



Making Buildings Fit for Sustainable Mobility

Comparing Regulations for Off-Street Bicycle
and Car Parking in Europe



EUROPEAN CYCLISTS' FEDERATION

The European Cyclists' Federation is an umbrella federation for national cycling organisations (organisations that promote bicycle use in the context of mobility) throughout Europe. Today, ECF represents over half a million people in 45 countries. It has pledged to ensure that bicycle use achieves its fullest potential so as to bring about sustainable mobility and public well-being. To achieve these aims, ECF seeks to change attitudes, policies and budget allocations at the European level. ECF will stimulate and organise the exchange of information and expertise on bicycle related transport policies and strategies as well as the work of cyclists' movements.

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Foreword



With the 2015 Paris Agreement, we have set the path for decarbonising the global economy by mid-century with the objective of keeping global warming below 1.5 degrees Celsius. If we are to honour this Agreement, transport will be the hardest challenge to overcome.

In the City of Paris, we are therefore building the mobility system of the 21st century. Active mobility, public transport and shared mobility services have the strong political backing of the local government and every single day, more Parisians embrace these sustainable transport modes. Car use is down to 15% of the transport mode share, one of the lowest in Europe. Despite this, air quality remains a major challenge.

Parking policies are a key ingredient in the type of mobility we induce. At the same time, parking policies also have a strong social element, certainly in cities with high property prices such as in the French capital. By requiring minimum numbers for bicycle parking and maximum requirements for car parking, we can deliver on a multitude of challenges – a win-win.

In this sense I am proud that France is leading the way in Europe in terms of setting national standards, as this report shows. However, this does not mean that we can rest on our laurels. The new Plan Vélo adopted by the national government in September 2018 has the objective of tripling bicycle use from 3% today to 9% in 2024, which also requires stronger criteria for bicycle parking. At the same time it has to ensure that the national law is properly implemented by local authorities, which today is not always the case. Of course, this is not just a French challenge but a universal one.

As for car parking, I'd like to see that the maximum requirements that apply today to housing projects financed with public loans are extended to the private sector. We need private developments to take public interests into account just as much as developments financed by state loans.

Easy access to secured bicycle parking is a key ingredient in making bicycle use supernormal. I warmly welcome this ECF report and call upon all authorities across the continent to use it as a source of inspiration.

A handwritten signature in black ink, which reads "Christophe Najdovski". The signature is stylized and fluid, with a long horizontal stroke at the bottom.

Christophe Najdovski
ECF President

1.0 Executive Summary

Easy access to parking is a major factor influencing people's daily mobility choices. This applies to bicycle parking as much as to car parking.

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. Minimum parking requirements cause an over-supply of parking, thereby affecting living costs, construction costs, land use, car ownership and mode share. If requirements for minimum amounts of parking were removed, housing developers would offer less car parking, especially in downtown areas.

Requirements for the provision of minimum amounts of car parking have been shown to be contradictory to sustainable mobility. ECF therefore strongly recommends public authorities at all levels to introduce maximum parking limits for cars instead. Maximum parking facilities should be facilitated through mobility management, such as the provision of bike- and car sharing services, and also better urban and spatial planning, such as avoiding new developments in low-density areas and when there is no good access to public transport.



By contrast, in order to encourage bicycle use, bicycle parking has to be made as easy as possible. Both quality and quantity need to be ensured. ECF strongly recommends in particular for national and regional authorities to introduce requirements for minimum amounts of bicycle parking.

This paper looks at off-street parking regulations, both for bicycles and cars, in a total of 31 countries (EU-28 + Iceland, Norway and Switzerland). For 28 countries we analysed national codes. For three states with a federal structure – Austria, Belgium and Germany – we analysed a total of 28 regional parking regulations in the federal regions. The main criterion is how parking has been regulated in apartment buildings as the majority of trips starts and/or ends here. ECF is not aware of any other comparable survey in this field.

To categorize the many different parking regulations we identified, ECF has defined four different categories for both modes: Excellent; good; sufficient; and insufficient.

	OFF-STREET BICYCLE PARKING	OFF-STREET CAR PARKING
Excellent	Minimum requirements are incorporated in national/regional legislation.	Maximum limits to the amounts of off-street parking provided are incorporated in national/regional legislation.
Good	National/regional framework legislation is in place requiring the local level to develop and implement specific standards.	Neither regulations nor guidelines at national/regional level; non-binding guidelines may exist.
Sufficient	Only non-binding guidelines have been developed at national/regional level. The local level is free to implement or not.	National/regional regulations require minimum amounts of parking; local authorities can deviate, e.g. through mobility management measures.
Insufficient	Neither any national/regional regulations nor guidelines are in place.	National/regional regulations require strict minimum amounts of parking.

It should be noted that other qualitative and quantitative criteria, such as the exact number of parking spaces or their design, have not been taken into account in this classification. Other elements we have not examined are the quality of implementation of these national or regional regulations by the local authorities, as well as other incentive-based schemes provided by national national/ regional authorities.

OVERALL COMPARISON OF OFF-STREET BICYCLE AND CAR PARKING REGULATIONS FOR 31 EUROPEAN COUNTRIES

CATEGORY	BICYCLE PARKING REGULATIONS				CAR PARKING REGULATIONS				
		NATIONAL	REGIONAL		NATIONAL	REGIONAL		NATIONAL	REGIONAL
Excellent	Minimum requirements	6/28 = 21.4%	9/28 = 32.1%	Maximum limits	1/28 = 3.6%	0/28 = 0%			
Good	National framework legislation; local implementation	3/28 = 10.7%	13/28 = 46.4%	No regulations/ guidelines	12/28 = 42.9%	9/28 = 32.1%			
Sufficient	Guidelines	8/28 = 28.6%	2/28 = 7.1%	Minimum requirements; local deviation possible	9/28 = 32.1%	10/28 = 35.7%			
Insufficient	No regulations/guidelines	11/28 = 39.3%	4/28 = 14.3%	Strict minimum requirements	6/28 = 21.4%	9/28 = 32.1%			
		N = 28	N = 28		N = 28	N = 28			

The table shows that bicycle parking is somewhat better regulated at regional level than at national level. While one in five EU countries have minimum bicycle parking requirements at national level, this is the case in almost one in three regions. Establishing a legal framework for bicycle parking but giving local authorities the freedom to set their own standards is rare at national level: only three countries, Denmark, Italy and the Netherlands, use this approach. In contrast, almost half of the regions have introduced such a law. More than seven out of ten EU countries do not set any bicycle parking standards at national level, i.e. it is entirely at the discretion of local authorities whether bicycle parking is regulated or not. For the regional level this applies only to a little more than one in five. A little less than one third of the countries and 7% of the regions use non-binding guidelines. A little less than 40% countries and 14% of regions have neither legislation nor guidelines in place.

As for car parking, 53% of all countries and 68% of all regions have minimum car parking requirements in place. However, 32% of the countries and 36% of the regions allow deviations from these requirements at local level if compensating measures are taken. Maximum parking regulations, in contrast, currently exist only in one single entity: France. Almost one third of regions apply a *laissez-faire* approach and leave the decision to regulate or not to local authorities.

Comparing both modes, at the regional level there is - at least in principle - a level playing-field for cycling and cars: while 22 regions (78.5%) regulate bicycle parking (Green and Blue category), this is the case in 19 regions (67.8%) for car parking (Yellow and Red). At the national level no such level playing-field exists: the 9 national minimum regulations (32%) on bike parking (Green and Blue category) are clearly outnumbered by the 15 (53%) national minimum car parking regulations (Yellow and Red).



Comparing jurisdictions, there is only one entity that is in the green/ excellent category for both bicycle and car parking. Berlin, Hamburg and Tyrol score best among the regions with being in the green category for bicycle parking and in the blue category for car parking. Romania and Slovakia are the only two countries that are in the red/ insufficient category for both bicycle and car parking. At the regional level, Burgenland and Bavaria both fail our parking test.

Overall, Europe's off-street parking regulations are still a long way off what they could be in terms of promoting sustainable mobility. The EU's transport sector is the only one that still sees an increase in GHG emissions compared with 1990: this fact highlights the need to have a holistic cross-sectoral approach. In households that live in detached houses and own a car, the car usually represents about 50% of the overall energy consumption (mobility and housing). In low-energy houses or in apartment blocks, this share is even higher. It is therefore essential that future energy efficiency standards in the building sector will be complemented by mobility criteria such as parking regulations that encourage cycling and discourage car use.

2.0 Introduction

Almost all bicycle and car trips involve three stages: picking up the parked vehicle, moving to the destination and parking the vehicle. While most of the research and public as well as political attention focuses on the transit stage, this report looks at regulations for off-street parking of bicycles and cars. Due to the abundance of local parking regulations, the focus of this report is on rules at national and regional parking levels.

The research of Peter Christiansen et al concludes that residential [car] parking supply is primarily a result of parking policy, and not as a market solution. Parking regulations cause an over-supply of parking, with effects on construction costs and living costs as well as on car ownership and mode choice.

From the perspective of bicycle users, and in view of policy goals to increase cycling, this mismanagement of supply and demand, with its overall impact on mobility needs to be addressed and rebalanced.

