	1 space per 500 m <sup>2</sup>	- Class 1: 75% - Class 2: 25%
Cinemas, theatres	1 space per 20 visitors	- Class 1: 20% - Class 2: 80%
Places of religious worship	(minimum 10 spaces)	- Class 1: 100%
Stadiums, sports arenas, etc.	1 space per 100 m <sup>2</sup>	- Class 1: 20% - Class 2: 80%
Administrative/ business offices	1 space per 100 m <sup>2</sup>	- Class 1: 50% - Class 2: 50%
Shops in city-centre areas	(minimum 10 spaces)	- Class 1: 30% - Class 2: 70%
Libraries, museums, galleries	1 space per 100 m <sup>2</sup>	- Class 1: 20% - Class 2: 80%
Schools, colleges, universities	- 1 space per 5 students - 1 space per 10 employees	- Class 1: 20% - Class 2: 80%
Childcare facilities	- 1 space per 10 children - 1 space per 10 employees	- Class 1: 10% for employees - Class 2: 90%
Multifamily residential buildings	1.5 spaces per household (minimum 6 spaces)	- Class 1: 100%
Dormitories	1 space per 2 beds (minimum 6 spaces)	- Class 1: 60% - Class 2: 40%
Sanatoriums, rest homes/ homes for the elderly	1 space per 4 employees	- Class 1: 25% - Class 2: 75%
Railways, bus terminals, airports	- 1 space per 30 passengers/ hour - 1 space per 10 employees	- Class 1: 30% - Class 2: 70%
Metro stations/ Intermodal passenger terminals	- Station with 1 line: 6 spaces - Station with >1 line: 12 spaces	- Class 2: 100%

Figure 21: Regulation for Bicycle Parking in Bulgaria.  
Source: Küster / Peters 2018: 26

How to make parking standards more sustainable

EXAMPLES FOR NEW DEVELOPMENTS:  
STANDARDS TO SUPPORT LIVEABLE  
NEIGHBOURHOODS



Figure 22: Mobility concept for Lincoln Housing Area in Darmstadt.  
Source: Fachbrochure Lincoln-Siedlung – Mobilitätskonzept:14



## 6. Examples for new developments: Standards to support liveable neighbourhoods

Many cities are growing. New housing is being created through redensification and urban expansion. Also new jobs are being created in the cities, especially in the areas of research and development and consultancy. Combined with a further increase in motorisation, the transport system is reaching its limits. High volumes of traffic causes congestion, health hazards caused by noise and air pollutant and greenhouse gases. Shouldn't new urban quarters offer different mobility routines, and the chance to significantly reduce private car ownership?

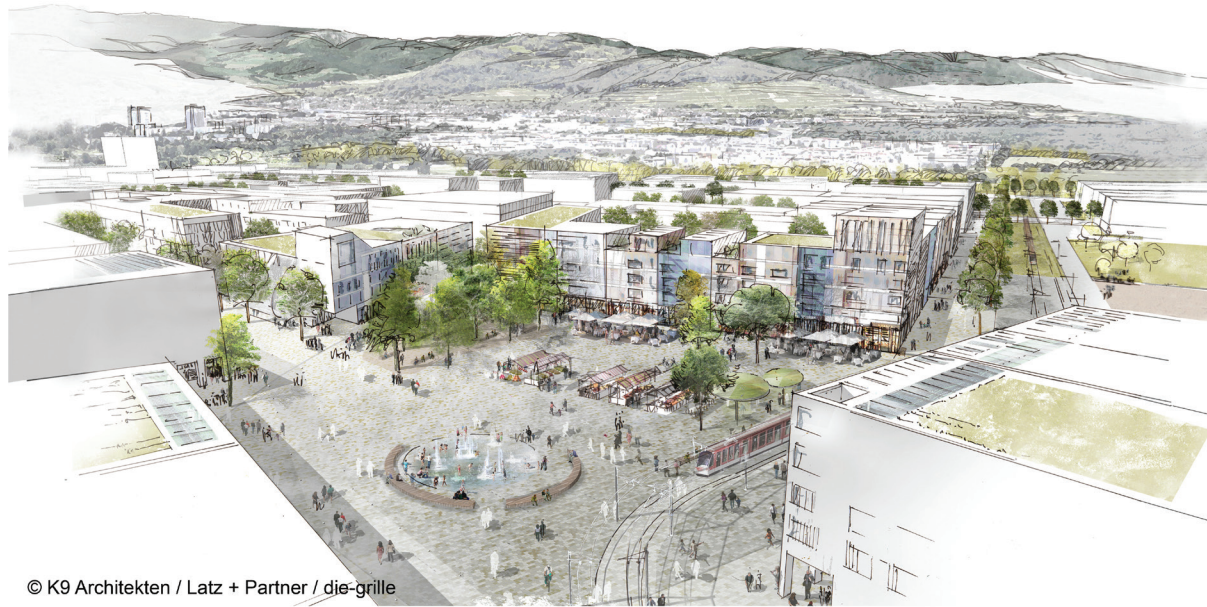
Mobility now plays an important role in the development of new neighbourhoods. Neighbourhoods are connected to public transport, sharing services are provided, and parking is separated from living space and costs. A parking space is no longer automatically rented. New quarters for living and working allow multiple uses of parking spaces. The aim is not only to make transport more sustainable by promoting alternatives to private cars, but also to reduce construction costs and thus housing costs for tenants. The following good examples show how it can be planned and work. New developments can be the laboratory for tomorrow's mobility.

