European
Commission

JRC TECHNICAL REPORTS

Task 2 Report: Technical State of Play, Market and Cost data

EU GPP Criteria for Maintenance of Public Spaces

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May 2017

EUR xxxxx xx

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EUR xxxxx xx

Print	ISBN xxx-xx-xx-xxxxx-x	ISSN xxxx-xxxx	doi:xx.xxxxx/xxxxxx
PDF	ISBN xxx-xx-xx-xxxxx-x	ISSN xxxx-xxxx	doi:xx.xxxxx/xxxxxx

Luxembourg: Publications Office of the European Union, 20XX [if no identifiers, please use Brussels: European Commission, 20XX or Ispra: European Commission, 20XX or Geel: European Commission, 20XX or Karlsruhe: European Commission, 20XX or Petten: European Commission, 20XX or Seville: European Commission, 20XX depending on your unit]

How to cite this report: Author(s), *Title*, EUR, doi

Printed in xxx (country name)

Acknowledgements

We would like to thank all of the stakeholders from different organisations across Europe that have provided feedback via e-mail. Your input has been greatly appreciated. It has helped shed light on an area with little European-wide data.

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Abstract

Europe's public authorities are major consumers. The European public service spends approximately 16% of European Union’s Gross Domestic Product on purchasing a large variety of products. By taking into account environmental criteria in its procurement procedures, contracting authorities promote modes of production that are more environmentally friendly and stimulate the supply of ‘green’ goods and services. Thus, they can make an important contribution to reduce environmental impact of consumption and production - which is called Green Public Procurement (GPP) or green purchasing.

This document presents the market research and an economic report regarding the situation of the public spaces maintenance sector at the European context. In order to be able to give an accurate and comprehensive overview of the sector, it is essential to collect key figures which enable quantitative assessments of the economic and environmental relevance of the products and services included within the sector. This includes definitions of public space maintenance services and the related products from a managerial, organisational and functional point of view.

Therefore, following the methodology of a market analysis, the public space maintenance sector has been characterised according to the volume of the public procurement purchases in EU 28[1] (product/service supply and demand), its market structure and future trends within public spaces maintenance.

[1] The European Union (EU) include 28 Member States: Austria (AT), Belgium (BE), Bulgaria (BG), Croatia (HR), Cyprus (CY), Czech Republic (CZ), Denmark (DE), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (EL), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Luxembourg (LU), Malta (MT), Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Spain (ES), Sweden (SE) and United Kingdom (UK).

1 Introduction

Europe's public authorities are major consumers. The European public service spends approximately 16% of European Union’s Gross Domestic Product on purchasing a large variety of products. By taking into account environmental criteria in its procurement procedures, contracting authorities promote modes of production that are more environmentally friendly and stimulate the supply of ‘green’ goods and services. Thus, they can make an important contribution to the development of environmentally green technologies - which is called Green Public Procurement (GPP) or green purchasing.

Although GPP is a voluntary instrument, it has a key role to play in the EU's efforts to become a more resource-efficient economy. It can help stimulate a critical mass of demand for more environmentally friendly goods and services which otherwise would be difficult to get onto the market. To achieve the objectives, environmental criteria should be developed for a large range of products and services involved in the maintenance of public spaces.

This document presents the results of a market research regarding the situation of the public spaces maintenance sector in the European context with the aim of providing a description of this segment and the related services and hardware from a technical point of view. In order to be able to give an accurate and comprehensive overview of the sector, it is essential to collect key information which enables a quantitative assessment of the economic and environmental relevance of the products and services included within the sector. This includes a description of public space maintenance services and the related products from a managerial, organisational and functional point of view. In addition, the market will be characterised according to market segmentation (geographical, technological, target group related), with an overview of the respective products and services, as well as identifying the key manufacturers/service providers and consumer groups/procurement entities.

Therefore, following the methodology of a market analysis the public space maintenance sector has been characterised according to the volume of the public procurement purchases in EU 28 (product/service supply and demand) and its market structure. Providing specific cases on future trends in the maintenance of public spaces is a key aspect in identifying service/manufacturers suppliers and consumer groups/procurement entities. In addition, the public spaces maintenance market has been segmented taking into account the data collected on the previous analysis and the scope established on the Task 1 Report (stakeholder survey, statistical, legal and criteria review, scope and definition proposal). Finally, an analysis on future trends within the public spaces maintenance sector is provided, among other things, by distinguishing between the advantages and disadvantages between outsourced maintenance services and in-house provisions of public spaces maintenance.

