Scope of **Parking** in Europe

Data Collection by the European Parking Association

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PRESENTATION

APPENDIX

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Dear friends,

Antoni Roig Alegre
EPA Vice President

Barcelona, September 2013

it is a pleasure to introduce this work, which has concluded four years after the EPA Board proposed that its members draft this study at the General Meeting in Vienna in 2009. Since then, I have led the process, and I must thank everyone for their support in providing proposals to move the project forward, from hiring specialised university helpers to validating the methodological keys, which are not always easy tasks.

The EPA's decision to undertake this work is strategic to the sector. For the first time, it arms us with the tools to be able to explain who we are, to have a general overview of our sector in Europe – broken down by different countries, by on- and off-street and by the types of spaces (and uses). We can state that there is a total market of nearly 41 million spaces in EPA countries, to which a further 190 million can be added that are not currently regulated on our streets. We also know that parking provides direct employment to close to 500,000 workers in EPA countries. (An estimate of indirect employment associated with the parking industry, through ancillary services etc., was beyond the scope of this particular study, but it would be reasonable to conclude that it is a multiple of these numbers). Overall annual turnover for the European parking industry totals some €26,400 million. These are the big numbers for our sector.

This study is undoubtedly one of the largest-scale outputs that the EPA has ever produced. And we are proud of that fact. Firstly because it is pioneering, as no other assessment has been published on our sector and, secondly and in particular, because our goal was to provide value. Value to our members, who today have a measurement of their domestic market in their hands, comparable to those executed in other countries, which were all obtained using the same model. I also hope the study will be of interest to operators, providers and technicians, as both a reference and as support in decision-making.

It is also essential that our political and economic spheres take our sector into account when drafting urban mobility policies and economic policies, both locally and at an EU level I must mention that parking is still absent from the White Paper on Urban Mobility that was published by the EU. Some 230 million parking spaces are an extremely powerful reason to assess this private transport management tool in our cities, a key to favouring a change in paradigm towards public transport and mobility on foot. Management by the parking sector will likewise improve the use of loading and unloading spaces, vital for the economic life of our cities, and the organisation of motorbike, and bicycle parking so that they do not disturb pedestrians.

As mentioned in the presentations of the partial results and progress report (Liverpool 2010, Turin 2011, Helsinki 2012), the precision of the study must obviously not be considered as absolute, which occurs with the majority of similar studies, as well as all studies consulted.

Readers may find it difficult to determine the precise stock of our marketing unit, or the exact number of spaces of each type for each city. However, there are also several strong points: the project is methodologically consistent, so that the results are perfectly congruent with the data obtained on different countries, even beyond the EU.

I must thank everyone who has participated on this project before I sign off, particularly those who have provided information on their towns and cities on the questionnaires. This information has been essential in elaborating this study.

1. Executive summary

This report is the culmination of a project that we called 'Data Collection', which started in September 2009 at the EPA General Meeting in Vienna.

Purpose

To determine, or approximate, for the first time, the broad numbers for the parking sector (on- and off-street, no. of spaces, turnover and employment), at the EPA level and at a general European level.

Methodology

To determine the methodology, the expertise was employed of researchers from the Regional and Public Applied Economics Research Institute at the University of Barcelona (IREA-UB), which also supervised data processing and came up with the final estimates.

We started from an approach, according to which we understand that it is extremely hard to have a good overall assessment by adding up only the information available of a few operators and players, because it would omit or leave out unknown information. However, we were able to obtain (almost) complete information on a fair number of cities and towns. And we are sure that it is possible and even better to estimate the overall sector using this sampling and a good projection method. The difference is that we estimate the entire sector, not just a part, using proven methods, even when all information is not available.

In the end, valid information was obtained for a total of 748 local entities in 17 countries, representing a sampling of 20.7% of the total municipalities with more than 20,000 inhabitants of EPA member countries.

EPA and its members

From the outset, national organisations were contacted, requesting information and clarifications on their publications that would let us use them for the aggregated work. This was extremely helpful. It merits mention that over the course of these four years, some of these associations have even adapted their preparations for analogue studies to make them compatible with those of the EPA, and there were cases where this EPA project was the trigger for entities to perform national studies. This fact could be considered a further added value of this project.

Parking spaces

A total of 33,760,146 regulated parking spaces in EPA municipalities with populations of over 20,000 was quantified, of which 21,756,041 are off-street and 12,004,105 on-street, distributed between the different categories of spaces into which the study was segmented.

The estimate for all EPA municipalities is 40,887,697 spaces, with 26,175,123 off-street and 14,712,574 on-street. The estimate for all of Europe, including countries that do not belong to EPA, is 47,124,388 regulated spaces, 30,167,672 off-street and 16,956,716 on-street. These last forecasts must be used with caution, as there were very little data available for their elaboration.

There are also a large number of kerbside spaces in our cities that are not regulated, and that could be subject to becoming a potential market over time. These have been assessed at over 190 million spaces. Private-use parking spaces have not been included in this study either, such as parking for private homes.

Turnover

The turnover for municipalities with populations over 20,000 in EPA countries was estimated at €22,921 million, of which €16,968 related to off-street and €5,953 to on-street. The estimate for all EPA municipalities was €26,370 million (€19,600 off-street and €6,770 on-street).

The total turnover assigned to the sector for all of Europe, with much less precision, is €29,315 million (€21,878 off-street and €7,437 on-street).

These quantities do not include VAT for any off-street tallies, although they are included for on-street, due to the latter often representing revenues for final rates, not prices.

Revenues the sector contributes to the administrations via vehicle penalty charge notices imposed by our personnel have not been included either, which are highly significant, as they can represent 70-80% of the turnover for use of spaces.

Finally, remember that only direct earnings from parking operators have been estimated, and earnings from sector industry / auxiliary services were not assessed.

Due to the above, it should be expected that the real turnover generated by the parking industry as a whole is much higher than the numbers expressed herein.

Employment

Analogously to the previous case, personnel from companies that provide services or equipment to operators shall not be included. In and of itself, this fact means that the figures we give are much lower than the overall employment generated.

We have estimated a total of some 409,000 employees in municipalities with populations over 20,000 in EPA countries (327,000 for off-street and 82,000 for on-street). With lesser precision, total EPA countries are estimated to have 490,000 employees, while this approximate number for direct employees in the sector for all of Europe could be some 569,000 people. ■

For further details on this study and its preliminary phases, please consult the EPA website:

www.europeanparking.eu

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2. Objectives

The project purpose is to approximate the key economic indicators of the parking sector in Europe.

This report shall provide responses for:

a.) The estimated number of on- and off-street parking spaces for cities with more than 20,000 inhabitants, for EPA member countries[1]. It is worth noting that countries were selected in 2009, when the project started, so that the list may not necessarily match the member countries today.

b.) The distribution of parking spaces by type, at a European level. Specifically, the weight of these types of parking spaces shall be provided:

- Total spaces in municipalities of all sizes within EPA, also including those with populations less than 20,000.
- Total spaces for all European countries, also considering countries that are not in EPA.
- The number of unregulated spaces, a value that could be indicative of the potential market for the sector.

c.) A first approximation of the number of employees and the turnover of companies in the parking sector, which lets its magnitude be seen.

This last objective is based on a different methodology than the method used for the rest.
We must point out that the reliability of the estimates in objectives b and c will be lower than for that in a. This is because there is very little information on parking spaces in municipalities with less than 20,000 inhabitants, and on European countries outside of the EPA. Thus, these numbers will be approximate, using similarity and proximity criteria, and the results should be interpreted with a higher margin of variability. ■

1 Austria, Belgium, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Holland, Hungary, Ireland, Italy, Luxembourg, Norway, Poland, Portugal, Serbia, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

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3. Background

When starting the project, there was no idea, not even a rough estimate, of the characteristics of our sector in Europe. There were only a few partial publications, which were not mutually coherent.

Information available on the parking sector is very fragmented. This uncertainty is a reflection of many aspects of the real situation, such as the difficulty of precisely determining the stock of spaces being managed, both on-street and off-street, and the enormous variability of regulations, uses and rates by areas, cities, regions and countries.

However, we also knew that we could indeed obtain a good estimate of the real stocks of spaces in some European municipalities, and we trusted that we could obtain a sufficiently significant sampling of them to be able to extrapolate data for all Europe with reasonable reliability.

After validating that the best way was to start with the parking bay unit, as you will see, the first phase centred on approximating the number of spaces in the sector for EPA countries.

The first thing we did was define an initial method, the way to extrapolate the information on the number of spaces through the population in each municipality, and an initial questionnaire to collect information on spaces in EPA municipalities.

The questionnaire was launched in the beginning of 2010, which EPA published and emailed to national associations so that they could pass it on to their members (local entities, operators, etc.). In parallel, and via the European city network of Polis and Impacts, contacts were established with municipal managers, who provided information in some cases.

With this information, we created the first database, and made our first projections, which were explained in Liverpool in September 2010 (13.8 million spaces). Despite the relative shortage of data compiled, the execution of this task was assessed as extremely positive. Indeed, it was pioneering research, which has been used as a reference for the work that is now concluding.

Encouraged to continue improving the approximation, at the beginning of 2011 the EPA saw the need to validate the results obtained in the first survey, oriented as seeking routes to make the estimation more precise using our data. At that time, it was deemed suitable to work with a professional team outside of EPA, which could provide a new methodological dimension to the study. This job was taken on by a team of professors from the Applied Economics Research Institute at the University of Barcelona (UB-IREA) (Spain), specialists in statistics and econometric modelling and with extensive experience on projects involving mobility[1].

With the support of this team, a process was outlined for attaining the study purpose, which was structured in three phases:

Firstly, the model used by the EPA was revised to carry out an initial estimate of the number of parking spaces, and the calculation method used was analysed, as well as the reliability of the results obtained (Suriñach et al., June 2011). They concluded that the model proposed by EPA represented an important step in increasing knowledge of the sector.

Secondly, two tasks were executed in Phase 2:

a. On the one hand, the viability of alternative methodologies to estimate the number of parking spaces was studied and analysed, based on statistical information available at that time (based primarily on the survey previously conducted by the EPA). To this end, both 'raising' estimates based on real available data and different econometric models were proposed (Suriñach et al., 2011). The aim was to improve the reliability of the estimation and, although the adjusted models and results improved in general, the lack of representativeness of the sample and the lack of more complete information on municipalities were limiting factors to take into account.

The new estimated value of the EPA market was presented in Turin in September 2011 (18.5 million spaces).

b. Furthermore, and with the aim of improving the model, by incorporating new comments and new explanatory variables, a new questionnaire was created[2], which not only collected information on the number of parking spaces, but also on several characteristics of the municipality, which could end up explaining why it had more or less parking on offer. These variables were partly explored by reviewing the literature drafted in Phase 1 (i.e. Anderson y de Palma, 2007; Davis et al., 2010). The bibliography search was extensive, but very few studies truly matched the objectives of the present work, so that their usefulness was limited[3].