traffic. The city uses every legally available option to make car use less attractive than alternative modes. For parking this means a reduction of the parking space per flat to a ratio of 0.65. The ratio comprises 0.15 parking spaces close to the flats for disabled people but also for shared cars and 0.5 parking spaces per flat located in parking garages at a maximum distance of 300 meters. Car owners have to rent a parking space at the garage. It is not possible to park anywhere else. Residents without a car don't have to bear costs of car parking. The alternatives for using the car are an attractive clocked public transport, offer of car and bike sharing and attractive cycle ways and cycle parking.

### 6.1 DARMSTADT: LINCOLN

The Lincoln Housing Area is a new housing area in the growing city of Darmstadt in the south of Frankfurt / Main. Planning for the conversion of the former barracks started in 2010 for completion in 2015. It was clear that an ambitious mobility plan would be necessary to protect the surrounding districts from the negative impact of growing car

The aim is not only to make transport more sustainable by promoting alternatives to private cars, but also to reduce construction costs and thus housing costs for tenants.



© K9 Architekten / Latz + Partner / die-grille

Figure 23: Planned mobility concept for Freiburg - Dietenbach.  
Source: K9 Architekten / Latz + Partner / die-grille

## 6.2 FREIBURG: DIETENBACH

The district of Dietenbach, which is to be developed in the 2020s, is located about four kilometres from Freiburg city centre. A central square with local amenities is to become the heart of the development, as well as other neighbourhood squares throughout the area. The area will be made accessible to public transport by extending a tram line. Pedestrian traffic is the leitmotif of the internal development! Bicycle traffic will be connected to the city's cycle fast route network. The modal split in the planned urban district is intended to make a positive contribution to the target figure for the city as a whole (80% sustainable modes of transport and 20% motorised individual transport). A parking space ratio of 0.5 to 0.7 per

housing unit will be provided exclusively in neighbourhood garages.

The following aspects are currently under discussion:

- How will the garage design comply with the building regulations of the country (regional jurisdiction)?
- How large the reservation area for further parking space should be?
- Whether parking space sharing can be made possible and how it should be organised?
- How a good pricing policy takes into account the cost of parking spaces in garages?
- How neighbourhood garages should be designed so that they can grow or shrink as necessary?



Figure 24: Sihlbogen quarter; City of Zurich.  
Source: BG Zurlinden

### 6.3 ZURICH: SIHLBOGEN

The Sihlbogen quarter with 220 apartments in the Zurlinden Cooperative in Zurich was first occupied in 2013. Sihlbogen was the first neighborhood in Zurich at that time with a mobility plan, so that a further reduction in the number of parking spaces to just under 0.3 per apartment was possible.