In the European context the maintenance of public spaces sector has a significant turnover. However, there is little information on the market performance. In this sense, the lack of updated information has constituted a serious limitation for the achievement of the research goals. Therefore, the data on the maintenance expenses and costs provided should be interpreted with caution, as the different European typologies require that each study be analysed according to its particular context.

2 Market analysis of the public space maintenance sector of report

In 2003, the European Commission on its Communication on Integrated Product Policy encouraged Member States to draw up National Action Plans for GPP to steer the market towards more environmentally friendly products. The National GPP Action Plans are not legally-binding but provide political impetus to the process of implementing and raising awareness of GPP. They allow Member States to choose the options that best suit their political framework and the level they have reached.

Table 1 shows the current situation of the National GPP Actions Plans in EU countries as of November 2014. A comprehensive overview of the situation in each EU Member States can be found in the document National GPP Action Plans (policies and guidelines).

Table 1. Status of the National GPP Actions Plans.

Status	**Countries**
National Action Plan or equivalent document adopted	Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, UK
No existing National Action Plan	Estonia, Greece, Hungary, Luxembourg, Romania

Source: National GPP Action Plans: http://ec.europa.eu/environment/gpp/action_plan_en.htm.

Table 2 summarizes the current situation regarding GPP in some EU countries, including the percentage of public bids with environmental criteria and priority aspects, such as GPP targets or products.

Table 2. Status of GPP in some EU countries.

Country	**% GDP for public procurement**	**Bidding with environmental criteria**	**Priority aspects: targets & products**
Austria	16%	60%	Under definition.
Denmark	19%	50%	Computer equipment, cleaning products, recycled paper.
Finland	16%	50%	n/a
France	16%	30%	Vehicles, construction, wooden products.
Germany	17%	70%	n/a
Italy	12%	30%	Energy efficiency and recycled material content in products.
Netherlands	21%	50%	In 2010, 100% GPP in Central Government and 50% in other public

			authorities.
Spain	13%	30%	n/a
Sweden	20%	80%	n/a
UK	17%	70%	Construction, catering, textiles, waste, paper and printing, energy, energy consumables and equipment, furniture, transport.

Source: National GPP Action Plans: http://ec.europa.eu/environment/gpp/action_plan_en.htm.

This study focuses primarily on understanding how the public spaces maintenance market works. Before any consideration or recommendation about the GPP criteria on maintenance of public spaces, it is essential to deepen the study of the market volume and market structure in the European context. The next section provides information on the function of the market of the product/service group from both the service provider and procurer perspective in order to interpret and identify relevant trends, drivers and innovations.

2.1 EU market overview

On the technical state of play analysis, the elaboration of a comprehensive database has been carried out. This database collected multiple groups of goods and services related to the maintenance of public spaces according to the scope identified on the Task 1 Report: stakeholder survey, statistical, legal and criteria review, scope and definition proposal.

In order to retrieve the most relevant information for our research purposes, this data was identified according to their Common Procurement Vocabulary (CPV). Within the CPV classification, many categories of supplies, works and services have been identified under its suitability to the Public Space Maintenance sector. This research methodology tries to gather within a unique database key information (relevant to the scope of the study) which will enable quantitative assessment of the economic relevance of the sector. Data for the following was collected:

- volume of the sector in EU 28
    - product/service supply and demand in approx. contract volumes
        - in EU total
        - at Member State level,
    - Annual growth rates and public procurement volumes of purchases.

Although the CPV system is the most reliable, its level of accuracy is not absolute. According to the report Review of the Functioning of the CPV Codes/System across Europe[2], submitted in 2012, the benefit of the CPV system for contracting authorities was assessed as high. The report estimated that 90% of all tenders issued were correctly coded with roughly 10% of all publishing authorities applying a code which does not correctly describe the nature of a tender.

[2] European Commission DG Internal Market and Services, December 2012. Available at: https://www.pianoo.nl/sites/default/files/documents/documents/121219report-review-cpv-codes-functioningen.pdf.

There are several reasons why codes might be applied incorrectly; e.g., some contracting authorities have very little experience with the CPV. Therefore these contracting authorities make mistakes by not providing the adequate code.