Phase 3, which concluded with this report and which will be extensively detailed, has consisted of:

a. Performing the fieldwork to obtain statistical data associated with the questionnaire designed in Phase 2.

b. Refining, validating and completing the statistical information obtained.

c. Creating and validating a new model to obtain a more precise estimate of the number of on- and off-street parking spaces in Europe.

d. Providing an approximate estimate of the revenues and jobs generated by the sector.

The new questionnaire was completed in Summer 2012, and disseminated in September 2012 , this time to be answered via Internet. Its publication was announced through EPA channels, national associations, and Polis, where we were provided with a direct contact (phone number, email), specifically for this topic.

During this period, the process was defined in greater detail to estimate the sector's economic and employment indicators.

The hiring of an EPA scholarship recipient (September-December 2012) at Barcelona de Serveis Municipals offices (Barcelona, Spain), working full time on the project and in direct contact with IREA-UB, led to the direct search for information via different channels, interaction with the parties surveyed by email, the processing of new information and the analysis and verification of the more dissonant data received.

After these endeavours, there was a greater amount of information, and more consistent information, available in February 2013, which is the basis on which the results set out herein were obtained. ■

1 Studies are being performed on road indiscipline, road indicators, parking times in car parks, accident predictions, etc. J. Suriñach (director), M. Alcañiz and J.R. García (www.ub-irea.com).

2 See Appendix 2.

3 For example, the study by the National Parking Association (NPA, 2011) was reviewed for the United States, although the NPA's objectives were unfortunately not equivalent to those in the present study. Neither the city types or the methodology employed were comparable and, thus, the methodology used by the NPA could not be translated or adapted.

4. Concepts and assumptions

4.1 Types of spaces

For the purposes of this study, they are classified as

OFF-STREET:

public-use parking spaces with access control. They may be publically or privately managed (private use spaces are excluded – homes, offices, etc. –), pay or free.

STRUCTURE: Multilevel or underground car parks.

SURFACE: Uncovered car parks at street level, in lots, with horizontal signs and access control (barrier, parking attendant, etc.).

P&R: Deterrent parking, with the majority located in the outskirts of large cities. In general, close to coach or rail stations or other transport interchanges (sea ports).

SPORT, CULTURAL AND LEISURE FACILITIES:
Located in stadiums, sport clubs, museums, theatres, etc.

SHOPPING CENTRES: In structure and/or surface.

OTHER TYPES: At hospitals, airports, universities, etc., in structure and/or surface.

ON-STREET:

Regulated spaces on the roadway, in which there is some type of signalling and/or control or surveillance. They can be pay or free.

REGULATED FOR GENERAL PUBLIC USE:
All vehicles can park there for a limited period of time.

RESIDENT ONLY: Exclusively for authorised residents.

LOADING AND UNLOADING:
For vehicles (vans, lorries, etc) that need to load or unload goods close to their destination with time limits.

MOTORBIKES: Allocated to parking motorbikes and two- and three-wheeled scooters (exclusively those signalled on roadway or kerb).

OTHER RESERVED SPACES: handicapped, police, hotels, taxis, etc.

UNREGULATED ON-STREET SPACES:
spaces for which there is no signposting and there is no type of special surveillance.

One of the discussions prior to starting the study was on determining the size of the spaces, as they may not be the same everywhere, particularly for on-street. The decision was to use the standard measurement that each place uses. ■

Photos (2): Shutterstock

4.2 Data Sources

The local administrations, through the different sources mentioned here, were the largest source of information. The main data sources and sources of complementary information have been:

Publications:
from national parking associations (France, Italy) or from other countries (USA), but also from other companies that are economic sector analysts. They have provided a large amount of data and references.

EPA questionnaires:
All data obtained on the first questionnaire (2010) were also used in the database (if they weren't updated on the second questionnaire), given that the latter was prepared taking this possibility into account.

Studies conducted by national associations:
An essential source supplied by several countries (Ireland, Sweden, Belgium, Germany, Norway, UK, Portugal), in some cases in coordination with our study, which have helped enormously. We were able to use baseline information of the publications in some of the cases.

Experts:
When planning the development for this part of the project, we realised that we had a great concentration of sector professionals available through EPA and related organisations, in a wide range of fields (on- and off-street operators, providers, technicians, etc.). We were therefore pleased to be able to count on their contributions and their outlooks.

Internet:
Has let us obtain a large amount of relevant information, particularly on special spaces (P&R, airports, shopping malls, others).

We should point out that when there were any doubts about a piece of information, we endeavoured to check it with the source before adding it to the database or discarding it. This was one of the functions of the scholarship recipient which contributed to better study reliability.

The information compiled in the database has been maintained on a strictly confidential basis. ■

5. Methodology, technical description

Let's assume that we obtained a good sampling of cities for which we know their stock of spaces. The first thing we have to do is estimate the spaces for all other municipalities. How did we do it? An initial assessment was done to select the suitable parameters to set up our database. We had to seek those that were most representative, on the one hand, and on the other, those that are well-known and reliable (Eurostat or similar) for all European municipalities.

Thus, three parameters were compared, with a sample of cities for which we had data for on- and off-street spaces: the municipalities' surface area (Ha), number of registered cars and the population. Other interesting parameters were ruled out due to the difficulty of finding out specifics for all municipalities, such as how long their streets are in kilometres. We discovered that the best regression, the best adjustment (R2) was for the ratio: no. of spaces/100 inhabitants, both for regulated on-street spaces and for public car parks.

Thus, we decided that for those cities or local authorities for which we knew their number of spaces, we would obtain a representative ratio of spaces/inhabitant (adding, according to the country, the type of space, city size and some further parameters characteristic of each city) and that, using the census registration for inhabitants in the rest of European cities, we could then estimate their number of spaces.

Estimating a figure as complex as the number of parking spaces in Europe necessitated the use of complex statistical and econometric methods. Using the data from a sampling of municipalities in different countries, it was then necessary to attribute new information based on similarity criteria related to the country, the number of inhabitants and other characteristics of the cities, to then create an econometric modelling to reach the final number. Given that this process was eminently technical, the methodology is detailed in Appendix 1, so that only a brief and simple description is given in this section, oriented at setting out the fundamental traits.

Figure 1 (page 11) summarises the stages that led to the final results and the interrelation between them.

The process was essentially:

a. Compilation of data from Phase 1 of the project that, through the questionnaire addressed to municipalities in EPA countries with over 20,000 inhabitants, information was collected on the number of parking spaces. These data were not as widespread as could have been hoped, so that it was decided to carry out a Phase 2, aimed at concluding the process.

b. Now in Phase 2, a new more complete questionnaire was designed, once again addressed to municipalities in EPA countries with over 20,000 inhabitants. This questionnaire contains greater detail on the types of off- and on-street spaces. It was also more widely distributed and there was follow-through to responses (in the framework of Phase 3 of the project).

c. Search for additional information to complete the database. Now in Phase 3 of the project, significant work was done, with the support of a scholarship recipient hired by the EPA, to collect additional data on the types of spaces, for responses that were too brief on the questionnaire and earlier sources. In particular, data were sought on spaces in: hospitals, universities, shopping centres and stadiums. Additional information was also collected on some characteristics of the municipalities, which would seem to be necessarily related to their parking offer: presence of metro or tram, administrative, tourist, shopping, health hub, etc. Quite comprehensive information was also collected on spaces at airports and park&rides[1].

d. Some countries did not respond to the questionnaire. Concretely: Holland, Cyprus, Denmark, Finland, Greece, Luxembourg, Poland and Serbia. Their GDP and population were sought, to then be able to add it later to the modelling.

e. Both the data from Phase 1 and those obtained from the new questionnaire and the additional search for information were entered into a file that was considered the starting database for later stages of the process to estimate parking spaces.

f. Attribution of unknown values. This was one of the most delicate phases of the project, for which interpolation techniques were used for missing values that statistics provides to correctly attribute unknown data using available data. The calculation of space per inhabitant ratios and knowledge of the weights of the different types of spaces out of the total were the determinants in this stage. We must point out that attributions were only performed for municipalities for which some data were available as a starting point. If there was no further information than the aggregate for off- and on-street spaces, no allocation was done due to the risk of imprecision this would have entailed, and the values for the total spaces for the modelling stage were conserved. A comprehensive description of the procedure used can be consulted in Appendix 1: Methodology.

g. Prediction of the number of regulated spaces for municipalities with over 20,000 inhabitants for EPA countries[2], using linear regression models. Two models were estimated, one for on-street spaces and another for off-street spaces (excluding airports and park&rides). To carry out these estimates, municipalities were broken down by their size, in terms of number of inhabitants, given that their behaviours as far as parking supplies are different. Each country's GDP was