Additionally the location between Sihl and the railway line would have made the installation of the regular number of car parking spaces in an underground car park in Sihlbogen disproportionately expensive.

The residents agree in their rental contract that they will not own a car. Car ownership is only possible upon application in justified cases. The decisive factor in the development of this car-reduced quarter was the close

proximity of a stop on the suburban railway line. Residents receive a voucher for the purchase of public transport tickets, which they can redeem for an annual ticket for Zurich.

In addition to a commercial car-sharing offer, the cooperative also offers its own vehicle for borrowing, which is powered by electricity from the roof of the house.

Annual management reports to the city of Zurich, must evidence that the low number of parking spaces is sufficient. So far, the mobility concept is working and no violations of the ban on private car ownership by residents are apparent.

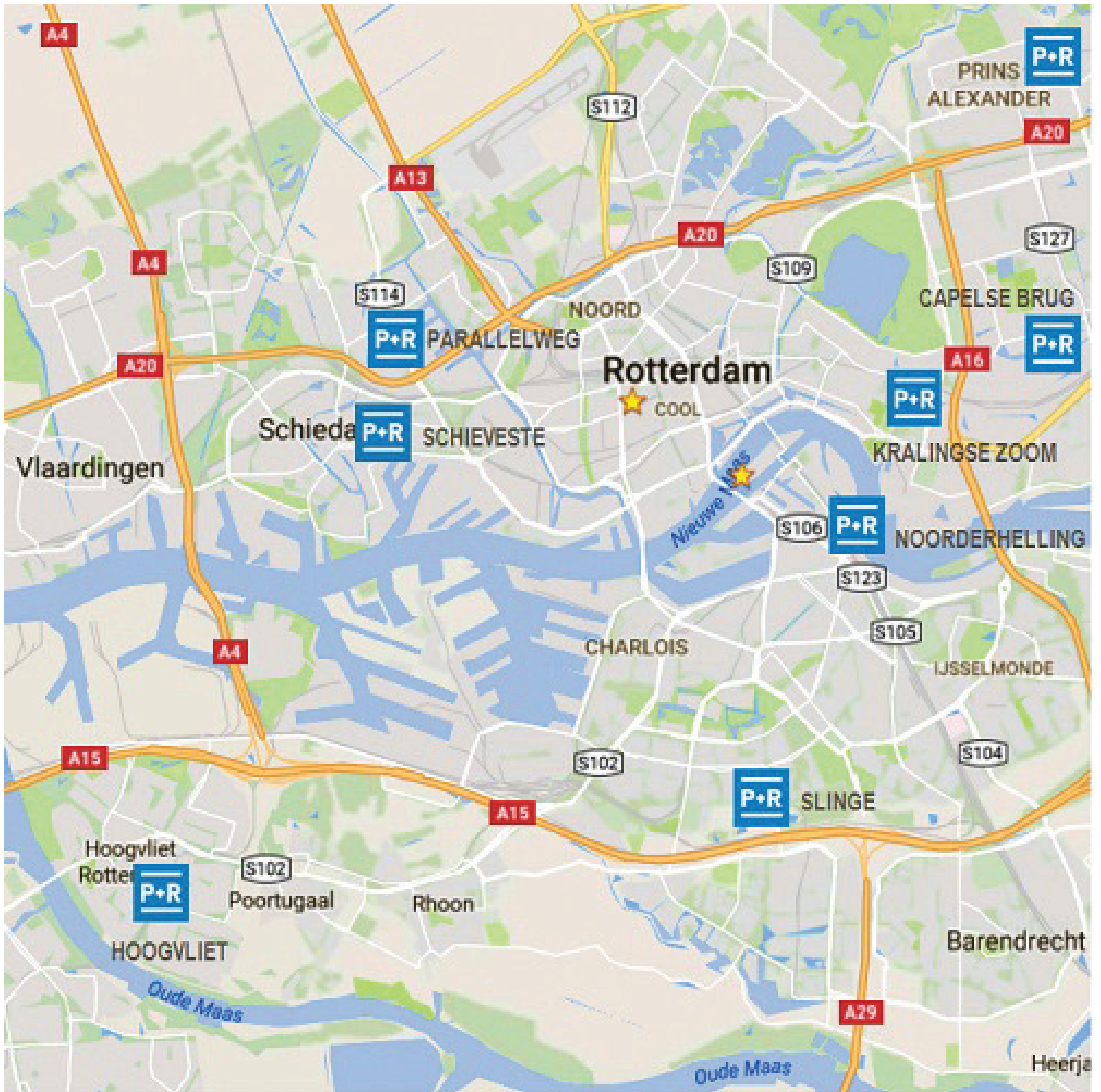


Figure 25: Park & Ride in Rotterdam  
Source: <https://www.car-parking.eu/netherlands/rotterdam/pr>



## 7. How to deal with standards of the past?

Even if ambitious standards are implemented in new urban quarters, this represents only a small percentage of the total city area. The legacy of the generous parking provisions of the past remains. Ways must be found to deal with this legacy so that yesterday's decisions do not thwart a future-oriented transport policy. A selection of good practice examples is listed.

The City of Rotterdam for instance has made on-street parking for users expensive and off-street parking much cheaper. The lower cost for off-street parking in parking garages

is subsidised with the revenue from high on-street parking fees. Additionally some parking garages in suburban areas are used for Park and Ride.



Figure 26: Too many parking spaces were built in the past.  
Source: pixabay



Figure 27: Off-Street and reduced on-street parking in Rotterdam.  
Source: Photos by Martina Hertel, Difu