In addition, another problem identified for the use of CPV Codes/System was to take the supplier's perspective more into account. According to many suppliers, the CPV structure does not represent business sectors – which causes inconsistencies for users. Language barriers still seem to be a difficulty for users at the European context. The original text that describes the tender is shown only in the language of the contracting authority; only the code text is shown in other languages. As some contracting authorities tend not to use the codes which are an exact fit, the code text does not always suit the object of a tender.

These problems have limited the depth of the market study, creating difficulties in obtaining a comprehensive database that enables an in-depth knowledge and understanding of the maintenance of public space sector in every European country. Therefore, and due to the language constraints which limit the accessibility to the primary sources (mainly national public procurement institutions), the European Tender Electronic Daily (TED), the online version of the Supplement to the Official Journal of the EU (OJS), dedicated to European public procurement were consulted. According to European Directive on public procurement, notices for procurement procedures of public authorities must be published in the Official Journals.

The awarding authorities for tenders included within TED, are central governments, local or regional authorities, bodies governed by public law, or associations consisting of one or more of these authorities or bodies governed by public law. Each year supply and public works contracts worth about 420 billion euros are published by public authorities in the EU. Every day the Supplement to the Official Journal publishes over 1,800 tenders containing invitations to tender among the following sectors:

1. Public contracts for works, supply and services from all EU Member States.
2. Utilities contracts (water, energy, transport and telecommunications sectors).
3. Public contracts from EU institutions.
4. Phare, Tacis and other contracts from Central and Eastern Europe.
5. European Investment Bank (EIB), European Central Bank (ECB) and European Bank for Reconstruction and Development (EBRD) financed projects.

Thus, according to the scope of the study, the following categories have been studied by TED:

— **Activities** related with Public Space Maintenance, organized around two main categories:
    - Cleaning
    - Gardening & landscaping
— **Equipment Items**, needed to accomplish maintenance activities, mainly:
    - Vehicles
    - Machinery

Hereafter, data management and its specific characteristics will be explained to help the data interpretation.

2.1.1 Data characteristics

The data shown in this report comes from public procurement standard forms, which are filled in by contracting bodies and sent as notices for publication in TED. Within TED, information on public procurement contracts, according to the EU rules can be found for the EU Member States. Generally, this data is provided "as is", because sometimes the source of the data is unverified output from contracting authorities or entities across Europe. As said before, it is not uncommon for data to be input incorrectly or to be missing, and thus great care has been taken with data management and its interpretation.

On the other hand, much of the data provided consists of notices above the procurement thresholds. However, publishing below threshold notes in TED is considered good practice, and thus a non-negligible number of below threshold notices is present as well.

Since September 2008, the common procurement vocabulary has changed. For this reason, the analysis was based only on data from 2009 onwards. In addition, according to the multiple levels provided by the European Union Open Data Portal (Contract Award Notices, Contract Awards and Contract Notices); for the purpose of our study, it is enough to work with the Contract Award Notices (CAN) files (which contain the CAN and Contract Awards levels of the data). Since, generally, the CAN informs on the final result of the procurement.

In a file with CANs, each row begins with the information from a CAN, including a Contract Awards (CA). When a CAN has multiple CA, then the information from the non-CA parts of the notice will be repeated.

2.1.2 Data management methodology

A subset of data was downloaded from Tenders Electronic Daily (TED) online platform covering public procurement for the European Economic Area and Switzerland from 2009-01-01 to 2015-12-31 in comma separated value format. This data included the most important fields from the contract notice and contract award notice standard forms.

Subsequently, for the period selected, a subset of data was filtered according to the relevant CPV-codes identified for every category included within the scope of the studio. Specifically, the information under the following CPV-codes was collected. As stated below, in a file with Contract Award Notices (CANs), when a CAN has multiple Contract Awards (CAs), the information from the non-CA parts of the notice will be repeated. Therefore, in our analysis we remove the information duplicated based on the ID_NOTICE_CAN, resulting for the year 2009 in a dataset of 761 rows (Filter single values or remove duplicate values).

In order to adapt the datasets to the European format, the points founded in the contract amounts were replaced by commas. The following activities related to Public Space Maintenance, and organized around five main services, were studied.