1 See Figure 1 for a summary of the numbers employed for each variable.

2 Different treatment was required for Great Britain and was not included in the model, as detailed in Appendix 1.

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ANALYSIS
EXPERIMENT
DATA
RESEARCH
INFORMATION
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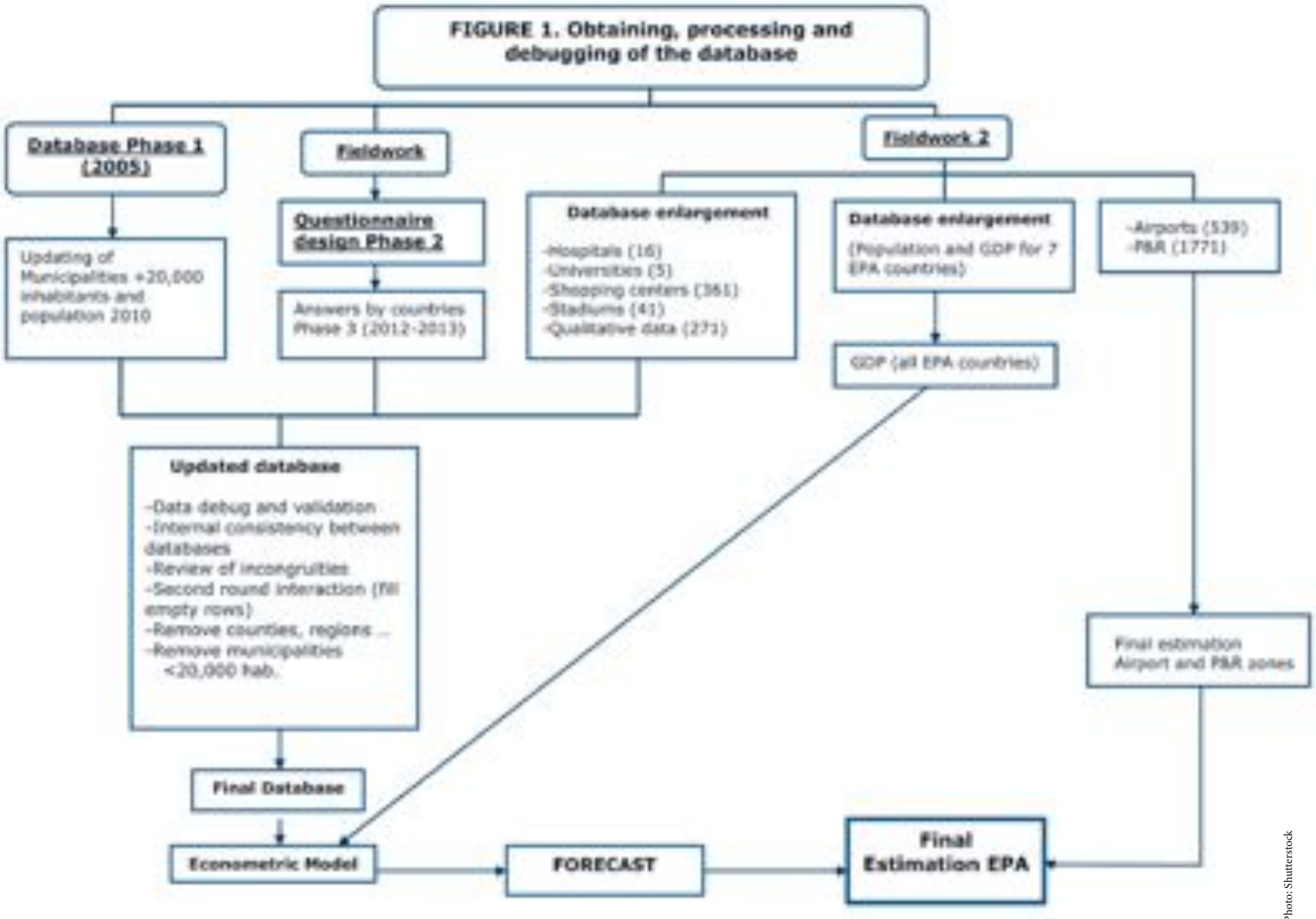

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also considered, as well as several qualitative indicators that have proven to be significant for different sizes of cities in estimating off-street spaces: if they are on the coast, if they have trams and if there are more than one million inhabitants. In turn, for estimating on-street spaces, we discovered that the fact of being southern European countries was relevant to the prediction, so this variable was also entered into the model.

h. After estimating and validating the previous models, the prediction was completed by adding airport and park&ride spaces, as all municipalities do not have these types of facilities and, therefore, the European total was calculated directly. Estimated spaces for Great Britain were also added using the detailed study elaborated by the British Parking Association[3]. In this way, the estimate of the main variable of interest was finally obtained: the number of parking spaces in municipalities with more than 20,000 inhabitants in EPA countries.

i. The next objective of the study is to estimate the parking spaces in all municipalities of EPA countries, regardless of their population. The final estimation was obtained from two sources. Firstly, the ratio of spaces per 1000 inhabitants was obtained, according to the regression model, for the municipalities considered small from the database (between 20,000 and 100,000 inhabitants). Under the conservative assumption that municipalities with fewer than 20,000 inhabitants should behave similarly to smaller municipalities for which there is information, or even with a lower ratio of spaces per 1000 inhabitants, a prediction was made for the whole of these municipalities, applying a weighting of 25%. Taking into account that 54.3% of the population in EPA countries reside in municipalities with less than 20,000 inhabitants, the prediction and product of the model was aggregated with this second approximation, obtaining the total spaces for all municipalities in EPA countries. Secondly, the information in the fieldwork database was used. There is scant information about municipalities with fewer than 20,000 inhabitants, although there are some data for Norway, France, Sweden and Ireland. Analysing this information let us approximate the ratio of spaces per 1000 inhabitants for these smaller municipalities,

3 British Parking Association (2012): The size and shape of the UK Parking Sector. A Skyblue Sector Research Report.

where this was the tool used to validate the previously obtained results. However, we must recall that the shortage of data on small municipalities means that the result should be assessed as an approximation with a high margin of error.

j. It is clear that the margin of error of estimates increases as we seek variables for which there is less information. However, with this premise clear, the total parking spaces for all of Europe were also quantified, adding countries that do not belong to the EPA. In general, these countries have a low GDP with respect to others, which could indicate their scant offering of regulated parking. Taking this consideration into account, to obtain an estimate of the number of parking spaces for European countries that do not belong to the EPA, the ratio of spaces over GDP was calculated for countries that are in EPA and then this ratio was applied to countries that do not belong to the EPA. Therefore, based on the GDP, we performed an approximation of the number of spaces for these countries and, by aggregation with the previous results, an indicative value was obtained of the total parking spaces in Europe. This criterion was used for all European countries except for Russia and Turkey, due to their special circumstances. Part of these countries' area and population is within the European continent, while the other part is in Asia. In these two cases, the part of the population in the European area was used, considering that this participation out of the total is the same as their GDP, thus obtaining an approximation of the European GDP for these two countries, which is what was employed to estimate the number of spaces there.

k. Having attained the previous objectives, we must ask ourselves what the potential market is for the sector. This is related to the space for parking that is not currently regulated. These unregulated spaces were also subject to a question on the survey, although unfortunately very little information was compiled, except for concrete countries including Germany, Norway and Portugal. Thus, this sampling let us perform a general approximation of the total unregulated spaces, which provides an idea of the potential on-street market, although it must be read with caution.

l. Using the number of spaces, and applying the general ratios we could adapt, the values were obtained – broadly – for sector invoicing and employees. ■

6. Results

6.1 Spaces

6.1.1 Spaces for EPA municipalities with more than 20,000 inhabitants

TABLE 6.1
Predictions on regulated parking spaces EPA municipalities with more than 20,000 inhabitants[1]

Off-street spaces	21,756,041
On-street spaces	12,004,105
Total spaces	33,760,146

1 Predictions of off-street spots come from estimating the regression model and adding Airport and Park&Ride spaces that were obtained using a different methodology, as explained in section 5. Likewise, estimates for the United Kingdom, which were obtained separately, as the data were broken down into different territorial areas and types, were incorporated into the tables.

After estimating and validating the off-street and on-street parking spaces using regression models, the number of spaces for the rest of the municipalities was predicted, using the respective models for the three sizes of municipalities considered. Simply adding up the predictions for each one of them let us obtain improved predictions on the total number of spaces. The prediction finally obtained (see table 6.1) depicts that the total parking spaces for municipalities of over 20,000 inhabitants in EPA countries was estimated at 33,760,146, with 21,756,041 of these off-street spaces and 12,004,105 on-street spaces.

Obtaining information and constructing the database was done by that which could be called a bottom-up methodology for municipalities and parking space types. Namely, we started by considering a geographic area (municipalities) smaller than the area we wanted to study, and a type of parking more disaggregated than the division between on- and off-street (specific types of parking spaces). Adding up the predictions for these lower levels led to the total predictions. Furthermore, this way of proceeding makes it possible to have information available at different aggregation levels. Thus, it lets us conduct a geographic division by countries, although the larger the level of disaggregation of the results, the larger the margin of error also is. In this regard, prediction results are summarised below, distinguishing the different EPA countries and the two general types of parking spaces (see tables 6.2 and 6.3).

In light of the result, resident only spaces seem to be many. It is possible that some responses to the questionnaire were mistakenly written in the box for mixed-use spaces (in which residents pay a low rate and non-residents pay a higher rate), that should theoretically be part of the category of general spaces. ■

Photo: Shutterstock

TABLE 6.2
Predictions on regulated parking spaces EPA municipalities with more than 20,000 inhabitants

Country	Off-street	On-street	Total
Austria	361,523	193,735	555,258
Belgium	664,331	343,480	1,007,811
Croatia	217,624	80,846	298,470
Cyprus	58,528	24,003	82,531
Denmark	292,693	123,911	416,604
Estonia	68,435	22,108	90,543
Finland	445,276	129,222	574,498
France	1,676,318	1,028,250	2,704,568
Germany	4,935,623	2,638,385	7,574,008
Greece	979,308	472,215	1,451,523
Hungary	534,519	219,457	753,976
Ireland	268,897	84,259	353,156
Italy	1,409,779	1,810,647	3,220,426
Luxembourg	20,083	4,604	24,688
Holland	1,085,257	431,773	1,517,030
Norway	382,185	103,571	485,756
Poland	1,704,192	698,848	2,403,040
Portugal	591,149	236,454	827,603
Serbia	395,440	178,158	573,598
Slovakia	238,844	57,930	296,774
Spain	1,558,712	1,190,311	2,749,023
Sweden	933,211	227,577	1,160,788
Switzerland	234,114	104,360	338,474
United Kingdom	2,700,000	1,600,000	4,300,000
Total	**21,756,041**	**12,004,105**	**33,760,146**

Source: In-house

TABLE 6.3
Predictions on regulated parking spaces EPA municipalities with more than 20,000 inhabitants

Off-street		**21,756,041**
	In structure	7,324,109
	Surface level	3,137,530
	Park&Ride (dissuasion)	922,759
	In sport, cultural and leisure facilities	2,171,436
	In shopping centres and markets	5,326,328
	Hospitals, universities	1,993,466
	Airports	880,414
On-street		**12,004,105**
	Regulated for general public use	7,069,879
	Residents only	2,975,493
	Loading and unloading	482,528
	Motorbike spaces	779,464
	Other reserved spaces (handicapped, police, etc.)	696,741
Total		**33,760,146**

Source: In-house

Photo: Shutterstock

6.1.2 EPA municipality spaces, regardless of number of inhabitants

Predictions made for all EPA municipalities, which are depicted in this section, must be assessed with precaution and care, owing to the lack of data on small municipalities. Nonetheless, the final prediction obtained indicates that the total parking spaces for all municipalities in EPA countries is estimated at 40,887,697, with 26,175,123 off-street spaces and 14,712,574 on-street spaces (see table 6.4).

TABLE 6.4 Predictions on regulated parking spaces in EPA

Off-street spaces	26,175,123
On-street spaces	14,712,574
Total spaces	**40,887,697**

Source: In-house

In this case, the lack of information advises against presenting the results obtained by breaking them down into EPA countries, so that only the results according to types of spaces is shown (see table 6.5).