## 7.1 NOTTINGHAM: WORKPLACE PARKING LEVY

Since April 2012, Nottingham has levied a charge on parking spaces used for business and professional purposes on private land in the city. This applies to parking spaces for the vehicles of employees, regular customers or pupils/students (Workplace Parking Places, WPP). The Workplace Parking Levy (WPL) is made possible in England and Wales by the Transport Act 2000 and the revenue must be used to meet the objectives and measures of the Local Transport Plan (LTP). The levy has a regulating effect and at the same time generates funds for the expansion of the light rail system (Nottingham Express Transit, NET), for increasing the attractiveness of the station and for improving the bus service.

Company owners apply for a permit for each of their company premises. The precondition for the use of a parking space on the company's property is the payment of the corresponding fee. Some of the costs are passed on to the users of the company car parks. It is the responsibility of employers to acquire the necessary number of licenses for company car parks so that unlicensed spaces are not used. A check is made by the city. Parking spaces for rescue vehicles, for people with multiple mobility impairments and companies with 10 or fewer parking spaces are exempt from the charge.

A survey indicates "that 8.6% of commuters currently travelling by sustainable modes switched from the car between 2010 and 2016 at least in part due to the implementation of the WPL and/or the associated transport improvements. In the region of 50 per cent of those individuals gave the WPL as a stand-alone scheme as an important factor in their decision to shift away from the car via an increase in the cost of parking at work or because their employer had removed



**Figure 28** Nottingham Express Transit, NET co-financed by the Workplace Parking Levy (WPL).  
Source: : Push & Pull Fact Sheet – Parking Policy and the implementation of the core funding mechanism in Nottingham, UK ([http://push-pull-parking.eu/docs/file/PP\\_factsheet\\_Nottingham\\_06062016\\_EN\\_web.pdf](http://push-pull-parking.eu/docs/file/PP_factsheet_Nottingham_06062016_EN_web.pdf))