This report is a comparative review of the regulations and standards applying to off-street parking in a number of European countries and regions. The main objective was to identify how bicycle and car parking is regulated in Europe and to assess the extent to which off-street parking regulations create a level playing-field between cycling and cars. We look at off-street parking for different types of building: buildings where people live (residential), buildings where people work (offices, industrial, commercial), and buildings that people visit (public buildings, shops, educational institutions, transport hubs).

The body of the report is organized as follows:

Chapter 3

We examine the relationship between parking policies and mobility choices. We use peer-reviewed research and add a comparison of data gathered by the ECF on local parking regulations with transport data (modal split) in a small sample of towns and cities.

Chapter 4

Analyses national and regional off-street parking regulations for bicycles in a total of 31 European countries (EU 28 plus Norway, Switzerland and Iceland). We then analyse 28 regional policies in the three federal countries Austria, Belgium and Germany.

Chapter 5

Examines the situation for car parking and in addition looks at the costs of free car parking.

Chapter 6

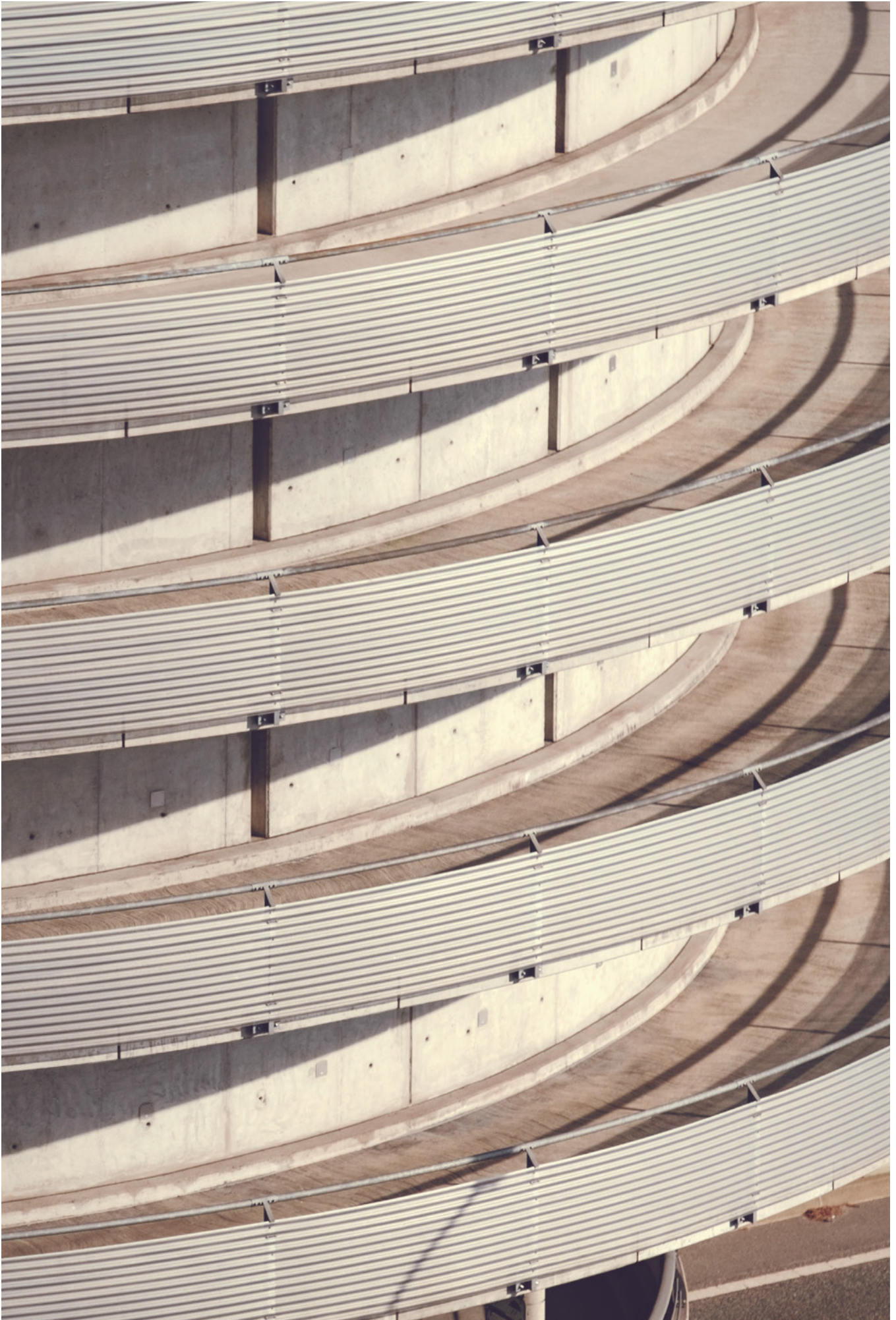
Provides a systematic overview of both bicycle and car parking regulations in residential buildings.

Chapter 7

Looks at the EU Energy Performance of Buildings Directive, which has been revised from 2016 – 2018 and for the first time also includes provisions on 'soft and green mobility and urban planning'.

Chapter 8

Lists policy recommendations addressed to national and regional authorities on how to improve off-street parking regulations in the future.



3.0 How Parking Policies Impact Mobility Choices

The relationship between car ownership/car use and parking regulations has been the subject of only a few academic studies. However, the overall conclusion of these papers is that households that own more cars, use them more often and drive them further if there is easy access to off-street parking, i.e. parking convenience, understood as the reliability of having a parking space and ease of parking (Guo, 2013 b and c).

A Norwegian case study by Christiansen et al found that non-car owners were almost as mobile as car owners. On average, non-car owners made 3.53 trips per day, compared to 3.73 for car owners.

Key findings from academic research include:

- Parking availability induces car ownership and car use; Access to private or reserved parking triples the likelihood of car ownership (Christiansen, 2017);
- Trip frequency does not change with car ownership or access to home parking, but it does affect mode share (Christiansen, 2017)
- 155m is the average accepted distance between home and home parking. For city planners this means that parking and housing do not need to be located on the same plot of land. However, it has been found that car mode share declines with increasing distance to the home parking space (Christiansen, 2017);
- Parking requirements are often arbitrary and rarely based on empirical evidence; they are pragmatic rules and quite often a result of historic developments or replications of practice in neighbouring areas. Minimum parking requirements therefore cause an over-supply of parking, and negatively affect living costs, construction costs, land use, car ownership and mode share (Shoup, 1997);
- In the absence of minimum parking space requirements, housing developers would offer less parking, especially in downtown areas (Manville, 2010, 2013).



Christiansen stresses that his team identified “bivariate and multivariate associations and strong correlations between parking, car ownership and car use. However, [they] have not established the direction of causation. People’s car ownership and use may be a function of access to residential parking, but it may also be the other way round, i.e. that people with different preferences for car ownership and car use choose housing with different parking options”. (Christiansen, 2017)

Against this background, ECF conducted some desk-top research by collecting mobility data from cities and comparing them with the cities’ parking requirements for apartment blocks. Although the sample is quite small, the results support the assumption that there is a relationship between parking regulations and modal choice:

1 Bicycle parking: Minimum requirements in almost all cases vary between 1 to 2 parking spaces per apartment. Cities with a higher cycle mode share tend to require a higher number of minimum bicycle parking spaces in apartment buildings.

2 Car parking: Minimum/maximum requirements vary between 0.35 to 1.5 parking spaces per apartment; 1 car parking space per apartment is the most frequent rule. Cities with a lower car mode share tend to have smaller minimum car parking spaces per apartment.

Correlation between Parking Spaces and Mode Share



CITY	COUNTRY	POPULATION	YEAR	WALK %	BIKE %	PT %	CAR %	BIKE PARKING	CAR PARKING
Sligo	Ireland	19199	2011	29	2	3	60	1	1.5
Utrecht	Netherlands	316000	2015	16.8	26.1	15.1	39.8	1	1
Glasgow	United Kingdom	592000	2017	23	3	36	37	1.25	1.25
Frankfurt (Oder)	Germany	58237	2013	31.9	3.9	13.5	50.7	1.4	1
Dresden	Germany	543825	2013	27	12	22	39	1.5	1.5
Odense	Denmark	176683	2016	20	26	4	38	1.75	0.75
Bergen	Norway	271949	2013	25	3	16	53	1.75	1.3
Zürich	Switzerland	402762	2015	26	8	41	25	1.75	0.6
Munich	Germany	1450381	2013	27	17	23	33	1.75	1
Darmstadt	Germany	143499	2013	28	17	17	38	2	1.2
Trondheim	Norway	181513	2017	23.7	9.1	11.9	55.4	2	0.8
Rostock	Germany	206011	2013	32.5	14.1	16.9	36.5	2	1
Freiburg	Germany	227000	2016	29	34	16	21	2	1
Karlsruhe	Germany	298000	2012	24	25	17	34	2	1
Nurnberg	Germany	506000	2017	22.8	13.2	22.6	41.4	2	1
Copenhagen	Denmark	591000	2016	19	29	18	34	2.8	0.35