TABLE 6.5
Predictions on regulated parking spaces in EPA

Off-street		**26,175,123**
	In structure	8,811,780
	Surface level	3,774,824
	Park&Ride (dissuasion)	1,110,190
	In sport, cultural and leisure facilities	2,612,497
	In shopping centres and markets	6,408,210
	Hospitals, universities	2,398,378
	Airports	1,059,243
On-street		14,712,574
	Regulated for general public use	8,665,046
	Residents only	3,646,849
	Loading and unloading	591,400
	Motorbike spaces	955,334
	Other reserved spaces (handicapped, police, etc.)	853,946
Total		**40,887,697**

Source: In-house

6.1.3 Spaces in European municipalities

Finally, a prediction was also obtained for all European municipalities. Clearly, the margin of error in this case is greater. Taking this restriction into account, the final prediction obtained indicates that the total number of parking spaces for all European municipalities is estimated at 47,124,388, with 30,167,672 for off-street spaces and 16,956,716 for on-street spaces (see table 6.6). ■

TABLE 6.6
Predictions on regulated parking spaces in all of Europe

Off-street spaces	30,167,672
On-street spaces	16,956,716
Total spaces	**47,124,388**

Source: In-house

6.1.4 Unregulated parking spaces

After performing different analyses to estimate the number of parking spaces, both in EPA countries and for Europe as a whole, it is worth asking about the potential market for the sector. This basically involved adding spaces in car parks or lots that are not being operated for public use, and on-street spaces that are not regulated. No projection could be done for the first case. With respect to on-street spaces, the predictions obtained until now make reference solely to regulated spaces, but... how many spaces that are still unregulated could exist in Europe? The answer to this question is very difficult to obtain. In this regard, it merits mention that the survey created to obtain information also asked about these spaces, although unfortunately very few responses were received. Therefore, the estimation presented below must be considered as only an initial approximation, which must be improved in future studies.

Out of all data obtained in fieldwork, there is a ratio available on unregulated spaces per inhabitant for the three countries in EPA: Germany, Norway and Portugal. The mean ratio resulting from all available information is 0.28 spaces per inhabitant. If we apply this ratio to the total European population, the result would be some 190 million unregulated spaces in Europe. Consequently, we could calculate that there are up to four unregulated spaces for each regulated space. However, it must be pointed out that Europe is comprised of very diverse countries, in which mobility has different levels of development. Thus, this figure must be interpreted as an upper range, which must be specified further in future studies. ■

Photo: SPA

6.2 Turnover

The adjusted on- and off-street estimation in EPA countries for cities with more than 20,000 inhabitants is shown below.

		EPA >20,000 Euro / space & year	Turnover
Off-street		**780**	**16,967,895,760**
	In structure	1100	8,056,519,900
	Ground level	900	2,823,777,000
	Park&Ride (as deterrent)	200	184,551,800
	At sport, cultural and leisure facilities	10	21,714,360
	At shopping centres and markets	700	3,728,429,600
	Hospitals, universities	550	1,096,406,300
	Airports	1200	1,056,496,800
On-street		**496**	**5,953,452,500**
	Regulated for general public use	800	5,655,903,200
	Residents only	100	297,549,300
	Loading and unloading	0	-
	Motorbike spaces	0	-
	Other reserved spaces (handicapped, police, etc.)	0	-
Total		**679**	**22,921,348,260**

Overall figures were also estimated for local entities with less than 20,000 inhabitants and for those in the rest of the Europe, in non-EPA countries, as a percentage with respect to the aforementioned ratio.

For all EPA countries, including towns with less than 20,000 inhabitants, a total of €26,370,000,000 revenue per year was estimated, distributed between €19,600,000,000 off-street, at an average of €749/space and year, and €6,770,000,000 on-street, at €460/space and year.

Total revenue for the sector in physical Europe was estimated at €29,315,000,000, of which €21,878,000,000 is off-street (€725/space per year), and €7,437,000,000 is on-street (€439/space per year).

In order to evaluate the total economic impact of the sector in Europe, the figures below must be added that are not currently included:

a. VAT for off-street revenues (which will vary in each country and in some of the categories, such as P&R). We have included VAT for on-street, given that these revenues are taxes in many countries, not prices, therefore without VAT to add.
b. Additional earnings generated by the sector under the umbrella of penalties and penalty charges imposed by local corporations.
c. Earnings for pre-reserving spaces.
d. The turnover generated by companies that provide their services to operators (via services or provision of equipment and material).

Furthermore, we mentioned an evaluation of some 190 million unregulated surface spaces. We must consider this stock as a potential market, which will tend to be materialised depending on urban development as parking demands are generated (residential or tertiary) in the areas surrounding these spaces, exactly how one day the current market came into being. Remember that the impact that private-use car parks could have (residential, offices, etc.) has not been assessed for this study.

Due to the above, we must consider that the study's results give numbers much lower than the real impact of our sector in Europe. ■

6.3 Employees

The table below summarises the mean adjusted ratios by number of employees/100 spaces for EPA municipalities with less than 20,000 inhabitants. These ratios only make reference to direct employees, that is, all employees in parking operator companies, not to the rest of companies that provide services or sell equipment to the first.

	EPA >20,000 Empl/100 sp.	Employees
Off-street	**1.50**	**326,743**
In structure	2.20	161,130
Ground level	1.80	56,476
Park&Ride (as deterrent)	0.50	4,614
At sport, cultural and leisure facilities	0.10	2,171
At shopping centres and markets	1.00	53,263
Hospitals, universities	1.80	35,882
Airports	1.50	13,206
On-street	**0.68**	**82,091**
Regulated for general public use	1.00	70,699
Residents only	0.30	8,926
Loading and unloading	0.15	724
Motorbike spaces	-	-
Other reserved spaces (handicapped, police, etc.)	0.25	1,742
Total		**408,834**

In all EPA country cities, including those of less than 20,000 inhabitants, we estimate a total reaching nearly 494,000 employees.

The estimate for all of Europe leads us to a calculation of some 569,000 employees working directly in the sector. In addition to the further factors mentioned in the section on revenues, we must consider, for the purpose of the number of sector employees, that in some countries and cities part of enforcement tasks are now carried out by local security forces. We are speaking of situations like parking in prohibited spaces (double parking, zebra crossings), but also in some cases of controls for specific types of spaces, such as loading and unloading, or some reserved ones. This study considered the staff that companies currently assign to enforcement, so that the additional potential market is not considered that – if the current trend is confirmed – would lead to subcontracting this type of job to specialised sector companies, with the police performing the functions more typical of this authority.

We should point out once again that due to all these factors, the estimation of the jobs generated by our activity is surely much higher than indicated in this study. ■

Photo: EPA

7. Conclusions & Recommendations (including future research)

Europe. More than 47 million public-use and regulated parking spaces, in addition to 190 million on-street spaces susceptible to becoming regulated. Without taking private-use spaces into account (primarily resident only), which could easily be a total equal to the previous one. A total probably no less than 400 million spaces in Europe.

400 million spaces are an enormous tool for managing mobility in our cities. They are the origin and destination of a huge number of journeys that many of the 700 million people on the continent make every day. Understanding (by developers, city planners and politicians) parking such as inter-modal transport interchanges (private vehicles to walking or public transport) best adapted to the territory, which must be integrated into the mobility and transport chain, is going to generate great benefits.

To give just a few examples:

a. Regulations that make the endowment of more or less spaces compulsory, especially private resident spaces, which have an impact on the motorisation index (private cars/1000 inhabitants). And in the modal distribution of our daily journeys, in explaining the stock of public spaces and managing their demand. This also affects the cost of building, the appearance of our cities, pollution and congestion.

b. The fair endowment of public off-street car parks, when demand continues to strain traffic fluidity and the supply of space on the streets.

c. The city planning and social conception of streets must prioritise other uses over parking. However, in specific areas without underground car parks, or with high tertiary demand, it will possibly continue to play an important role. And with only professional regulation of these spaces, their functionality will be guaranteed with a minimal physical occupation of space.

d. Trends indicate that the sector is well positioned to efficiently manage some of the main challenges of urban mobility, such as loading and unloading spaces, reserved spaces, motorbike spaces, bus stops, all of them vital for good economic and road health of our metropolises.

e. We are also strategically placed to be the basic infrastructure for recharging electric vehicles, which will take on leading roles sooner or later.

The parking sector directly employs nearly 570,000 people, only at operating companies. From the viewpoint of employment, we are an important sector, a sector that also has a well-established future projection.

We invoice some €30,000 million, revenue that is also an indicator of the value of balancing cities' supplies of spaces with the demand of car destinations. This would exercise a fundamental role by limiting excess demand that could otherwise collapse many of our streets.

For the purpose of possible future studies, some recommendations:

a. Having the cooperation of national associations: they have increasingly more information and better access to it. Continuing to foster the drafting of fieldwork studies integrated with this information, or at least compatible with it.

b. Improving the unification of criteria (for example, distinguishing between cities and municipalities).

c. Establishing from the beginning the way to handle information that will be received. Offering this as a starting point, as explained in detail in this work.

d. In the fieldwork to obtain spaces, and with the aim of ensuring that a minimum amount of information is obtained from each site:
   - Use / reach agreements with existing websites (like Parkopedia)
   - Take advantage even more of the relationships with operators to obtain more and better information on spaces in municipalities.

e. With respect to turnover and employees:
   - Obtain information from operators (directly or from other sources such as economic publications or from the administrations for concessions).
   - For the smaller operators, we suggest seeking information by sampling, so that numbers can be compared with the data obtained for the larger operators. ■

Photo: Shutterstock

8. About the authors, acknowledgements

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APPENDIX 1

Statistical and econometric methodology

Previous pages contained a brief description of the methodology used in the present study. This appendix will describe the technical issues and statistical-econometric procedures in greater detail that have led to the final results on the number of parking spaces in Europe. The appendix is broken down into three parts:

1. compilation of information and construction of the working database,
2. the econometric models used to estimate the number and types of parking spaces in EPA countries, as well as in the rest of Europe, and
3. sector turnover and employment information. ■

1. Building the working database

1.1 Preliminary phases and new questionnaire

As mentioned in the section Background, in Phase 1 of this project, EPA suggested a model for estimating the number of parking spaces in Europe[1]. However, this model had several limitations, which included the lack of data available at that time. With the aim of remedying this shortage, a new questionnaire was created in Phase 2[2], to be answered by municipalities in EPA member countries with over 20,000 inhabitants. This questionnaire collected information not only on the number of parking spaces, but also on their distribution according to different types, characteristics of the city that could be considered related with the larger or smaller supply of regulated parking, and on the number of employees and turnover in the sector.

The questionnaire was available on the Internet from September 2012 to February 2013, and has been translated into 11 languages, to make it easier for operators in different countries to respond. The continuous interaction with city representatives in different countries merits mention, as well as with the authors of publications, in order to have the largest and most reliable amount of information possible.