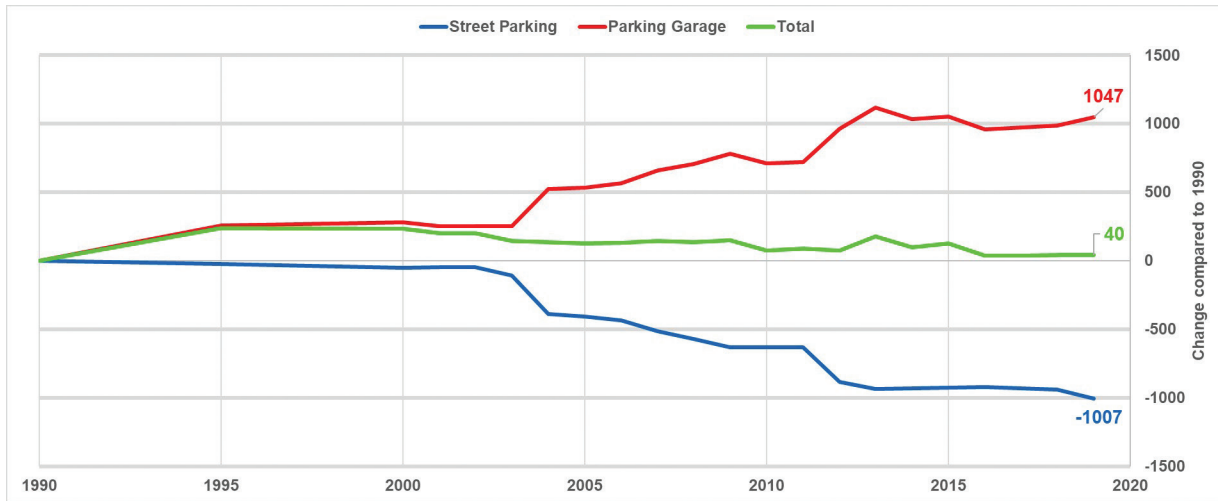
workplace parking spaces. However, this research has also revealed evidence of commuters switching to the car away from other modes demonstrating a significant suppressed demand for travel by car which in part offsets some of the beneficial impacts of the WPL package." (Dale et al. 2019: 749)

Nottingham was the only city with a WPL for a long time, but this is now under consideration in a number of other locations, for example Birmingham, Edinburgh, Glasgow, Cambridge, Bristol and Hounslow and Camden in London.

## 7.2 ZURICH: 'HISTORIC COMPROMISE' TO FREEZE THE NUMBER OF PARKING SPACES

For the inner city of Zurich the so called 'historic compromise' has been in place since 1996. The number of parking spaces, approximately 7600,





**Figure 29:** The historic compromise in practice.  
 Source: Robert Dorbritz, Tiefbauamt der Stadt Zürich



**Figure 30:** Rennweg with and without on-street parking.  
 Source: Tiefbauamt der Stadt Zürich (left), Hannes Bickel (right)

was fixed at the 1990 level (parking supply cap). For every new off-street space created an on-street space must be removed. Above-ground parking spaces are compensated by underground parking spaces.

The compromise was made in order to make the inner city more attractive for pedestrians whilst addressing the parking needs of

business. However, this regulation also means there is an absolute limit to the number of parking spaces. The historic compromise is now being developed further. Above-ground parking spaces may be abolished without compensation up to ten percent below the 1990 level. Above-ground parking spaces are to be significantly reduced in order to gain space for bicycle routes (Willi 2019).



Figure 31: Umeå newly developed river bank.  
Source: Photos by Martina Hertel, Difu

### 7.3 UMEÅ: GREEN PARKING PAY OFF AND OTHER DEVELOPMENTS

Umeå, a city in the northeast of Sweden known for its university and research activities, became European Capital of Culture in 2014.

Up until then large areas of on-street parking existed near the river and city centre. The inner city of Umeå was redeveloped. On-street parking areas were removed to create space for a new library and urban activity along the riverbank.

One measure Umeå introduced was the Green Parking Payoff project. “Property developers provide sustainable mobility services in exchange for lower parking requirements.

Examples of services are to provide bicycle facilities such as service stations and dressing rooms, connect the property to a carpool and allocate resources to a mobility management fund. Umeå Municipality wants to set a good example by participating in the Green Parking Payoff” .

Meanwhile the city hall has been rebuilt, the newly developed city block Forsete is in place and parking spaces have been transferred to a parking garage near the station.

Instead of building parking spaces the developer(s) had to pay a certain amount into a mobility fund that was used to build the parking garage. The parking garage provides parking for customers, visitors, staff and residents of the area.

If new developers come along and expand the area or change the use, more money will be collected and a second garage could be build.