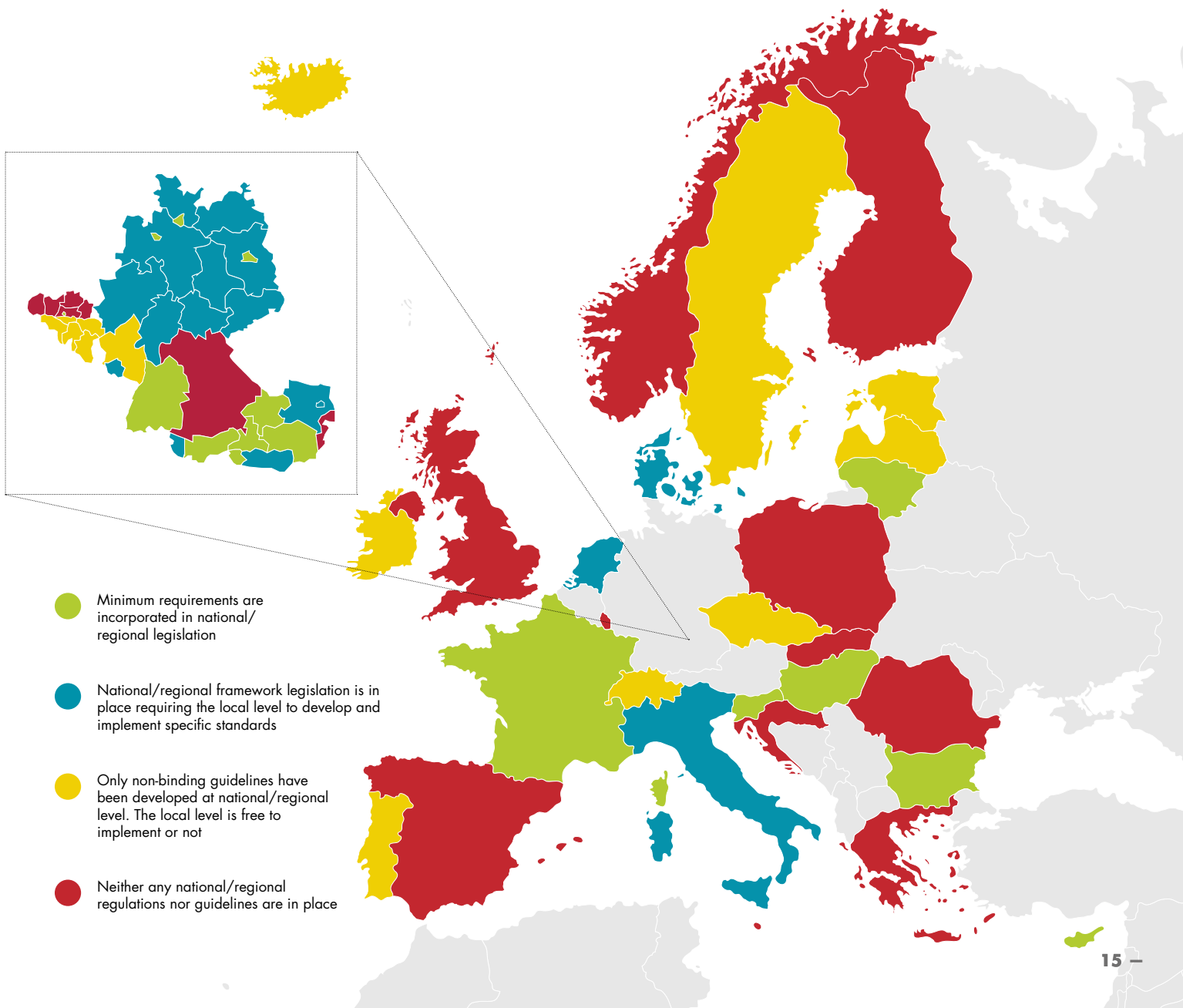
The year is the year of the mode split analysis. Bike and Car Parking are minimum requirements in each city. Some of the cities regulate the number of car and bike parking spaces by area of living space instead of apartments; we use a conversion of: 70 m² = 1 apartment. Some legislation mandates designated area for bike parking instead of a number of spaces; we use a conversion of: 1.5 m² = 1 space. Some cities have zones with different regulations; in these cases we evaluated the central zone.

4.0 Bicycle Parking

4.1 Bicycle Parking Regulations across Europe at a Glance

To create a workable approach, we grouped countries (and regions) according to the way in which they regulate bicycle parking in apartment buildings (Image 1, Table 1).

The green category are countries that have national or regional regulations requiring a certain amount of bicycle parking in new buildings. At the national level this is true of Bulgaria, Cyprus, France, Hungary, Lithuania and Slovenia. At regional level this is true in Austria for Salzburg, Styria, Tyrol and Upper Austria; in Belgium for the Brussels-Capital Region, and in Germany for Baden-Württemberg, Berlin, Bremen and Hamburg.





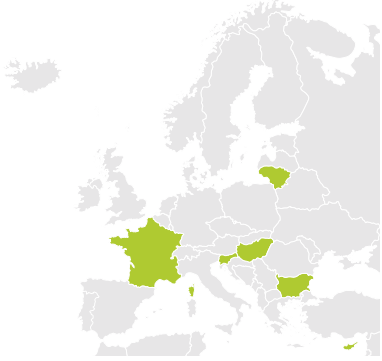

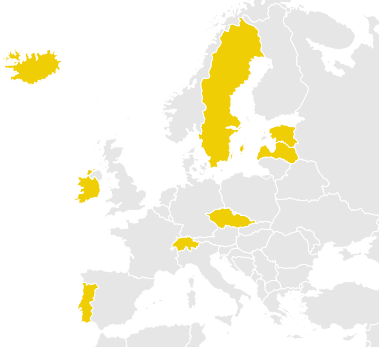
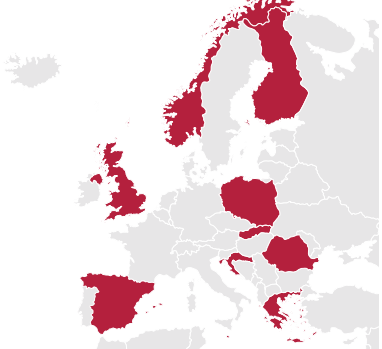
The Bulgarian, French, Hungarian and Lithuanian building codes call for a specific amount of parking spaces for different kinds of apartment buildings. In Slovenia bicycle parking is only regulated for residential buildings with three or more living units and in Brussels, similarly only for “multi-unit buildings”. Cyprus only regulates new buildings with a total floor area of 1200 m² or more. Croatia requires a specific amount of bicycle parking for a number of types of buildings but not apartment buildings. It therefore was not included in the green category.

In the blue category are countries with national or regional legislation that requires the local government level to regulate bicycle parking, but without specifying exact numbers. For example Denmark’s regulatory framework generally requires space for peoples’ modes of transport with bikes being explicitly mentioned as one of them. This group includes Denmark, Italy and the Netherlands, and a large set of federal regions in Austria and Germany. Italy’s law was only adopted in December 2017 and requires local authorities – whenever they revise their building codes – to set minimum requirements. Implementation of the law will hence take many years.

In the yellow category are countries and regions with national or regional legislation that explicitly mentions bicycle parking but without establishing requirements. These suggestions are therefore not binding on local building authorities – and in practice they are applied in some areas and not in others. Countries with this type of arrangement include the Czech Republic, Estonia, Iceland, Ireland, Latvia, Portugal, Sweden and Switzerland; Ireland’s legislation is a guideline and only sets a benchmark of minimum standards which “should be required”. The Icelandic legislation is phrased similarly.

The red category contains countries and regions that have no legislation generally requiring bicycle parking. This is by far the largest group and includes Croatia, Finland, Greece, Luxembourg, Malta, Norway, Poland, Romania, Slovakia, Spain and the United Kingdom. In Luxembourg, bicycle parking facilities are required by national legislation in new government buildings only. However, in all countries in the red category, local standards may exist.

Table 1:
Detailed Information on Groups of Countries

	<p>Bulgaria • Cyprus • France • Hungary • Lithuania • Slovenia</p> <p>Austria: Salzburg • Styria • Tyrol • Upper Austria</p> <p>Belgium: Brussels</p> <p>Germany: Baden-Württemberg • Berlin • Bremen • Hamburg</p>
	<p>Denmark • Netherlands • Italy</p> <p>Austria: Carinthia • Lower Austria • Vorarlberg • Vienna</p> <p>Germany: Brandenburg • Hesse • Mecklenburg-Vorpommern • Lower Saxony • North Rhine-Westphalia • Saarland • Saxony • Saxony-Anhalt • Schleswig-Holstein • Thuringia</p>
	<p>Czech Republic • Estonia • Iceland • Ireland • Latvia • Portugal • Sweden • Switzerland</p> <p>Belgium: Wallonia</p> <p>Germany: Rhineland-Palatinate</p>
	<p>Croatia • Finland • Greece • Luxembourg • Malta • Norway • Poland • Romania • Slovakia • Spain • UK</p> <p>Austria: Burgenland</p> <p>Belgium: Flanders</p> <p>Germany: Bavaria</p>

4.2 Examples of Bicycle Parking Regulations

To convey a more precise picture of the state of bicycle parking regulations in the EU and EFTA, this chapter will give specific data and examples of the statutory requirements from different countries, regions and municipalities. Local examples will be listed in the respective country category, i.e. London examples will be listed in the red category because the UK is classified to this category.