Moreover, as detailed later, with the help of B:SM and a scholarship recipient specially hired for this purpose, new data has continued to be compiled on airports, shopping centres, park&rides, stadiums, hospitals and universities, which have been transferred to an Excel spreadsheet organised by countries. ■

1 See the report entitled 'Parking spaces in Europe: Results Checking and New Model Proposal. Phase 1: EPA Model Checking', available at the EPA website, in the Data Collection section.

2 The report on Phase 2, also available on the EPA website, is: 'Parking Spaces in Europe: Results Review and New Model Proposal. Phase 2: EPA Model Improvement and Design of a New Survey'. The questionnaire is also contained in Appendix 2 of this document.

1.2 Content of the initial database

The database built using the survey results and prior sources of information[1] primarily contains information on cities with more than 20,000 inhabitants, although some data on smaller cities was also obtained (in France, Ireland, Norway and Sweden), which were used to approximate the final estimation on the number of parking spaces in municipalities with any number of inhabitants.

Some of the stages of building this initial database were:

a. Statistical information was added during Phase 1 of the study, the majority for the year 2005. In some cases, this has entailed having to adapt historical data to the 2012 model-questionnaire.
b. We also verified that the list of municipalities with over 20,000 inhabitants that we worked with was comprehensive. This list comes from the study conducted in Phase 1. Some absences were detected, which were rectified, adding the municipality and its population from 2010.
c. Conversely, there were municipalities in the 2010 database that were removed, as their populations dropped below the threshold of 20,000 inhabitants.
d. For the seven EPA countries for which there was no information on parking spaces (Cyprus, Denmark, Finland, Greece, Luxembourg, Poland and Serbia), we looked for their population and per capita GDP, in order to estimate the number of spaces using an econometric model.
e. For countries for which there was information available on spaces and population, information on their per capita GDP was also added, given that this will be an explanatory variable in regression models.
f. In all cases the population was completed for all EPA municipalities with over 20,000 inhabitants.

1 See section Data Sources.

The table below shows the population of each country; the population that resides in municipalities with over 20,000 inhabitants and the percentage this represents out of the total for the country; the number of municipalities with over 20,000 inhabitants; the number of these cities for which some data on parking was available (as well as the total number of on-and off-street parking spaces), and the percentage these cities represent out of the total study.

It is important to recall that municipalities were included for which there was some information on the number of on- and off-street spaces, even when the information is incomplete and refers only to some concrete type of space. It was considered appropriate in all cases to collect information in this way, as it was only possible to directly attribute a number of spaces to those municipalities for which some data were available. ■

TABLE A.1 EPA Countries: Available population & data

Country	Population (millions) (2012)	Cities > 20K inhab. (millions)*	% pop. in cities >20K inhab.	No. cities >20K inhab.	No. cities >20K inhab. w/ data	% cities >20K inhab. w/ data
Austria	8.4	3.2	37.7%	26	13	50.0%
Belgium	11.1	7.6	68.3%	148	19	12.8%
Croatia	4.4	1.6	37.3%	19	8	42.1%
Cyprus	0.9	0.4	45.2%	8	-	-
Denmark	5.6	2.8	49.9%	32	-	-
Estonia	1.3	0.7	50.4%	6	1	16.7%
Finland	5.4	3.7	68.6%	56	-	-
France	65.3	23.2	35.5%	408	143	35.0%
Germany	81.8	48.0	58.6%	689	76	11.0%
Greece	11.3	9.3	82.5%	162	-	-
Hungary	10.0	4.8	48.2%	60	12	20.0%
Ireland	4.6	3.2	70.0%	42	29	69.0%
Italy	60.8	31.1	51.1%	505	81	16.0%
Luxembourg	0.5	0.1	26.6%	3	-	-
Holland	16.7	14.7	88.1%	263	3	1.1%
Norway	5.0	3.0	59.7%	52	12	23.1%
Poland	38.5	18.4	47.8%	222	-	-
Portugal	10.5	4.2	40.1%	82	41	50.0%
Serbia	7.3	3.3	45.3%	42	-	-
Slovakia	5.4	2.1	38.7%	39	3	7.7%
Spain	46.2	32.4	70.1%	401	86	21.4%
Sweden	9.5	7.6	80.0%	117	110	94.0%
Switzerland	8.0	2.1	26.5%	37	6	16.2%
Great Britain	63.0	31.0**	-----	194*	105	54.1%
Total	**481.6**	**258.5**	**54.3%**	**3.613**	**748**	**20.7%**

Source: In-house using Eurostat

* Data on population by municipalities is for 2010 to 2012, depending on the country.
** More than 50,000 inhabitants

The data in the database corresponds to all variables collected on the questionnaire: quantitative (type of off-street and on-street spaces) and qualitative.

a. The types of off-street spaces considered are: in structure, surface, park&ride, in sport, cultural and leisure facilities, in shopping centres and markets, and others (hospitals, universities and airports).
b. The types of on-street spaces included in the study are: regulated for general public use, resident only, loading and unloading, reserved for motorbikes, and other reserved (handicapped, police, etc.). We have also wanted to quantify, albeit with a greater margin of error, unregulated spaces, which represent a potential market for the sector.
c. Qualitative variables are associated with characteristics of cities that could influence their supplies of parking spaces: presence of metro or tram; municipality with extensive parking regulations; coastal municipality; tourist municipality; densely populated municipality; municipality with regular congestion problems during peak traffic hours; regional administrative, university or health centre; regional business, employment or industrial hub; municipality with large shopping facilities, or others.

Table A.1 above only contains data directly related to the number of spaces, disaggregated by types. As can be seen, the response received to the survey by different countries and cities was variable. There are seven countries for which there is no information: Cyprus, Denmark, Finland, Greece, Luxembourg, Poland and Serbia. For the rest of the countries, sometimes overall information for on- and off-street spaces was received (Norway), but others only provided on- and off-street totals, or only some of the types of spaces.

We must point out that there was some information provided for a total of 748 cities, representing a sample of 20.7% of total European cities with more than 20,000 inhabitants. ■

1.3 Search for additional information

In order to have greater information on the types of off-street spaces, we did additional fieldwork to complement the data provided by cities. All these data were used to be able to better estimate the number of off-street spaces attributable to each type of facility in those cities for which complete data were not available.

The actions implemented were:

a. Given that European airports are limited and known, parking data was compiled on 539 airports in EPA countries[1]. In general, there are regulated spaces at airports considered large or mid-sized. There is less information on the number of spaces at airports with little traffic and at aerodromes, some of which do not have regulated spaces.
b. New information was also collected on 1171 park&ride facilities (P&R) distributed throughout Europe. This search for information was done via Internet. It was possible to compile relatively comprehensive population information for Germany and Austria. There is also a large volume of data for France.
c. Data on airports and on P&R were handled separately, as it was possible to conduct a more complete count at a country level, which approaches the population totals for airports. Therefore, it was deemed more advisable to add spaces of these types to the final estimation, taking into account that not all municipalities have associated airports or P&R spaces.
d. Given that the original database contained little information on spaces at shopping centres, a search was performed of websites of establishments there, which led to substantial additional information: the spaces at 361 shopping centres were added, whose operations are not handled by external operators[2]. This search was stratified according to country and municipality size, so that there were data available for municipalities with more than 100,000 inhabitants, from 40,000 to 100,000 inhabitants and from 20,000 to 40,000 inhabitants. Information was found on some municipalities on the number of spaces at some shopping centres, and we verified the existence of others for which this information did not exist. In these cases, it was assumed that the shopping centres tallied represented a sampling of the total, and the number of spaces was extrapolated, assuming that all the city's

1 Airports without regulated spaces are included. The survey included a question on the total number of spaces at 'airports, hospitals and universities'. In general, municipalities did not write in information on the number of spaces at airports. In the small number of responses that did include it, this figure was subtracted to separate it from 'hospitals and universities', and to be able to process it separately. The detail on airports was considered as not included in the survey outcome when the number of spaces was less than the number obtained directly from information provided by the airport in question.

2 If operation is handled by an external operator, the spaces were tallied as structure car parks. The aim was to avoid repeating the number of spaces.

shopping centres had similar parking situations. Subsequently, the original datum was compared to this raised datum for those municipalities for which this additional information was collected, then proceeding the same way as for airports, namely, the original datum was always used, except where there was proof that the spaces given were undervalued.

e. In the starting database, there was scant information on hospital and university spaces. Thus, we sought additional information. Nonetheless, given the lack of publically accessible information, it was only possible to collect some further data on hospitals (16 cases) and universities (5 cases), which were included in the database, in those cases in which this information was lacking initially.

f. Like the previous category, the initial database contained little information on sport facilities, which was collected associated with cultural and leisure facilities. Given that sport facilities included stadiums, which have the largest number of spaces in this category, a search was performed for data on spaces at stadiums, to complete the initial information. Data on spaces at 41 European stadiums were collected. The criterion for incorporating these data was the same as for the rest of the categories explained above.

In summary, the additional information that was added to that which was compiled in the survey and from previous sources was:

TABLE A.2 Additional information compiled, according to facility type

	No. data	Countries
Airports	539	Austria, Belgium, Croatia, Estonia, France, Germany, Hungary, Ireland, Italy, Holland, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland
P&R	1771	Austria, Belgium, Estonia, France, Germany, Hungary, Ireland, Italy, Holland, Norway, Portugal, Spain, Sweden, Switzerland
Shopping centres	361	Austria, Croatia, Germany, Italy, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland
Hospitals	16	Ireland, Norway, Portugal, Sweden, Switzerland
Universities	5	Ireland, Norway
Stadiums	41	Austria, Estonia, Germany, Ireland, Italy, Portugal, Slovakia, Sweden, Switzerland

1.4 Data debugging and validation

After completing all information available in the database, a series of operations were carried out to improve it, eliminating errors and lack of coherence. The aim was to ensure that the data are useful and reliable to be used in drafting the models to estimate the number of parking spaces.