2.1.2.1 Cleaning activities market overview

The relevant CPV-codes for cleaning activities are mostly listed in: Division 90 Sewage, refuse, cleaning and environmental services. Specifically, under the group 9060 Cleaning and sanitation services in urban or rural areas, and related services, within which are included the following categories:

— 90610000, Street-cleaning and sweeping services

— 90620000, Snow-clearing services

— 90630000, Ice-clearing services

— 90640000, Gully cleaning and emptying services

— 90650000, Asbestos removal services

— 90660000, Deleading services

— 90670000, Disinfecting and exterminating services in urban or rural areas.

— 90680000, Beach cleaning services

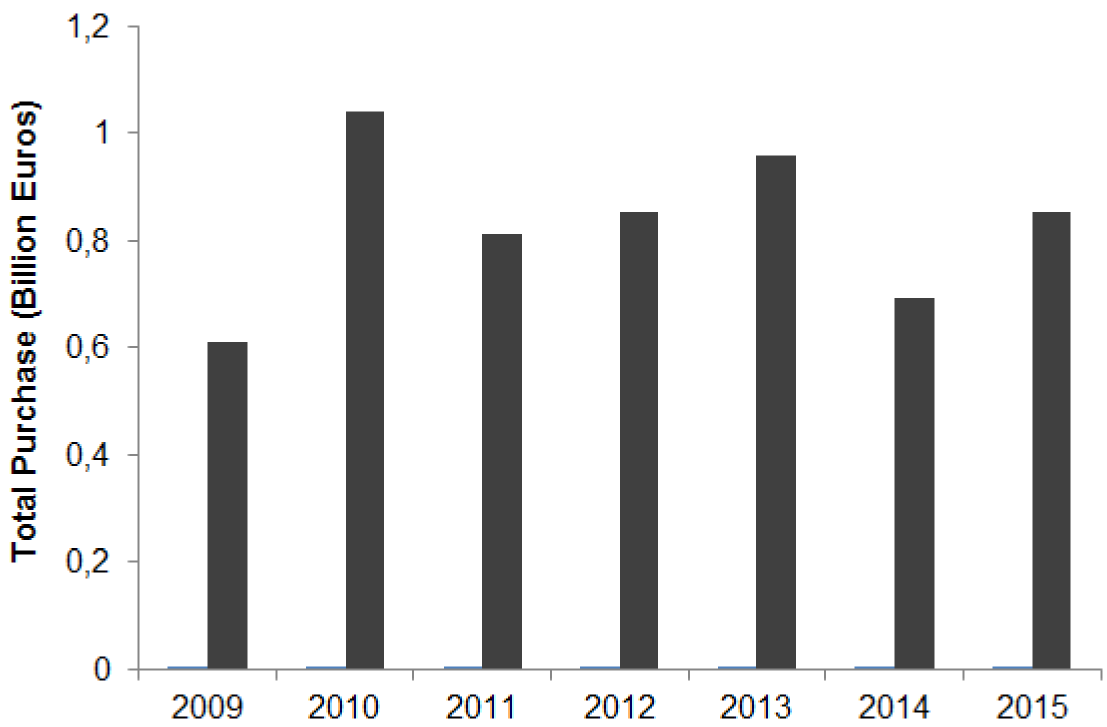
In addition, three classes of the group 9091 Cleaning services have been included within the cleaning activities for the maintenance of public spaces:

— 90914000, Car park cleaning services

— 90918000, Bin-cleaning services

In 2015, the cleaning activities regarding the maintenance of public spaces involved more than 800 million euros of (CANs). As reflected in Figure 1, between 2009 and 2015, the total value of the services included under this category maintained an irregular pattern, exposed to the ups and downs based on budget constraints. While in 2010 the volume of contracts experienced an increase of 70%, 2014 saw a decrease of 28% in the volume of CAN. During this entire period the total purchase of cleaning activities was never below 600 million euros. The total average number of CAN for these 7 years was 831 million euros, reflecting the large volume of this market in the European context. On the other hand, the average number of CAN published on TED about this topic was 935 contracts. Since the geographical coverage included in the dataset (Former Yugoslav Republic of Macedonia, Iceland, Norway, Switzerland, Liechtenstein and EU28) the value distribution of cleaning activities contracted, registered remarkable differences between each country.