We examine different categories of buildings in turn:

- Residential buildings, including student residences and retirement homes.
- Buildings that workers commute to – office and industrial buildings.
- Buildings with large numbers of visitors, such as commercial centres, educational institutions and public transport hubs.

These categories of buildings are not always addressed in regulations: e.g. Slovenia only regulates bicycle parking for residential buildings.

Also, legislation in different places specifies different building types at very different levels of detail – from considering all residential buildings as one category (e.g. Slovenia), to subdividing the category of “retirement home” into three sub-classes with different bicycle parking requirements (Malmö, Sweden).

Regulations may also use different definitions of what kind of area they apply to; e.g. Bulgaria’s building code only applies “urban transport systems”, meaning places where the network of streets provides necessary conditions for all types of traffic – excluding rural areas and non-urban built-up areas.

There may also be distinctions between long- and short-stay bicycle parking; both London and Bulgaria do this. And yet here too the calculations are done differently: either working from a total number of bike parking spaces, which is then divided into Class 1 and Class 2 (Bulgaria) or estimating the need for long-stay and short-stay spaces and combining this to a total at the end (London).

In the following sections we will review these regulations for specific places in detail.

4.2.1 Residential Buildings

Table 2 lists the regulations on bicycle parking in residential buildings in different countries and regions. In all cases, residential buildings are only multi-apartment buildings. While Styria and Copenhagen relate the number of parking spaces for bikes to the living space, most building codes link the number of required spaces to the number of apartments (Bulgaria, Hungary, Lithuania, Malmö, London). France designates an area that must be reserved for bicycle parking instead of a number of spaces: 0.75 m² for each apartment with one or two rooms. Slovenia calculates the bike parking spaces based on the number of people living in the building.

London uses even more detailed calculations: for example a 40-unit apartment building with 20 one- and 20 two-bedroom apartments must provide 60 long-stay bicycle parking spaces (and 1 short-stay one).

Legislation in many cases differentiates between different types of residential use, e.g. with specific regulations for student residences or retirement homes. Croatia, Bulgaria, London and Styria calculate the amount of required bicycle parking based on the number of residents (beds). In Styria, student residences are further subdivided into those for secondary and third-level students. In Malmö, the number of parking spaces required for student residences is lower than for ordinary residential buildings (1.5 spaces vs. 2.5 spaces per apartment). In Copenhagen, the building code mentions student residences but the requirements do not differ from ordinary residential buildings.

Table 2:
Regulations for Apartment Buildings

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Bulgaria	1.5 spaces per apt (minimum 6 spaces total)
France	Bike parking space per apt: · 1 or 2 rooms: 0.75 m ² · > 2 rooms: 1.5 m ²
Hungary	1 space per apt
Lithuania	1 space per 5 apts
Slovenia	0.6 spaces per person
Upper Austria	2 spaces per apt
Salzburg	2 spaces per apt
Styria	1 space per 50 m ²
Tyrol	2 spaces per apt
Baden-Württemberg	2 spaces per apt
Berlin	2 spaces per apt
Bremen	· <60 m ² : 1 space per apt · >60 m ² : 2 spaces per apt
Hamburg	· <50 m ² : 1 space per apt · <75 m ² : 2 spaces per apt · <100 m ² : 3 spaces per apt · <125 m ² : 4 spaces per apt · >125 m ² : 5 spaces per apt
Copenhagen	4 spaces per 100 m ²
Malmö	2.5 spaces per apt
London	· Long stay: 1 bedroom: 1 space per unit; >1 bedroom: 2 spaces per unit · Short stay: 1 space per 40 units

Table 3:
Regulations for Student Residences

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Bulgaria	1 space per 2 beds (minimum 6 spots)
Croatia	6 spaces per 10 residents
Copenhagen	4 spaces per 100 m ²
Malmö	1.5 spaces per apartment
London	<ul style="list-style-type: none"> · Long stay: 1 space per 2 beds · Short stay: 1 space per 40 beds

We only found specific regulations for retirement homes (Table 4) in four of the building codes presented here. In Copenhagen, the number of required spaces is lower than for student residences and ordinary homes. In Malmö, the “senior homes” have different requirements depending on the type of care the facility provides to the residents. If no care is required, the same standards as for other residential buildings apply; with some care provided only 1 space per apartment is required and if the retirement home is mainly a nursing facility, only parking spaces for employees and visitors are required. In Bulgaria the regulation only applies to buildings of the nursing home type and therefore only requires parking spaces based on the number of staff. London also only requires parking spaces for staff and visitors and does not differentiate between types of retirement homes.

Table 4:
Regulations for Retirement Homes

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Bulgaria	1 space per 4 employees
Copenhagen	1.5 spaces per 100 m ²
Malmö	Apartment buildings for seniors (55+): <ul style="list-style-type: none"> · No care: 2.5 spaces per apartment · Some care: 1 space per apartment · Mainly nursing facilities: No spaces for residents · General: 0.4 spaces per visitor/ employee
London	<ul style="list-style-type: none"> · Long stay: 1 space per 5 staff · Short stay: 1 space per 20 bedrooms

4.2.2 Offices and Other Workplace Buildings

Here we focus on building types that are almost exclusively frequented by employees, i.e. office buildings and buildings serving some form of industry. Buildings in which the numbers of transient visitors greatly outnumber employees will be dealt with in the next section.

As can be seen in Table 5 and 6 the approaches to specify the exact parking space requirements differ between office buildings and industrial buildings. Generally more spaces per square meter are required in office buildings than in industry buildings (Hungary, Lithuania, Malmö, London). A rationale for this is most likely that industry buildings will have large spaces occupied only by machinery. Where the requirement for bicycle parking is calculated by the number of employees (France, Styria), no difference is made between office and industry buildings. In London there are different requirements for long-stay (i.e. for residents) bicycle parking for locations in the city centre and in the periphery; the requirement for short-stay spaces (i.e. for visitors) is the same in both zones. The legislation also differentiates between light industry (including research and development) and general industry (including storage and distribution).

Only the regulations in London and Bulgaria account for visitors separately from employees, using different categories of bicycle parking spaces. By contrast, Malmö uses a single overall number, based on the factor of 0.4 spaces per person frequenting the building, including employees, residents and visitors. The numbers of people and square metres given in Tables 2 to 9 for the Swedish city are indications of the assumed amount of needed bicycle parking spaces.

Table 5:
Regulations for Office Buildings

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Bulgaria	1 space per 100 m ²
France	Bike parking space 1.5% of total office space/ enough space for 15% of employees
Hungary	1 space per 100 m ²
Lithuania	1 space per 250 m ²
Styria	1 space per 20 employees
Copenhagen	<ul style="list-style-type: none"> · Bikes: 4 spaces per 100 m² · Cargo bikes: 2 spaces per 1000 m²
Malmö	<ul style="list-style-type: none"> · 18 spaces per 1000 m²
Croatia	1 space per 100 m ²
London	<ul style="list-style-type: none"> · Long stay: <ul style="list-style-type: none"> · Inner London: 1 space per 90 m² · Outer London: 1 space per 150 m² · Short stay: <ul style="list-style-type: none"> · first 5,000 m²: 1 space per 500 m² · thereafter: 1 space per 5,000 m²

Table 6:
Regulations for Industrial Buildings

COUNTRY/ REGION / MUNICIPALITY	REGULATION
France	Enough space for 15% of employees
Hungary	1 space per 10 employees
Lithuania	1 space per 500 m ²
Styria	1 space per 20 employees
Copenhagen	<ul style="list-style-type: none"> · Bikes: 4 spaces per 100 m² · Cargo bikes: 2 spaces per 1000 m²
Malmö	<ul style="list-style-type: none"> · 6 spaces per 1000 m²
London	<ul style="list-style-type: none"> · Long stay: <ul style="list-style-type: none"> · Light industry: 1 space per 250 m² · General industry: 1 space per 500 m² · Short stay: 1 space per 1000 m²

4.2.3 Buildings with High Visitor Frequency

The definition of “Buildings with high Visitor Frequency” is relatively broad. During the research for this report, we identified eleven different types of building for this category. The types we considered most important were public transport stations (Table 7), buildings dedicated to shopping (Table 8) and educational institutions (Table 9).

Table 7:
Regulations for Public Transport

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Bulgaria	Railways, Bus Terminals, Airports: <ul style="list-style-type: none"> · 1 space per 30 passengers/ hour · 1 space per 10 employees
Lithuania	1 space per 100 inhabitants
Croatia	10% of daily passengers

Table 7 shows the regulations for public transport stations. Only three of the building codes provide a specific number. In London the existence of bicycle parking spaces at public transport station is required, the exact amount however is to be determined on a case-by-case basis. Long distance transport hubs in Bulgaria calculate the amount of spaces by passengers per hour and for local transport per number of lines (e.g. metro lines) serving the stations.