The main actions taken were:

a. Validation of the internal coherence of data for each country. In this regard, we verified whether the partial sum of the number of spaces matched the total, or if the aggregate data needed to be modified after considering the new data from the fieldwork performed at airports, park&rides, shopping centres, etc. From the analysis conducted, a diversity of situations was detected that were resolved ad hoc.

b. Review of incongruities. The individual review of the available data generated a series of changes to the initially available database. Given the multitude of cases, we will not detail every change made. By way of example, we detected that data on parking spaces in Madrid and Vienna were very different in the 2010 and the 2012 databases. Due to this, these cities were contacted again to clarify which information was correct. Likewise, the cities of Stockholm and Gothenburg had an overall number of spaces much higher than the figure obtained by their respective types of off-street space types. For this reason, we considered that they included spaces associated with their airports, which were subtracted and handled jointly with the rest of airports.

c. From the review of the data received, significant vacuums were seen for some countries, which generated second round interactions to expand upon statistical information.

d. Data associated with cities in which the total spaces did not match the partial sum of types were received in the initial database. The criterion used was: if the total were greater than the sum of the values of the sections, the difference was distributed between the blank off-street boxes; this distribution was done using the weight in the total parking spaces for other cities with similar characteristics. Conversely, if the total was less than the broken down sum, this difference was added to the total, due to understanding that the total had been underestimated. More details can be read in the next section on attributing missing values.

e. Counties, districts and regions were eliminated from all countries, with the aim of maintaining the uniformity of the database, limiting it to municipalities with more than 20,000 inhabitants. Likewise, cities with less than 20,000 inhabitants were separated, which appear in a couple one-off cases (Sweden, Ireland), to be handled separately. ■

Photos (2): Shutterstock

1.5 Attribution of unknown values

This is the most delicate step in the process, which required the use of a statistical methodology to assign a number of spaces coherent with expectations, in those cases in which the original plus additional information thus permitted. A conservative stance was held at all times, aimed at allocating only those spaces that were considered to result in reliable numbers that sufficiently matched the real situation. We would like to point out that the airport and park&ride spaces were not used in this phase, as they were tallied separately.

Some features of this allocation are detailed below:

a. There were many blank cells in the original database, owing to not answering them on the survey or lacking additional information. Since the first survey performed by EPA, the questionnaire instructed that blank cells would be interpreted as unknowns, although not zero for this reason. Likewise, the questionnaire that provided the data for this study, a methodology note was included that notified respondents that a 'blank' would not be interpreted as an absence of spaces, but would be considered an unknown value.

b. Starting from the premise above, blank cells were handled by the methodology described hereafter. For cities in a country for which only the total number of spaces was available, no disaggregation by types was done. These cities were passed on directly to the modelling phase, comprising part of the data from which parameters for the models would be estimated.

c. If no data were available for the municipality, neither total nor aggregate, no spaces were allocated to them for this phase. This would be done by aggregate for all of the country's municipalities, in the later phase of prediction using the estimated econometric model.

d. For those countries for which there was no information on how to distribute the total off-street spaces into different categories, the resulting percentages were applied by considering the data as European means. This option was deemed better than using the weightings from other countries with similar characteristics, given that the lack of data in many cases would entail greater errors.

e. With the aim of improving the models to proceed to estimating the parking spaces, an initial search was performed on which qualitative variables would be useful to know to best adapt the regression models for a sub-set of municipalities. In this regard, the preliminary results obtained indicated that it was possible to refine the model and predict large municipalities with greater precision (more than 400,000 inhabitants). For this reason, an additional search was performed on the value these qualitative data would take (presence of underground or tram, coastal municipality, etc.) on the survey for all large cities, in values were not submitted for them.

Some special features of the attributions are detailed below depending on whether they were on- or off-street spaces. ■

1.5.1 Off-street spaces

The attribution for off-street spaces was done by the type of space:

a. Hospitals and universities: From a conservative outlook, and using the scant information available in the database, we only considered that municipalities with more than 75,000 inhabitants would have spaces at hospitals and universities. For the rest, no allocation was done, assuming that the number of spaces in this category was zero. This criterion could give rise to an underestimation, as there may be some smaller municipalities that do have spaces of this type. However, taking into account that no data were collected on spaces at primary care centres and other larger health centres, we believe that the effects are compensated and the final estimation is not biased.

The way of performing attributions for municipalities with more than 75,000 inhabitants was: starting from the municipalities with information, the ratio of hospital and university spaces by inhabitant was calculated, using the data available on the country in question. For municipalities in the same country in which this datum did not exist, the number of spaces was attributed using this ratio per inhabitant. The result was a new off-street total, which now takes into account these spaces that were not previously tallied.

Those countries in which there were no data on hospitals or universities for any municipality represented a different problem. In this case, the mean ratio for all other available countries was adopted (mean European ratio). This value is 8.3 spaces per 1000 inhabitants. This mean was deemed to have enough reliability, given that it significantly approximates the mean for countries for which there is more information (like Portugal), which also shows quite homogeneous results. The countries with ratios furthest from the mean are: above, Ireland (10.0), Italy (17.0) and Austria (10.1); and at the lower end: Spain (2.6), Sweden (2.6) and Switzerland (2.7).

The countries for which it was necessary to perform attribution based on the average were: France, Croatia and Slovakia, as they had no information on these types of facilities.

b. Sport, cultural and leisure facilities: The same procedure was followed as for hospitals and universities, except for considering that any municipality with more than 20,000 inhabitants would have spaces in this category.

Using the municipalities that had information on these types of spaces, the number of spaces per 1000 inhabitants was estimated, as an aggregate. This value was used to estimate the number of spaces in those municipalities for which data existed already.

The number of spaces per 1000 inhabitants has a similar variability to that observed at hospitals and universities, which is considered acceptable. The mean European average is 6.7 spaces per 1000 inhabitants, calculated using only those countries for which there was information on at least two municipalities. For example, Spain was excluded, which only had information on one municipality, deemed insufficient to include its ratio for calculating the mean. Slovenia was not considered either, given that its ratio was abnormally low (0.9), calculated from few observations. Nonetheless, for Slovenia, its ratio was indeed used in the attribution of its municipalities, under the assumption that this scant number of spaces per inhabitant was due to a specific characteristic of the country.

In calculating the ratio, the countries above the European mean are: Belgium (11.8), Germany (12.0) and Portugal (15.8). Those that are significantly below this mean, apart from Slovenia, are: Ireland (2.3) and Italy (2.6).

c. Shopping centres and markets: For this type, it was considered that the number of spaces per inhabitant at shopping centres and markets differs significantly according to the municipalities' size. Thus, three population ranges were defined: more than 100,000 inhabitants, 40,000-100,000 inhabitants and 20,000-40,000 inhabitants. In countries for which there were data in this category, the spaces per 1000 inhabitants were calculated by the three ranges.

In general, there was information for each range (at least three municipalities). Thus, for the rest of the municipalities with data on any category, the spaces were allocated that would correspond according to their numbers of inhabitants, always using data from the same country. Two countries were found in which it was necessary to allocate ratios from others, given that there was no information (France) or it was considered too small (a single municipality in Holland). Naturally, data are attributed by the mean ratios by population ranges.

These mean European ratios were calculated using the data available by countries. We can observe that the three means are similar for each country, a fact that poses the question of whether we need to separate them into ranges. However, smaller municipalities do have a slightly higher ratio of spaces per 1000 inhabitants.

d. In structure and on surface:

These spaces were estimated based on the percentage they represent of the total. This method was employed because it is the way to conserve off-street totals given by some European municipalities, which are considered valid values, due to having been provided directly by the original source.

In some countries, like Italy, there are municipalities in which zero spaces were factored in both for surface and structure parking. Given the unlikeliness that this is true, these records were deleted and they were estimated as if this erroneous information never existed.

The general criterion for carrying out attribution was: To calculate the percentage of the total spaces for structure and surface, these percentages were obtained for each municipality for which both figures existed, using the total that also considered all other categories. Subsequently, and for each country, a mean was taken of all percentages that represented structure/surface spaces, so that any municipality –large or small- contributed equally to the mean result. This was done because we consider that the mean should be representative of all the country's municipalities, without assigning more weight to larger cities.

After a country's mean percentage was calculated, the number of spaces resulting from the country's mean percentage was then attributed to structure and surface spaces (or to one of the two, keeping the original figure for the other).

In countries for which there were no figures for structure and surface, spaces were attributed according to the European mean. The mean European ratio is 0.314 spaces in structure out of total spaces, and 0.211 surface spaces of the total.

The allocation of airport data, as well as information on park&rides (P&R) was done separately, as it was possible to perform a comprehensive count. The count done is quite close to the population total. In this way, a separate allocation was made to both types of parking spaces to then, in the last phase, add these types of spaces to the final estimation.

The special features of attributing spaces at airports and P&R are:

a. Airports: Since the number of airports in Europe is limited, we fully identified each of them, compiling information whenever possible. For each airport, we tried to obtain information on the number of parking spaces and whether airports could be considered small, medium or large, according to their sizes. It merits mention here that the airport size is not directly related to the size of the municipality in which it is located, but to the number of flights.

In the majority of cases, obtaining information let us also obtain the number of parking spaces. In the few cases where this was not possible, we attributed using this criterion: the mean number of parking spaces was calculated for all airports for each of the types. After calculating the mean for large, medium and small airports, the rest of the airports were allocated a number of spaces, according to their sizes. We proceeded in this way because we deemed that this average should be representative of all municipalities according to the airport size. It merits mention that the number of spaces could be tabulated for all large airports, so that no allocation needed to be done. We could also assess the number of parking spaces for approximately 90% of medium-size airports, so that allocation was only done in 10% of the cases. Finally, the number of parking spaces for approximately 85% of medium-size airports could also be counted, so allocation was only done in 15% of the cases.

b. Park&ride: The task of searching for and compiling this information was done as comprehensively as possible for the P&R for different municipalities in EPA countries. The difficulty of obtaining information on P&R was high and information considered complete could only be obtained for Austria, France and Germany. The information thus obtained refers to the number of parking spaces, number of P&R facilities for which there are data and the number of facilities for which there is no information about the volume of parking spaces. It merits mention that in the majority of cases, we could obtain information on all P&R facilities in the municipality.

However, in some municipalities (only some 5%), we found information on some park&rides, but not for all of them. In these cases, attribution was done based on: the spaces/facility ratio was calculated for the municipality and this ratio was applied to facilities in the same municipality for which there was no information. This allocation criterion was based on the assumption that this ratio would be representative of the municipality's park&rides for which there was no information. After calculating the number of P&R spaces in Austria, Germany and France, we obtained a figure of 2.2 spaces per 1000 inhabitants, and considered that these countries could be representative of all EPA countries. Thus, for the rest of the countries, the number of spaces resulting from applying this ratio was allocated. ■

1.5.2 On-street spaces

The same method was used for all on-street spaces (regulated for general public use, resident only, loading and unloading, motorbike spaces and other reserved spaces). The number of spaces of each type per 1000 inhabitants was calculated in those municipalities for which there was some information. The average was found for the country's municipalities, and this value was used to allocate spaces to municipalities in the same country without information, based on their number of inhabitants.

For those countries in which there were no data of any type for on-street spaces, the European mean was used, given the scarcity of data, it was not advisable to use the mean for a lower number of countries, which had similar characteristics of the country for which to perform the allocation. The European average is 30.5 spaces per 1000 inhabitants for regulated public use spaces, 22.9 for resident only, 2.1 for loading and unloading, 2.5 for motorbike spaces and 3.5 for other reserved spaces (handicapped, police, etc.).