As a further development of the Green Parking Payoff, Umeå is examining the possibility of extending this idea to a new residential area. The new area is planned for about 3,000 residential units with parking only available in neighbourhood garages.

This poses a greater challenge than workplace parking, but at the same time offers a greater impact on traffic and land use in the city.



**Figure 32:** Umeå parking garage and the new city block Forsete.  
*Source: Photos by Martina Hertel, Difu*



**Figure 33:** Streets for active modes –instead of cars –were established in Umeå.  
*Source: Photos by Martina Hertel, Difu*

Even if ambitious standards are implemented in new urban quarters, this represents only a small percentage of the total city area. The legacy of the generous parking provisions of the past remains.



© Rupprecht Consult 2019

Figure 34: The 12 Steps of Sustainable Urban Mobility Planning (2nd Edition) – A decision maker’s overview  
 Source: © Rupprecht Consult 2019



## 8. Improved Parking standards as part of the parking management strategy and its integration in SUMP - Key findings and outlook

For much too long the discussion about sustainable mobility has focused on flowing traffic. It has overlooked the fact that stationary traffic is also a major factor in the choice of transport mode. Plenty, and possibly even free, parking spaces close to the start and end of a trip encourages the use of one's own car. It is therefore important to also address parking space (non-)availability as part of sustainable mobility planning.

Parking spaces in new urban development projects may no longer be oriented to expected future demand, but should achieve modal split targets with a view to sustainable urban development.

For car parking this implies substituting minimum requirements with maximum requirements; while for alternative modes such as cycling minimum requirements are appropriate. In addition, multiple use options should be examined when planning new quarters with multiple uses including living, working, shopping and leisure.

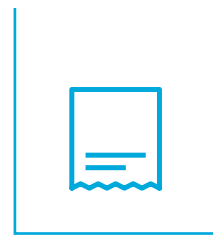
It is also important to separate parking and living not only spatially but also in terms of costs (unbundling). The distance to the car should be at least as far as the nearest public transport stop. A parking space should not

automatically be part of the apartment, but should be rented or bought separately.

Ambitious standards in new buildings fail to have an effect if parking in public spaces is not managed at the same time. Developers should be permitted via regulation - to lower the minimum requirement for car parking if alternatives are available due to

- excellent availability by public transport (called "public transport bonus")
- shared mobility options such as car sharing, bike sharing, cargo bike sharing etc.
- high quality bike parking facilities
- an advanced mobility plan.

Opportunities to move into public spaces



must be avoided. An absolutely necessary precondition for lower parking requirements is paid or regulated on street parking for the area and its surroundings. The legacy of the past should not be underestimated. In the future, the aim will be to steer demand away from public space and towards private space.

The consistent management of public space and the development of parking in private areas support the choice of sustainable transport modes as an alternative to the private car. These are public transport, infrastructure for cycling and walking and car rental options.

Therefore it is clear, that parking policy must be integrated into the SUMP. Parking management should be an important part of sustainable urban mobility planning (SUMP) but unfortunately, it is one the most underdeveloped segments. Parking standards must be derived from transport policy objectives that also guide the development of alternatives to the private car.

Parking spaces in new urban development projects may no longer be oriented to expected future demand, but should achieve modal split targets with a view to sustainable urban development.

Limiting the construction of parking spaces in new developments creates the basis for more sustainable mobility if mobility solutions are part of the development plan. It therefore seems sensible to further develop parking standards in the direction of mobility standards.

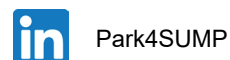
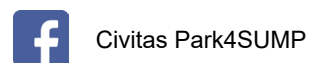