Table 8:
Regulations for Shopping Amenities

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Bulgaria	1 space per 35 m ²
France	<ul style="list-style-type: none"> · <40 car spaces: 10%; min. 2 · <400 car spaces: 5%; min. 10 · >400 car spaces: 2%; >20, <50
Hungary	<ul style="list-style-type: none"> · 2 spaces per 150 m² · >1000 m²: 2 spaces per 500 m²
Lithuania	<ul style="list-style-type: none"> · <5000 m²: 1 space per 200 m² · >5000 m²: 1 space per 300 m²
Styria	1 space per 50 m ²
Copenhagen	<ul style="list-style-type: none"> · Bikes: 4 spaces per 100 m² · Cargo bikes: 2 spaces per 1000 m²
Malmö	30 spaces per 1000 m ²
Croatia	5 spaces per 100 m ²
London	<ul style="list-style-type: none"> · Long stay: <ul style="list-style-type: none"> · Food: 1 space per 175 m² · Non-food: <ul style="list-style-type: none"> · <1000 m²: 1 space per 250 m² · >1000 m²: 1 space per 1000 m² · Short stay: <ul style="list-style-type: none"> · Food: <ul style="list-style-type: none"> · <750 m²: 1 space per 40 m² · >750 m²: 1 space per 300 m² · Non food: <ul style="list-style-type: none"> · <1000 m²: 1 space per 125 m² · >1000 m²: 1 space per 1000 m²

Turning to shops, the regulations listed in Table 8 are based rather diverse definitions of the type of shops or shopping malls or other commercial centres. In France for example the standards apply to “Commercial Centres”, therefore excluding smaller, individual shops. The Bulgarian regulation only applies to “stores in central city areas”, excluding bigger stores and centres on the outskirts of an urban area. In Malmö the word that is used in the regulations is simply “shop”. The City of Copenhagen does not apply a general requirement to shopping malls and instead demands a case-by-case assessment. Apart from this, Copenhagen applies the same requirements of 4 spaces per 100 m² to almost all building types; it also has the only rule specifically requiring space for cargo bikes. The building regulations in London distinguish between food and non-food shops and again, between short-stay and long-stay parking spaces. The regulations only apply to shops that are larger than the threshold of 100m².

Almost all regulations in Table 8 are calculated in reference to the size of the (effective) sales space. The only exception is France where the number of bicycle parking spaces is linked to the amount of available car parking. France is also the only country limiting the amount of bicycle parking spaces to a maximum of 50 spaces. Nevertheless, at least two spaces have to be provided even if there is only one car parking space.

Table 9 shows the bicycle parking requirements for educational institutions. Again the definitions of the institutions the regulations apply to differ from place to place. In Croatia, Lithuania and Styria they only apply to schools. In Hungary the regulations apply to schools, colleges and universities. In Bulgaria there is one regulation for schools, colleges and universities and another for childcare centres. In Copenhagen the same rule applies to schools, colleges, universities and kindergartens. Malmö is the only example that distinguishes between primary and secondary schools.

Table 9:
Regulations for Educational Institutions

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Bulgaria	<ul style="list-style-type: none"> · Childcare facilities: 1 space per 10 children; 1 space per 10 employees · All others: 1 space per 5 students; 1 space per 10 employees
Hungary	2 spaces per 50 m ²
Lithuania	1 space per 250 m ²
Styria	1 space per 5 students
Copenhagen	0.5 spaces per student/employee
Malmö	<ul style="list-style-type: none"> · Kindergarten: 0.4 spaces per employee/visitor · Primary School: 30–70 spaces per 100 students · Secondary school: 60–80 spaces per 100 students
Croatia	2 spaces per 5 students/employees
London	<ul style="list-style-type: none"> · Long stay: <ul style="list-style-type: none"> · Kindergarten/school: 1 space per 8 students/ staff · Universities: <ul style="list-style-type: none"> · 1 space per 4 staff, · 1 space per 20 students · Short stay: <ul style="list-style-type: none"> · Kindergarten/school: <ul style="list-style-type: none"> · 1 space per 100 students · University: <ul style="list-style-type: none"> · 1 space per 7 students

4.3 A Closer Look: Bulgaria

In Bulgaria, the law regulating the size and set up of bicycle parking spaces came into force in September 2016. It only applies to urban areas. The most innovative element of the Bulgarian bicycle parking regulation is the use of two classes of parking spaces (Table 10). 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 are applied to provide a suitable mix of parking for a range of different types of building, assigning more long-term parking spaces to buildings with many people staying for longer periods of time (e.g. residential buildings, hospitals) and fewer to buildings with mostly transient visitors (e.g. cinemas, shops). The percentage indicates the relative numbers of spaces of each class (e.g. a hotel with 100 rooms has to provide 10 spaces, of which 6 have to be of Class 1 and 4 of Class 2). For educational institutions and childcare facilities the secure parking of Class 1 is reserved for teachers and other employees while the remaining 90% of spaces are for students and visitors.



Table 10:
Regulation for Bicycle Parking Bulgaria

BUILDING TYPE	REGULATION PARKING SPACES	CLASSIFICATION
Hotels	1 space per 10 rooms	· Class 1: 60% · Class 2: 40%
Hospitals	1 space per 500 m ²	· 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 ²	· Class 1: 20% · Class 2: 80%
Administrative/ business offices	1 space per 100 m ²	· 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 ²	· 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%

5.0 Car Parking

5.1 Car Parking Regulations across Europe at a Glance

Here we present an overview of regulations on provision of car parking using a similar approach as in Section 4.1 for bicycle parking. Again, we use four different categories, and as in the bicycle parking section, the colour does not represent specific qualitative or quantitative elements of the building codes but merely states whether a national or regional policy framework is in place.

Image 2:
Country-specific regulations on car parking in apartment buildings

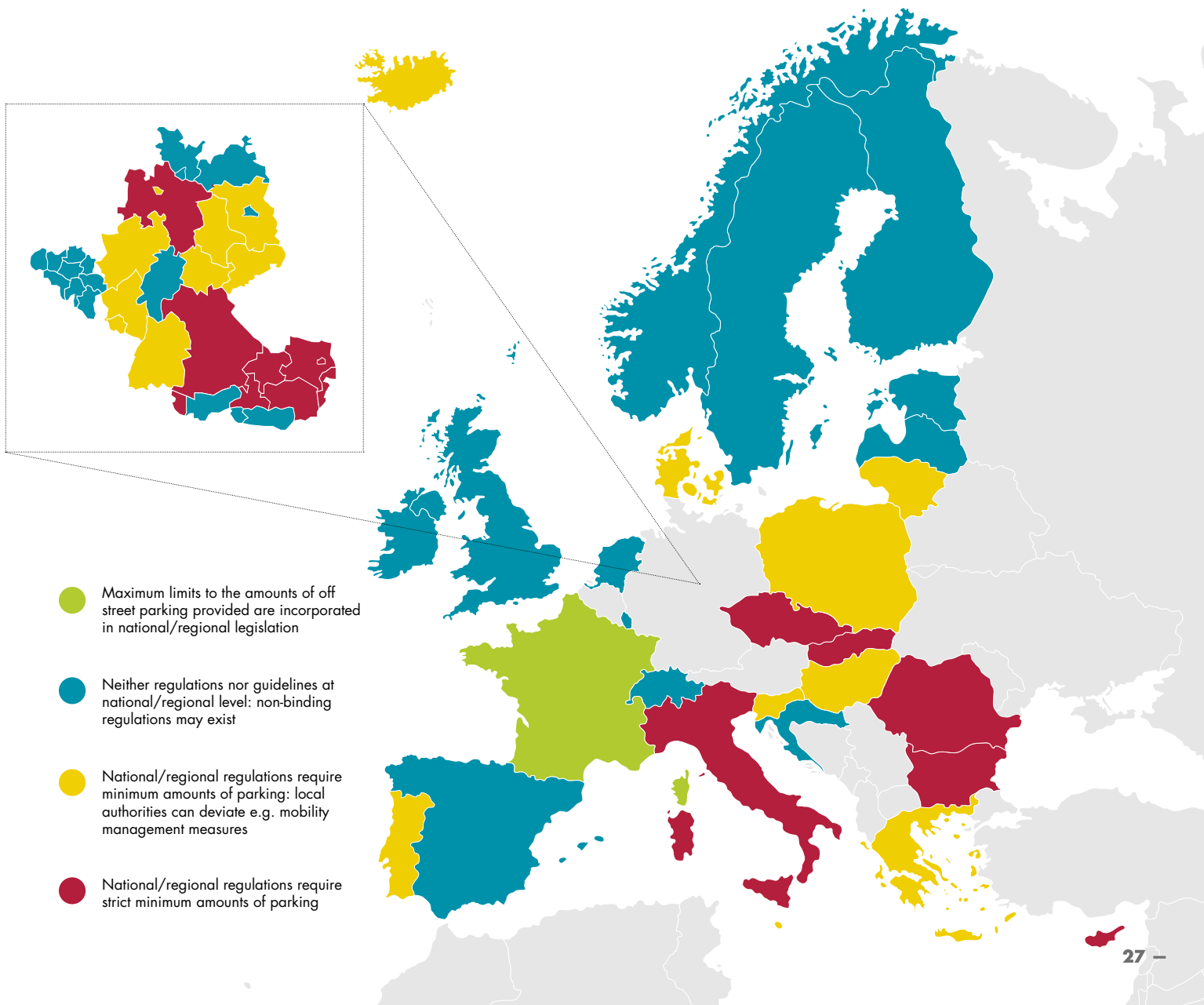


Table 11:
Detailed Information on Groups of Countries

	<p>France</p>
	<p>Croatia • Estonia • Finland • Ireland • Latvia • Luxembourg • Netherlands • Norway • Spain • Sweden • Switzerland • United Kingdom</p> <p>Austria: Carinthia • Tyrol</p> <p>Belgium: Flanders • Wallonia</p> <p>Germany: Berlin • Hamburg • Hessen • Mecklenburg-Vorpommern • Schleswig-Holstein</p>
	<p>Denmark • Greece • Hungary • Iceland • Lithuania • Malta • Poland • Portugal • Slovenia</p> <p>Belgium: Brussels</p> <p>Germany: Baden-Württemberg • Brandenburg • Bremen • North Rhine-Westphalia • Rhineland-Palatinate • Saarland • Saxony • Saxony-Anhalt • Thuringia</p>
	<p>Bulgaria • Cyprus • Czech Republic • Italy • Romania • Slovakia</p> <p>Austria: Burgenland • Lower Austria • Salzburg • Upper Austria • Styria • Vorarlberg • Vienna</p> <p>Germany: Bavaria • Lower Saxony</p>