After finishing the attribution process, the statistical information thus built (except for airports and P&Rs) was merged with the information from phase 1, leading to a much more complete database, which let the predictive models be estimated for the number of spaces per country and for all of Europe. ■

Photo: Shutterstock

2. Estimation by regression of all regulated spaces

Obtaining a prediction of regulated spaces for all municipalities with over 20,000 inhabitants in EPA countries, using a linear regression model, was done by using several regression models, which include the number of on-street and off-street spaces as endogenous variables. Thus, separate models were employed to analyse on-street and off-street spaces. To make these estimates, the municipalities were segmented by size, approximate by population, and breaking them down into three broad groups: more than 400,000 inhabitants (large), from 100,000 to 400,000 inhabitants (medium) and, finally, those with between 20,000 and 100,000 inhabitants (small)[1].

The distinction among the models by whether they consider the number of on-street and off-street spaces as an endogenous variable is due to the fact that the number of observations for which information could be obtained is different depending on the type of space (on-street or off-street). In turn, the differentiation of models according to municipality size was done, due to the different behaviours they display. This let us enter different explanatory variables to help characterise them for each of the models for the municipality groups (small, medium and large).

The starting point for all regression models specified is based on the idea outlined by parking spaces from the population. EPA itself did this using a different methodology the EPA of estimating the number of than the one outlined herein[2]. In our case, we wanted to find a stable relationship between parking spaces and population for all municipalities for which this information was available in order to translate this ratio to the rest of the municipalities for which we know (or could know) the population, but where we did not know the number of parking spaces. This inference was done by applying the parameters estimated in the initial regression model to the rest of the municipalities for which we wanted to estimate the number of parking spaces.

The process to improve this starting point has entailed planning that the regression model should explore the possibility of entering other explanatory variables, such as GDP, the number of vehicles or the lengths of roads, which would let the effect on the country be captured. The analyses performed with these variables have provided results that reveal a weak relationship to the number of spaces, with the sole exception of the GDP, which is seen as relevant when explaining the number of parking spaces.

Likewise, dummy variables were also entered in order to collect differentiating effects of the municipalities, corresponding to diverse characteristics and specificities. Concretely, to estimate off-street spaces in large municipalities, dummy variables were used that distinguish whether or not they are on the coast, whether they have trams and whether they have more than one million inhabitants. In reality, in the model specification process, other variables were tested that are associated with these characteristics of municipalities: presence of metro or tram; municipality with extensive parking regulations; coastal municipality; tourist municipality; densely populated municipality; municipality with regular congestion problems during peak traffic hours; regional administrative, university or health centre; regional business, employment or industrial hub; municipality with large shopping facilities, or others... but only the first were significant and selected in the end. Moreover, to estimate on-street spaces in small municipalities, a dummy variable was entered called South, to distinguish municipalities in southern European countries.

The estimation of the regression model, with the improvements set out, entailed a significant advance in explaining the number of parking spaces. However, the econometric validation performed revealed that there is a quadratic relationship between the population or the GDP and the number of parking spaces. To include this discovery, we included squared population and GDP variables when necessary in the regression model.
Thus, the estimated, validated and finally selected regression models are:

Off-street

Large municipalities:

$$Off_i = \beta_1 + \beta_2 Pobl_i + \beta_3 PIB_i + \beta_4 Pobl_{1m_i} + \beta_5 Tranvia_i + \beta_6 Costa_i + u_i$$

Medium municipalities:

$$Off_i = \beta_1 + \beta_2 Pobl_i + \beta_3 PIB_i + \beta_4 Pobl_i^2 + \beta_5 PIB_i^2 + u_i$$

Small municipalities:

$$Off_i = \beta_1 + \beta_2 Pobl_i + \beta_3 PIB_i + \beta_4 PIB_i^2 + u_i$$

On-Street

Large municipalities:

$$On_i = \beta_1 + \beta_2 Pobl_i + \beta_3 Pobl_i^2 + \beta_4 Pobl_{1m_i} + \beta_5 Pobl * Pobl_{1m_i} + u_i$$

Medium municipalities:

$$On_i = \beta_1 + \beta_2 Pobl_i + \beta_3 PIB_i + \beta_4 Pobl_i^2 + \beta_5 PIB_i^2 + u_i$$

Large municipalities:

$$On_i = \beta_1 + \beta_2 Pobl_i + \beta_3 PIB_i + \beta_4 PIB_i^2 + \beta_6 Sur_i + u_i$$

1 The study was broken down into these three types of municipalities after analysing the results associated with the econometric models, which let these three homogeneous blocks of municipalities be better characterised.

2 The review of the model used by the EPA can be consulted in the work by Suriñach et al., 2011.

Where:

Off_i the number of off-street spaces in municipality i.
$Pobl_i$ the number of inhabitants in municipality i.
PIB_i the gross domestic product for the country in which municipality i is located.
$Pobl_{1m_i}$ is a dummy variable that takes the value 1 when municipality i has more than 1 million inhabitants and otherwise is 0.
$Tranvia_i$ is a dummy variable that takes the value 1 when municipality i has a tram transport system and otherwise is 0.
$Costa_i$ is a dummy variable that takes the value 1 when municipality i is on the coast and otherwise is 0.
Sur_i is a dummy variable that takes the value 1 when municipality i is in a southern European country and otherwise is 0.[1]

These estimates are the final models selected, after executing different specifications and evaluation tests, such as: analysing the significance of other qualitative variables; entering these variables as added and/or multiplicative effects; analysis of outliers..

1 The southern European countries deemed as belonging to the EPA are: Croatia, Cyprus, Greece, Italy, Portugal, Serbia and Spain.

Photo: Shutterstock

TABLE A.3 Estimates and predictions Off-street spaces: EPA municipalities with more than 20,000 inhabitants[1]

	Large municipalities	Medium municipalities	Small municipalities
C	7,902.55 (0.356)	351,399 (0.094)	3,787.75 (8.064)
Pop.	0.0286533 (2.659)	0.156094 (4.412)	0.0530478 (7.592)
GDP	0.00997253 (-1.728)	-0.0174297 (-7.590)	-0.0073997 (-9.318)
$Pop.^2$		-2.40884e-07 (-3.056)	
GDP^2		6.75692e-09 (7.774)	2.87712e-09 (8.683)
Pop._1m	32,191.5 (1.906)		
Tram	26,605.8 (1.906)		
Coast	24,259.5 (2.146)		
R^2 N	0.607841 42	0.470251 158	0.309698 273
Prediction	3,708,778	4,154,494	9,389,596
Prediciton total off street		**Total: 17,252,868**	

T-ratio in brackets

1 Data on off-street spaces included in the estimate do not include numbers for Airports or Park&Rides, or data on spaces in the United Kingdom.

TABLE A.4 Estimates and predictions On-street spaces: EPA municipalities with more than 20,000 inhabitants[1]

	Large municipalities	Medium municipalities	Small municipalities
C	-31,755.5 (-1.619)	10,938.4 (2.287)	117,184 (0.436)
Pop.	0.122593 (3.630)	-0.0704683 (-1.533)	0.0313424 (7.365)
GDP		-0.0060876 (-1.928)	-0.001048 (-1.494)
$Pop.^2$	-5.20246e-08 (-4.288)	2.85961e-07 (2.805)	
GDP^2		2.77463e-09 (2.197)	6.23921e-10 (1.955)
Pop._1m	-146569 (-2.862)		
Pop.*Pop._1m	0.146711 (3.034		
South			1,088.41 (4.664)
R^2 N	0.852140 34	0.324242 138	0.23333 359
Prediction	2,669,457	2,354,438	5,380,210
Prediciton total off street		**Total: 10,404,105**	

T-ratio in brackets

The results prove that these regression models are significant. Thus, we can confirm that the explanatory variables entered let the number of parking spaces be explained. The adjustment of the models is acceptable, although it differs depending on whether the municipalities are large, medium or small. Thus, the variability of the parking space variable is explained by a higher percentage for large municipalities than for small and medium-size municipalities. This is due to the large diversity of characteristics of small and medium municipalities that could not be collected in quantifiable variables and that could affect the number of parking spaces there are.

After the models were estimated and validated, the prediction was done for the number of spaces for the rest of the municipalities for which there was no information. A simple sum of the prediction for each of them yields a prediction of total spaces. The prediction obtained in the end tells us that the total parking spaces for municipalities of over 20,000 inhabitants in EPA countries is estimated at 27,656,973.

Nonetheless, we must point out that these predictions do not include, and therefore must be added, the spaces for the United Kingdom and Airport and Park&Ride spaces that were tabulated differently, given the characteristics of the information available. ■

1 On-street spaces included in the estimate do not include those for the United Kingdom.

TABLE A.5 Predictions using the regression models: EPA municipalities with over 20,000 inhabitants[1]

	Large municipalities	Medium municipalities	Small municipalities	Total
Off-street spaces	3,708,778	4,154,494	9,389,596	17,252,868
On-street spaces	2,669,457	2,354,438	5,380,210	10,404,105
Total spaces	**6,378,235**	**6,508,932**	**14,769,806**	**27,656,973**

1 Estimates for off-street spaces do not include figures for Airports or Park&Rides, or predictions for the United Kingdom. Moreover, estimates of on-street spaces do not include the United Kingdom either. Predictions made using regression models refer to regulated spaces and, thus, do not include predictions for unregulated spaces.

Great Britain has unique features that advise performing the estimate of the number of parking spaces differently than for all other countries. In particular, the information on spaces is disaggregated between those that are handled by 'local authorities', those that are managed by 'non-local authorities', and unregulated spaces.

Moreover, only cities or counties with over 50,000 inhabitants were tabulated, so that there is no information on the lower range of towns that have between 20,000 and 50,000 inhabitants, which were considered in other countries. Furthermore, the database available does not let us know the identity of the cities/counties, so that we do not know if any of the counties have cities with more than 20,000 inhabitants.

In any case, it merits mention that Great Britain performed its own study in 2012[1], which concluded via extrapolation that there are at least 8 million spaces in the entire country. This count tabulated 'local authority' spaces (between 50% and 60% of the total) and the rest (those run by 'non-local authorities', plus unregulated spaces). For on-street spaces (regulated or not), the margin of error is high, as only limited information was compiled.

According to the information for all EPA countries, taking into account that the percentage of the population that resides in municipalities of more than 20,000 inhabitants is 54.3% (see Table A.1), one can conclude that there are some 4.3 million parking spaces in Great Britain in municipalities with more than 20,000 inhabitants, of which some 2.7 million are off-street spaces, while 1.6 million are on-street. These last values were calculated from the on- and off-street totals obtained using the models for the rest of Europe, given that one cannot assume that the distribution in municipalities/counties with more than 50,000 inhabitants is the same as when smaller municipalities are taken into account. ■

1 British Parking Association (2012): The size and shape of the UK Parking Sector. Skyblue Sector Research Report.

3. Turnover and employees

The sources of information with which we started are listed below.