## 9. List of References

1. Christiansen P., Fearnley, N., Hanssen, J. U., and Skollerud, K. (2017): Household parking facilities: relationship to travel behaviour and car ownership, in: *Transportation Research Procedia* 25 (2017) 4185–4195.
2. Christiansen, P., Engebretsen, Ø., Fearnley, N., Hanssen, J. U. (2017): Parking facilities and the built environment: Impacts on travel behaviour, in: *Transportation Research Part A* 95 (2017), Pages 198-206.
3. Dale, S., Frost, M., Ison, S., and Budd, L. (2019): The impact of the Nottingham Workplace Parking Levy on travel to work mode share, in: *Case Studies on Transport Policy*, Volume 7, Issue 4, December 2019, Pages 749-760.
4. Eriksen, H. C. (2018): The effect of flexible parking norms on car use and car ownership in new residential development: a multiple-case study of Malmö, Gothenburg and Copenhagen, <http://danskedelebiler.dk/wp-content/uploads/2018/04/Flexible-parking-norms-effect-on-car-use-and-car-ownership-in-residential-housing.pdf>.
5. Gertz, Carsten (2018): Stellplatzschlüssel und Mobilitätskonzepte – Erste Bilanz nach Aufhebung der Stellplatzverpflichtung im Wohnungsbau in Hamburg. In: *PlanerIn*, Heft 3/2018, S. 19-21.
6. Geschäftsstelle Zukunftsnetz Mobilität NRW (ed.) (2017): *Kommunale Stellplatzsatzungen. Leitfaden zur Musterstellplatzsatzung NRW*, Köln.
7. Guo, Z. (2016): From Parking Minimums to Parking Maximums in London, *ACCESS* 49, Fall 2016.
8. Küster, F. and Peters, M. (2018). Making buildings fit for sustainable mobility – Comparing regulations for off-street bicycle and car parking in Europe. European Cyclists' Federation. Brussels. November 2018.
9. Mingardo, G. (2016), *Articles on Parking Policy*. TRAIL Thesis Series no. T2016/17.
10. Mingardo, G., van Weeb, B., and Rye, T. (2015): Urban parking policy in Europe: A conceptualization of past and possible future trends, in: *Transportation Research Part A: Policy and Practice*, Volume 74, April 2015, Pages 268-281.
11. Rye, T. (2017): Tom Rye on parking standards, in: Rye, T., Mingardo, G., Hertel, M., Thiemann-Linden, J. et al.: *Parking management and incentives as successful strategies for energy-efficient urban transport*, Push&Pull-Project, final report, [http://www.epomm.eu/newsletter/v2/content/2017/0217/doc/Push&Pull\\_Final\\_Brochure\\_EN\\_web\\_final.pdf](http://www.epomm.eu/newsletter/v2/content/2017/0217/doc/Push&Pull_Final_Brochure_EN_web_final.pdf).
12. Rye, T., Mingardo, G., Hertel, M., Thiemann-Linden, J. et al. (2015): *Catalogue on Parking Management Solutions*, [https://www.eltis.org/sites/default/files/trainingmaterials/pp\\_pm\\_catalogue\\_01062015\\_final.pdf](https://www.eltis.org/sites/default/files/trainingmaterials/pp_pm_catalogue_01062015_final.pdf).
13. Sprei, F., Hult, C., Hult, Å., and Roth, A. (2020): Review of the Effects of Developments with Low Parking Requirements, <https://www.mdpi.com/2071-1050/12/5/1744>.
14. Willi, E. (2019): *Parkraumplanung im Zeichen der Verdichtung. Das Beispiel der Stadt Zürich. Vorlesungsreihe „Standort- und Projektentwicklung“*, ETH Zürich 15. November 2019, [https://ethz.ch/content/dam/ethz/special-interest/baug/irl/irl-dam/lehrveranstaltungen/msc/project-developement/01-vorlesung/07\\_Prae\\_ETHPPPlan\\_191115.pdf](https://ethz.ch/content/dam/ethz/special-interest/baug/irl/irl-dam/lehrveranstaltungen/msc/project-developement/01-vorlesung/07_Prae_ETHPPPlan_191115.pdf).



[www.Park4SUMP.eu](http://www.Park4SUMP.eu)



The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union. The European Commission is not responsible for any use that may be made of the information contained therein. All images are provided by the respective partners (unless otherwise noted) and are approved for reproduction in this publication.



THE CIVITAS INITIATIVE  
IS CO-FINANCED BY THE  
EUROPEAN UNION

Park4SUMP is a project under the CIVITAS Initiative.  
Read more - [civitas.eu](http://civitas.eu)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 769072.