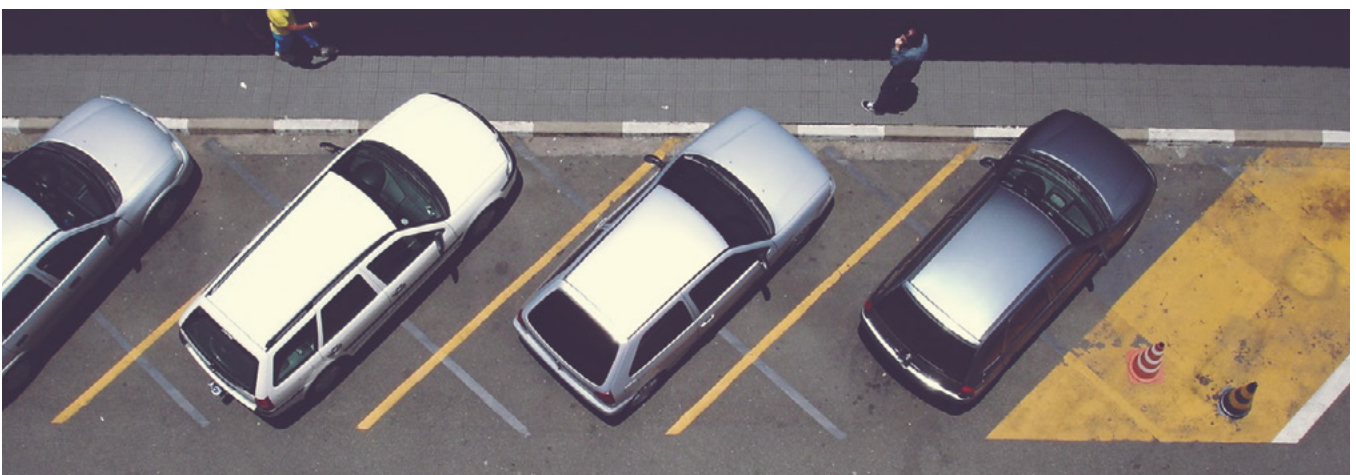
The green category represents countries or regions that have imposed a maximum number of car parking spaces that can be provided in new developments. This category at this point consists only of one country: France. It should be noted that this maximum car parking policy only applies to rental housing financed with a loan assisted by the state as well as certain types of developments providing accommodation for the elderly and for university residences. Tyrol and Vorarlberg in Austria have maximum requirements in place but because they also mandate minimum car parking they did not fit in this category. The blue category comprises countries and regions in which no specific, mandatory numbers are imposed by national or regional legislation.

Individually, however, differences exist. Some countries and regions do not mention car parking and have moved the responsibility completely to the local level (Croatia, Estonia, Finland, Ireland, Latvia, Luxembourg, the Netherlands, Norway, Spain, Sweden and the UK; in Belgium: Flanders, in Germany: Berlin, Hesse and Mecklenburg-Vorpommern.)

The UK has been put in this category despite the fact that Northern Ireland has issued a guideline regarding car parking. Others have issued non-binding guidelines and recommendations, also leaving the final decision to the municipalities (Estonia, Switzerland, and in Belgium: Wallonia).

The third, yellow category is comprised of countries and regions that require a minimum number or a “sufficient number” of car parking spaces in different developments. Where a minimum number is required, there may be mechanisms whereby this requirement can be relaxed: e.g. if the local authorities ensure that mobility management measures, such as a good connection to public transport are in place, or if developers pay a financial penalty. Where a “sufficient number” is required, the ultimate responsibility is left to the local level. All these options make it more difficult to reduce car parking spaces for developers, especially compared to the green and the blue category. Countries that require a minimum amount of car parking are: Denmark, Greece, Hungary, Iceland, Lithuania, Malta, Poland, Portugal and Slovenia.

Finally, the red category is countries and regions whose legislation requires a strict minimum of parking spaces with no possibility of exemptions at local level. The countries in this category are Bulgaria, Cyprus, the Czech Republic, Italy, Romania and Slovakia.



5.2 Examples of Car Parking Regulations

5.2.1 Residential Buildings

A minimum requirement of one car parking space per apartment is the most common provision found across different countries and regions.

Table 12:
Regulations Residential Buildings

COUNTRY/ REGION / MUNICIPALITY	REGULATION
France	Max 1 space per apartment in rental housing built with state loans; Max 0.5 space per apartment if located within 500m of public transport station
London	· > 4 beds: max 2 spaces per apartment · 3 beds: max 1.5 spaces per apartment · 1–2 beds: max 1 space per apartment
Hungary	1 space per apartment
Lithuania	1 space per apartment
Slovenia	1 space per apartment
Copenhagen	· Usually: <1 per. 200 m ² ; >1 per. 100 m ² · Within 300m from a station: At least 1 per. 250, max 1 per. 100 m ²
Malmö	0.6–1.1 spaces per apartment
Styria	1 space per apartment

Malmö, Copenhagen and also several Swiss cities have a minimum and maximum regulation of car parking spots in place. In Swiss cities it is in addition also quite common to apply different rules for high-density and low-density neighbourhoods. An exception to this rule is Basel that does not have a minimum parking regulation in place across the entire city area. For example, for a residential building with 8 apartments, between 0 and 8 car parking spots can be provided. We have not found a minimum-maximum range policy like this anywhere at the regional or national level.

London meanwhile is considering introducing restrictive parking measures: “All developments in areas of good public transport accessibility in all parts of London should aim for significantly less than 1 space per unit”, and “in locations with high public transport accessibility, car-free developments should be promoted (while still providing for disabled people)”.

In Copenhagen student residences, requirements for parking spaces in connection with colleges and youth housing and care homes can be determined on a case by case basis taking into consideration the access to public transport and the characteristics of the project, including the building plan and the use and location of the property in the city, etc.

Table 13:
Regulations Student Residences and Retirement Homes

COUNTRY/ REGION / MUNICIPALITY	REGULATION
France	Max 1 space per apartment in rental housing built with state loans; Max 0.5 space per apartment if located within 500m of public transport station
Copenhagen	1 space per 300 m ²
Malmö	0.15 spaces per student resident; 0.2 per retirement home employee
Hungary	1 space per 10 visitors/residents
Styria	1 space per 5 residents

5.2.2 Offices and Other Workplace Buildings

Table 14 shows a limited number of examples of how car parking is regulated in office and industrial buildings. For other types of buildings, specific numbers of car parking space requirements are calculated in different ways, either based on spaces per m² or spaces per employee.

Table 14:
Regulations for Office Buildings

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Hungary	1 space per 20 m ²
Lithuania	1 space per 25 m ²
Copenhagen	· Town Centre/ urban development area: 1 space per 150 m ² · Other areas: 1 space per 100 m ²
Malmö	9 per 1,000 m ²
Styria	1 space per 5 employees

Table 15:
Regulations for Industrial Buildings

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Hungary	1 space per 200 m ²
Lithuania	1 space per 100 m ²
Copenhagen	1 space per 100 m ²
Malmö	3 per 1,000 m ² / 0.2 per employee
Styria	1 space per 5 employees

5.2.3 Buildings with High Visitor Frequency

Below a limited number of examples of how car parking is regulated in buildings with a high visitor frequency, including at public transport stations, shops and educational institutions.