Publications: Generally by national EPA associations or other countries, but also others by companies that are economic sector analysts. They have provided a large amount of data and ratios. In the majority of cases, the difficulty rested with comparing data provided by different publications, because they rarely used exactly the same concepts (VAT included or not in revenues, employees only of operators or also of equipment and service providers, etc.).

The questionnaire: Several questions were purposefully designed so that respondents could provide sufficient information easily and quickly, without forcing them to build sophisticated data or perform complex operations. They supplied minimum and maximum values for earnings per space for on- and off-street for all pay spaces in each municipality. For future versions, it is recommended to skilfully review this section of the questionnaire, in order to obtain greater yields and precision of responses.

Studies conducted by national associations: An essential source supplied by several countries (Ireland, Sweden, Belgium, Germany, Norway, UK, Portugal), in some cases in coordination with the study, which have helped enormously. There was baseline information available in some cases for drafting publications.

Experts: As mentioned, we have relied upon their expertise. After submitting this decision to the EPA Board, an explanatory guide and a brief Excel questionnaire were prepared, and these people were asked to complete them. Broad sector numbers and ratios were requested (revenue per space, employees per 100 spaces). The majority of the responses received were ranges (not a specific and fixed ratio), and were used as guidelines or reference margins during the critical assessment. As mentioned, a different methodology was used to estimate the number of spaces for this part of the study. This is because, in general, the sources and availability of data were also different. Although it is possible to obtain these two figures for large corporations through publications, it is also true that the spaces they manage are a small portion of the actual situation in cities, regions or countries. And also in general, their structure is very different from the possible structure of hundreds of small operators that, as a whole, have a great weight in the sector. For these two reasons, we avoided using the large operators as the sole indicator, although we did use them as a reference, both for revenues and for employees.

A table was then constructed for each country, approximating the values based on all available information, and subsequently estimating the countries for which no information was available (GDP). Starting there, mean ratios were adjusted so that they would be as consistent as possible overall.

In all cases, we should point out that the values obtained approximate the actual situation, at a referential level valid overall, but also obtained from extremely diverse information. There are an infinity of different realities for each case.

A few examples by way of example:

a. For on-street, the mean ratio was 0.68, 1.0 for general regulated spaces and 0.3 for resident only spaces, responding to the fact that the latter are generally in clusters and their low rotation does not require the same level of enforcement. We also considered that there would be some personnel working in enforcement for reserved spaces (handicapped, police, embassy, etc.) (0.25) and for loading and unloading spaces (0.15), but not for motorbike spaces.

b. Hospitals / universities. After fieldwork was conducted, it seemed clear that there is more business management and more revenue with the first group, where the revenue and personnel working in the parking sector could be similar to the category of structure parking in large cities and in smaller cities with large hospitals (although in many others, hospitals have large free surface parking). Conversely, although with exceptions, it would seem that very few universities have parking at significant prices, instead reduced parking with controlled access for personnel and students, at most with a symbolic price. A ratio for the category was adjusted, although we now know that upcoming studies should separate hospitals and universities into different categories.

c. Dissuasion car parks, P&R, have great dispersion of how they are operated in Europe: The mean adjusted ratio of personnel for this category is 0.50 employees/100 spaces, knowing that in some countries/companies it is close to 2 and in others it is rare to have personnel (0). The same thing happens with their revenues, whose average in EPA was given as €200/ space and year, when countries like Spain and Portugal have minute earnings in this category. Moreover, some countries included inter-modal interchange car parks in sea ports, many of which are mature and run professionally, with established rates and management.

For executing the projections done for EPA cities with less than 20,000 inhabitants and for all of Europe, related to revenue and number of employees, we compensated downward for the revenue/space and employees/100 spaces ratios for each type of space. ■

Photos (2): ICES

APPENDIX 2 – Materials

The new questionnaire

"The scope of parking in Europe"
Instructions to fill in the questionnaire

The aim of this study of the *European Parking Association* is to assess the **magnitude and scope of the parking industry in Europe**.

To do this, please help answer the following **brief questionnaire**. The greater the precision of the answers, the more reliable the results obtained will be.

- If you have no data, but you can give an approximation, please do it. Otherwise, leave the question blank.
- If there are no parking spaces of a given type, indicate it with a 0.
- Do not take into account the size of the parking spaces. Fill in the number of parking spaces using your own standard.
- If parking spaces have more than one purpose, fill in the number only in the most frequent one.

OFF-STREET parking spaces

Parking of **public use** with **access control** (barrier, parking lot attendant, etc.).

No matter whether the manager is **public or private**.
No matter whether **payment is required or not**.

⇒ Excluded: Private use parking (housing, offices, etc.).

***Off-street* type of spaces:**

- In a structure: Multi-storey or underground parking.
- On the surface: As long as there is an access control.
- Park&Ride: Dissuasive parking, normally next to train stations.
- In sport, cultural or leisure facilities: stadiums, museums, theaters, cinemas, etc.
- In shopping malls or markets.
- Others (in hospitals, universities, airports, etc.)

ON-STREET parking spaces

Regulated parking spaces on the **kerbside**.
No matter whether **payment is required or not**.

⇒ Excluded: Spaces on private land, non-regulated spaces.

***On-street* type of spaces:**

- Regulated spaces for general public use.
- Resident-only spaces
- Loading and unloading spaces.
- Motorbike spaces.
- Other regulated spaces: Handicapped, embassies, police, etc.

Important note: Non-regulated spaces are taken into account in another separate question. Please, do not add them here. Non-regulated spaces are considered to be those without signaling, where no special surveillance is carried out.

"The scope of parking in Europe"

Photo: Shutterstock


FEEDBACK

The aim of this study from the *EPA* is to conduct a solid description of the **parking industry in Europe,** allowing the assessment of its true **magnitude and scope**. Please, read the indications on the attached sheet before filling in the questionnaire.

⇨ **If you don't know an answer but you can give an approximation, please do it.**

Contact person:		**e-mail:**	
Name of the municipality:		**Country:**	

MOBILITY

1. First, we raise some questions regarding mobility in your **municipality**. Please, answer *yes* or *no*, checking the box with a cross.

	Yes	No
The municipality has metro	☐	☐
The municipality has tram	☐	☐
On-street parking has undergone an extensive regulating plan	☐	☐
There are usually traffic congestion problems at peak hours	☐	☐
It is a coastal municipality	☐	☐
It is a municipality densely populated	☐	☐

2. The city attracts **trips** because:

	Yes	No
It is the administrative / sanitary / universitary center of the area	☐	☐
It is a business / work / industrial center	☐	☐
It has lots of commercial activity	☐	☐
It is a cultural or touristic municipality	☐	☐
Others: (specify).....	☐	☐

PARKING SPACES

3. How many **off-street and on-street parking spaces** are there in your municipality? Give the total number of parking spaces of each kind. If you wish, you can use the itemization shown in order to approximate the total.

***OFF-STREET* total spaces**	⇦
In a structure	
On the surface	
Park&Ride (dissuasive)	
In sport, cultural or leisure facilities	
In shopping malls or markets	
Others (Hospitals, Universities, Airports, etc.)	

✍ Please, fill in this data even if it is approximated

***ON-STREET* total regulated spaces**	⇦
Regulated for general public use	
Exclusive for residents	
Loading and unloading	
Motorbike spaces	
Other regulated spaces (handicapped, police,etc.)	

✍ Please, fill in this data even if it is approximated

4. Approximately, which percentage of the total spaces indicated before are **charged** parking spaces?

	Spaces	
	off-street	*on-street*
No charged spaces	❒	❒
Less than 20%	❒	❒
20%-50%	❒	❒
50%-80%	❒	❒
More than 80%	❒	❒

5. If you had to approximate the **average occupancy** rate of the charged parking spaces, which one would it be?

	Spaces	
	off-street	*on-street*
Less than 20%	❒	❒
20%-50%	❒	❒
50%-80%	❒	❒
More than 80%	❒	❒

6. Approximately, which percentage of the *off-street* spaces requires a **pass**?

	Pass
Less 20%	❒
20%-50%	❒
50%-80%	❒
More than 80%	❒

7. How many **non-regulated** *on-street* spaces are there in your municipality? Please, try to give an approximate value.

NON-REGULATED *on-street* spaces

RATES

8. Finally we will ask you some questions about **Rates**. If you do not have the exact figure or there are different rates, try to **approximate the average rate**.

If possible, we would appreciate you to show the figures in **Euros**. Otherwise, use the currency of your country, please specify it. Please, include the VAT.

OFF-STREET parking	**Euros**	**Other currency (please specify)**
Average rate per hour		
Average monthly rate (pass)		

ON-STREET parking	**Euros**	**Other currency (please specify)**
Average rate per hour (foreign)		
Average monthly rate (resident)		

Thank you very much for your collaboration.

Websites

Some of the websites consulted to obtain and compare data are listed below.

Airports

www.es.wikipedia.org
www.en.wikipedia.org
www.airport-authority.com
www.aeropuertosdelmundo.com
www.aena-aeropuertos.es
www.nshispeed.nl
www.avinor.no
www.italianairportsguide.com
www.airport-guides.com
www.azworldairports.com
www.airport.fr
www.atlasnavigator.com
www.airport-brac.hr
www.zagreb.airport.hr
www.split-airport.hr
www.zadar-airport.hr
www.rotterdamairport.org
www.aeropuertomadrid-barajas.com
www.bordeaux.aeroport.fr
www.lyonaeroports.com
www.marseille.aeroport.fr
www.nantes.aeroport.fr
www.metz-nancy-lorraine.aeroport.fr
www.montpellier.aeroport.fr
www.nantes.aeroport.fr
www.nice.aeroport.fr
www.aeroportsdeparis.fr
www.pau.aeroport.fr
www.strasbourg.aeroport.fr
www.toulouse.aeroport.fr
www.euroairport.com
www.clermont-aeroport.com
www.brest.aeroport.fr
www.lille.aeroport.fr
www.lorient.aeroport.fr
www.rennes.aeroport.fr
www.aeroport-perpignan.com
www.aeroport-rodez.fr
www.toulon-hyeres.aeroport.fr
www.leipzig-altenburg-airport.de
www.berlin-airport.de
www.airport-bremen.de
www.koeln-bonn-airport.de
www.dortmund-airport.de
www.dresden-airport.de
www.duesseldorf-international.de
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APPENDIX 3 – Literature Review

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