Table 16:
Regulations for Public Transport Stations

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Lithuania	1 per 1,000 inhabitants (not less than 5 places)
Hungary	<ul style="list-style-type: none"> · Settlements up to 30,000: one space for each 1,000 inhabitant · Settlements between 30,000 and 100,000 or suburban, holiday station: one space for each 1,500 inhabitant · Settlements over 100,000 inhabitants or transport nodes: one space for each 2,500 inhabitant

Table 17:
Overview – Shopping

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Hungary	<ul style="list-style-type: none"> · Up to 100 m²: 1 space per 10 m² · Above 100 m²: 1 space per 20 m²
Lithuania	<ul style="list-style-type: none"> · Supermarkets: 1 space per 20 m² · Shopping Centre: 1 space 30 m² · Non-food stores: 1 per 20 m²
Copenhagen	1 space per 100 m ² (50 m ² for space consuming goods)
Malmö	18 per 1,000 m ²
Styria	1 space per 50 m ²

Table 18:
Regulations Educational Institutions

COUNTRY/ REGION / MUNICIPALITY	REGULATION
Hungary	1 space per employee OR 1 space per 20 m ²
Lithuania	<ul style="list-style-type: none"> · University: 1 space per 10 students · General education: 1 space per 30 students · Kindergarten: 1 space per 40 students
Copenhagen	Max 1 space per 100 m ²
Malmö	· 0.2 per employee, number for students depending on type of school
Styria	1 space per 20 students

5.3 The Costs of Free Car Parking

Since the ground-breaking research published by Donald Shoup in the late 1990s we understand that parking is usually heavily subsidized. Shoup, Professor for Urban Planning at the University of California, Los Angeles (UCLA), analysed in detail at how much each additional new parking space built at his university campus cost. He concluded that the average new parking space at UCLA, built from 1977 – 1991, cost \$ 23,600 in 1994 US dollars (or \$ 40,100 in 2018 US dollars). If there were four parking spaces for every 1,000 square feet of office space, in accordance with Los Angeles minimum parking requirements at that time, this would have accounted for 39% of the total cost of constructing an office building, including the parking, Shoup found. In Australia, based on typical affordable housing development costs, one parking space per unit increases costs approximately 12.5%, and two parking spaces can increase costs by up to 25%.

Shoup’s research also demonstrated that urban planners typically set minimum parking requirements to meet the peak demand for parking at each land use, without consideration of the price motorists pay for parking nor the cost of providing the required parking spaces. “Eliminating minimum parking requirements would reduce the costs of urban developments, improve urban design, reduce automobile dependency, and restrain urban sprawl”, Shoup concluded.

US motorists at the time of Shoup’s research parked free of charge for 99 per cent of all automobile trips. While the European figure for free parking may be somewhat lower than in the US, here also the bill is largely footed by the general public. According to the European Parking Association, the umbrella organisation for European parking associations, the average subsidy for (on-street) parking across Europe is 300 Euros per taxpayer per year.

Table 19:
Cost comparison of parking spaces for bicycles and cars¹¹

TYPE OF PARKING SPACE	BICYCLE	CAR
On-street parking space	€ 200	€ 2,000 – 3,500
Roofed parking space	€ 625 – 1,700	€ 10,000 – 15,000
Parking space in underground parking garage	€ 2,000 – 3,500	€ 15,000 – 25,000

Construction costs may vary across Europe. These figures taken from a 2015 VCÖ (Verkehrsclub Österreich/Traffic Club Austria) publication are probably at the lower end, but demonstrate the differences in costs in providing for one bicycle parking versus one car parking space in different settings. Providing (more) bicycle parking facilities at the expense of car parking is an effective means to reduce overall need for parking space and hence decrease construction costs.



6.0 Bike and Car Parking Overview

Looking at bicycle and car parking together, France is the only jurisdiction that scores highest marks for both categories. France is followed by Berlin and Hamburg, the only two entities that are in the green category for bicycle parking and in the blue category for car parking. At the other end of the spectrum, Romania and Slovakia are the only countries that are in the red category for both. At the regional level, Burgenland and Bavaria fail our parking test.

COUNTRY	BIKE PARKING	CAR PARKING	TOTAL
France	****	****	*****
Hungary	****	**	*****
Lithuania	****	**	*****
Netherlands	***	***	*****
Slovenia	****	**	*****
Bulgaria	****	*	*****
Cyprus	****	*	*****
Denmark	***	**	*****
Estonia	**	***	*****
Ireland	**	***	*****
Latvia	**	***	*****
Sweden	**	***	*****
Switzerland	**	***	*****
Croatia	*	***	****
Finland	*	***	****
Iceland	**	**	****
Italy	***	*	****
Luxembourg	*	***	****
Norway	*	***	****
Portugal	**	**	****
Spain	*	***	****
UK	*	***	****
Czech Republic	**	*	***
Greece	*	**	***
Malta	*	**	**
Poland	*	**	***
Romania	*	*	**
Slovakia	*	*	**

REGION	BIKE PARKING	CAR PARKING	TOTAL
Berlin (DE)	****	***	*****
Hamburg (DE)	****	***	*****
Tyrol (AT)	****	***	*****
Baden-Württemberg (DE)	****	**	*****
Bremen (DE)	****	**	*****
Hesse (DE)	***	***	*****
Mecklenburg-Vorpommern (DE)	***	***	*****
Schleswig-Holstein (DE)	***	***	*****
Carinthia (AT)	***	***	*****
Salzburg (AT)	****	*	*****
Styria (AT)	****	*	*****
Upper Austria (AT)	****	*	*****
Brussels (BE)	****	*	*****
Wallonia (BE)	**	***	*****
Brandenburg (DE)	***	**	*****
North Rhine-Westphalia (DE)	***	**	*****
Saarland (DE)	***	**	*****
Saxony (DE)	***	**	*****
Saxony-Anhalt (DE)	***	**	*****
Thuringia (DE)	***	**	*****
Lower Austria (AT)	***	*	****
Vienna (AT)	***	*	****
Vorarlberg (AT)	***	*	****
Flanders (BE)	*	***	****
Lower Saxony (DE)	***	*	****
Rhineland Palatinate (DE)	**	**	****
Burgenland (AT)	*	*	**
Bavaria (DE)	*	*	**

Bike Parking:

- *: Neither any national/regional regulations nor guidelines are in place
- ** : Only non-binding guidelines have been developed at national/regional level. The local level is free to implement or not
- ***: National/regional framework legislation in place requiring local level to develop and implement specific standards
- ****: Minimum requirements are incorporated in national/regional legislation

Car Parking:

- *: National/regional regulations require strict minimum amounts of parking
- ** : National/regional regulations require minimum amounts of parking; local authorities can deviate, e.g. through mobility management measures
- ***: Neither regulations nor guidelines at national/regional level; non-binding guidelines may exist
- ****: Maximum limits to the amounts of off-street parking provided are incorporated in national/regional legislation

7.0 EU Legislation on Parking

The EU's revised Directive on the Energy Performance of Buildings (EU 2018/844) for the first time also refers to mobility issues. While most new buildings and those undergoing major renovation in the future will also need to install recharging infrastructure for electric vehicles (Art. 8, Paragraphs 2-7), the Directive also includes a provision to Member States to consider 'coherent policies for buildings, soft and green mobility and urban planning'.

The specific sections of the Directive read as follows:

Recital 28: "When applying the requirements for electromobility infrastructure provided for in the amendments to Directive 2010/31/EU as set out in this Directive, Member States should consider the need for holistic and coherent urban planning as well as the promotion of alternative, safe and sustainable modes of transport and their supporting infrastructure, for example through dedicated parking infrastructure for electric bicycles and for the vehicles of people of reduced mobility."

Art. 8, Paragraph 8: "Member States shall consider the need for coherent policies for buildings, soft and green mobility and urban planning."

Taking the recital and the paragraph together, it is appropriate to state that the legislator asks Member States to contemplate how their current approach to building codes and urban planning policies fit into the wider framework of soft and green mobility and how it supports energy efficiency in the transport system. This active process also applies to Member States with a federal structure where these competences have been delegated exclusively or primarily to federal states/regions.

In the process of transposition of this EU Directive into national law, we ask Member States to take the policy recommendations as laid out in Chapter 8 into account.

Following its adoption on 30 May 2018 and its publication in the EU's Official Journal on 19 June 2018, Member States will need to transpose this Directive into national law by 10 March 2020. The European Commission will publish a guidance note for Member States on the transposition of this Directive to ensure a harmonised approach across Member States as much as possible.

Strong influence of the type of mobility on overall energy consumption of the residential sector

Low-density neighbourhoods are prone to higher car ownership rates than high-density ones. Figures from Austria show that the primary energy consumption of a newly built low-energy building in a rural area is about 60% higher compared to a building in an urban environment, simply due to the different type of mobility it induces. In detached houses with a car, the overall energy consumption there is about 28,500 kWh/year, 50% thereof is generated by the car. The same household without a car reduces its energy use to 17,700 kWh/year, or 38% less. In low energy houses and in apartment blocks, the reduction is even higher: 50% and 45% respectively. For that reason, Austria for example is experimenting with energy passports for entire neighbourhoods. On top of building-relevant criteria other factors are taken into account as well, including distances to work places, schools, grocery stores and its accessibility by public transport.

8.0 Policy Recommendations

8.1 Bicycle Parking

In order to encourage regular cycle use, access to bicycle parking most of all has to be easy and convenient. It should be as barrier-free as possible, weather-protected, theft-secured and provided in sufficient numbers in or near the entrance to buildings, taking bicycle ownership as well as (projected) daily/regular use into account. Facilities to accommodate the increasing diversity of bicycles, such as tricycles, cargo bikes and bike trailers should also be provided.

Existing developments without bicycle parking should be retro-fitted, either by converting car parking spaces into bicycle parking or by providing parking facilities near/adjacent to buildings. An adequate number of power sockets should be installed for recharging e-bikes.

We advise competent national/regional governments to take following steps, dependent on the categorisation in our framework:

Red countries/regions



Following provisions as laid out by Directive EU 2018/844, develop, as a minimum, guidelines to local authorities on bicycle parking in building regulations and urban planning policies (i.e. the yellow category). These guidelines should include both quantitative (i.e. number of parking spaces) as well as qualitative elements. Develop these guidelines by 10 March 2020.

Red + Yellow countries/regions



Introduce a legally binding framework at national/regional level, requiring local authorities to adopt specific parking regulations (i.e. the blue category). This policy approach seems to work well in the Netherlands and in Denmark, Europe's two leading cycle countries that can look back on a long history of cycle-friendly planning;

In jurisdictions where cycling as a mode of transportation is underdeveloped and where the majority of local authorities do not legislate for bicycle parking, the competent national and regional authorities should introduce legally binding minimum parking requirements, such as in Bulgaria or France (i.e. the green category). Local authorities should be able to go beyond these minimum requirements, taking local circumstances into account.

Blue countries/regions



Analyse whether local authorities properly transpose the national/ regional framework law into local regulation. If your assessment finds this is not the case, introduce national/ regional minimum requirements.

Green countries/regions



Analyse whether existing national/regional minimum requirements are still up to date and meet demand. If your assessment finds this is not the case, strengthen these requirements. Verify whether local authorities properly implement national/regional minimum requirements.

All countries/regions



All public authorities should lead by example by introducing ambitious minimum bicycle parking standards in all state-owned buildings, similar to the existing law in Luxembourg.






8.2 Car Parking

Many problems that come with a too high car use transcend the local level, such as climate change, air pollution, congestion, etc. Therefore national and regional authorities have to assume an active role in shaping off-street parking policies.

To manage car ownership and car use, an integrated approach covering both on-street and off-street car parking has to be found. Often off-street car parking projects are justified with the argument that they would reduce on-street car parking but in reality they often simply add new car parking space. In our opinion it makes little sense to introduce restrictive off-street parking regulations if on-street parking is abundant. Quantitative minimum parking requirements have to be based on proper research looking at car ownership rate per household. For example, in the Brussels-Capital Region, only 55% of households own a car, yet the regional building code requires at least one car parking space for every new apartment. To avoid the privatization of public land as well as artificially subsidizing car ownership, parking should be a payable service, reflecting market prices.

As a general rule, public authorities should reverse the policy of mandating minimum parking requirements by setting maximum parking limits in all developments. As stated in Chapters 3 and 5.3, researchers agree in the assessment that minimum parking regulations cause an over-supply of parking, thereby affecting construction costs, living costs, car ownership and mode choice.

We advise competent national/regional governments to take following steps:

<p>Red countries/regions</p> 	<p>Following provisions as laid out by Directive EU 2018/844, develop, as a minimum, car parking guidelines to local authorities. These guidelines should include both quantitative (i.e. maximum number of parking spaces) as well as qualitative elements. Develop these guidelines by 10 March 2020.</p>
<p>Red + Yellow countries/regions</p> 	<p>Remove all minimum car parking requirements, or at least introduce a hybrid of minimum and maximum requirements at the same time, such as in Malmö or in some Swiss cities. If an authority insists on keeping minimum parking requirements, bring these in line with car ownership rates per household.</p>
<p>Blue countries/regions</p> 	<p>Introduce a legally binding framework, either by setting maximum parking regulations at national/ regional level or by mandating local authorities to set maximum parking requirements. Maximum parking regulations need to be supported with mobility management measures such as providing bike- and car-sharing services and good access to public transport.</p>
<p>Green countries/regions</p> 	<p>Set maximum car parking requirements based on car ownership per household. Check whether national/regional maximum requirements are properly implemented at local level.</p>
<p>All countries/regions</p> 	<p>All public authorities, including local ones, should lead by example by introducing maximum car parking standards in all state-owned buildings. If minimum and maximum requirements apply, set them as low as possible, taking car ownership per household into account.</p>

8.3 General recommendations on housing and mobility

- 1** Consider energy-efficiency standards for buildings not in isolation but link them to mobility as well as to urban and spatial planning. As far as possible, avoid new housing developments in low-density neighbourhoods. Further develop the concept of the 'low-energy building' into one of a 'low-traffic building' with as little car traffic as possible. Mobility needs should be met primarily by walking, cycling, public transport and shared/pooled services.
- 2** Parking requirements have to take into account current as well as long-term mobility and societal trends and projections, such as population growth in cities, an increase in households not owning a car (partially due to a growing share of single-person households), increasing real estate prices in many European urban centres (hence a growing need for affordable housing), a lack of physical activity among more than 50% of the population, etc.
- 3** At the very minimum, bicycle parking in new buildings should enjoy a level playing-field with car parking by 2022, e.g. if a competent authority by then continues to legislate minimum car parking, equivalent provisions also have to exist for bicycle parking. The overview table in Chapter 6 provides a summary of where action is needed.
- 4** All competent authorities should ensure compliance with regulations. A law is only as good as its implementation. We have been notified of examples where national and/or regional regulations have been ignored or not properly implemented by local authorities. It should be analysed in every jurisdiction whether the 'system of regulation' works properly and is fully implemented. Audits should be carried out before and after construction of the development to see whether regulation has been properly applied and whether building permit specifications on parking have been actually implemented.



Annex 1:

Overview of Bicycle Parking Regulations

COUNTRY/ REGION	RESIDENTIAL (SPACES PER APARTMENTS)	STUDENT RESIDENCE (SPACES PER RESIDENTS)	RETIREMENT HOME	OFFICE BUILDING	INDUSTRIAL BUILDING	TRANSPORT HUB	SHOPPING	EDUCATIONAL INSTITUTION (SPACES PER UNIT)
Bulgaria	1.5 per 1 (minimum 6 spaces in total)	1 per 2 (minimum 6 spaces)	1 space per 4 employees	1 space per 100 m ²		1 space per 30 passengers/h 1 space per 10 employees	1 space per 35 m ²	1 per 5 students; 1 per 10 employees
Croatia		6 per 10		1 space per 100 m ²		10% of daily passengers	5 spaces per 100 m ²	2 per 5 students/ employees
France	Bike parking space per apartment: · 1-2 rooms: 0.75 m ² · >2 rooms: 1.5 m ²			Bike parking space 1.5% of total office space/enough space for 15% of employees	Enough space for 15% of employees		≤40 car spaces: 10%; min. 2 ≤400 car spaces: 5%; min. 10 >400 car spaces: 2%; >20, <50	
Hungary	1 per 1			1 space per 100 m ²	1 space per 10 employees		2 spaces per 150 m ² >1000m ² :	2 per 50 m ²
Lithuania	1 per 5			1 space per 250 m ²	1 space per 500 m ²	1 space per 1000 inhabitants	<5000m ² : 1 space per 200m ² >5000m ² : 1 space per 300m ²	1 per 250 m ²
Slovenia	0.6 per person							
Lower Austria	1 per 1	High school: 1 per 4 University: 1 per 2	1 space per 3 apartments	1 space per 20 employees	1 space per 20 employees		1 space per 50 m ²	1 per 5 students
Salzburg	2 per 1	Like Lower Austria	1 space per 30 residents	1 space per 20 m ² employees	1 space per 90 m ²		1 space per 100 m ² Food: 1 space per 50 m ²	Grade 1-4: 1 per class Grade 5-13 5 per class University & other: 1 per 10 students
Styria	1 space per 50 m ²	Like Lower Austria		1 space per 20 employees	1 space per 20 employees		1 space per 50 m ²	1 per 5 students

COUNTRY/ REGION	RESIDENTIAL (SPACES PER APARTMENTS)	STUDENT RESIDENCE (SPACES PER RESIDENTS)	RETIREMENT HOME	OFFICE BUILDING	INDUSTRIAL BUILDING	TRANSPORT HUB	SHOPPING	EDUCATIONAL INSTITUTION (SPACES PER UNIT)
Vorarlberg	Per apartment: Inside: 3.5 m ² Outside (for visitors): 0.5 m ²				1.4 m ² per 5 employees		1.4m ² per 100 m ² Food: 1.4 m ² per 50 m ² Large items: 1.4 m ² per 300 m ²	
Baden- Württemberg	2 per 1	1 per 2	1 space per 10 residents	1 space per 100 m ²	1 space per 225 m ²		1 space per 50 m ²	School: 1 per 3 students University: 1 per 5 students
Berlin	2 per 1	1 per 2	1 space per 10 residents	1 space per 100 m ² >4.000m ² : 1 space per 200m ²	1 space per 200 m ²		1 space per 100 m ²	Like Baden Württemberg
Bremen	<60 m ² : 1 space >60 m ² : 2 spaces	1 per 1.5	1 space per 10 residents	1 space per 40 m ²	1 space per 70 m ²		1 space per 40 m ²	1 per 3 students
Hamburg	<50 m ² : 1 space <75 m ² : 2 spaces <100 m ² : 3 spaces <125 m ² : 4 spaces >125 m ² : 5 spaces	1 per 1	1 space per 3 apartments	1 space per 80 m ²	1 space per 300 m ²		1 space per 50 m ²	School: 10 per classroom University: 1 per 6 students

Annex 2:

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Car: Wiener Garagengesetz, §48 & 50. <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrW&Gesetzesnummer=20000052> (accessed 20. March 2018).
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Germany:

- Baden-Württemberg Administrative Regulation:
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Endnotes

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¹⁴ Brussels Institute for Statistics and Analysis. Figure applies to 2016. 2012: 56%; 2014: 56%.

¹⁵ VCÖ, 2015. Here the German term 'Verkehrsparkhaus' was coined.



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