Figure 1. *Total purchase of cleaning activities*



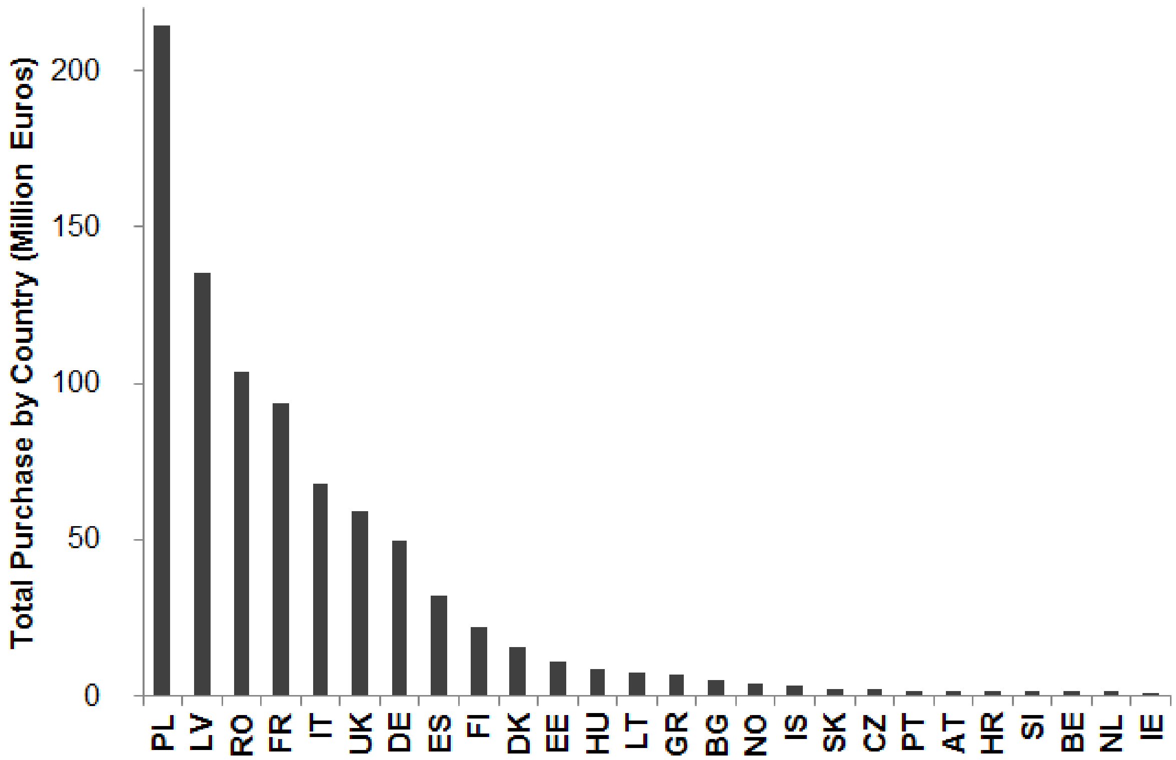
Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

As shown in Figure 2, the highest value spent on cleaning activities by the public authorities contracting in the year 2015 belongs to Poland, followed by the public contracting authorities of Latvia, registering more than 200 million euros and 100 million euros, respectively. Romania, France, Italy, United Kingdom and Germany exceed 50 million euros in volume of contracts, while countries like Spain, Finland and Denmark are above 15 million in volume of contracts for the year 2015. The weight of each country within the total percentage fluctuates remarkably for each year analyzed; however countries such as Poland, France, Italy, the United Kingdom, Germany or Spain maintain a predominant weight throughout the period 2009-2015.

Despite the fact that these services should be contracted periodically, the volume and number of cleaning activities and services contracted by the public authorities in each country vary widely between different years. Two specific cases draw a lot of attention. In 2009, Latvia registered a contracting volume of cleaning services and activities of 117 million euros. During the next five years, total public procurement in Latvia for cleaning services was approximately 8 million euros. On the contrary, the year 2015 Latvia recorded a contracting volume of 135 million euros. This irregular trend in public contracts can be explained considering the validity of public contracts, being the responsibility of each country to set up their own public contract terms.

The case of Spain is representative because it reflects the role of public entities as instruments of national economic policy. The volume of services and cleaning activities contracted by public bodies in Spain in 2010 was 415 million euros, a figure well above the average recorded for the period 2009-2015 (31 million euros). This disproportionate increase reflects the weight of public expenditure as an instrument to counteract the effects of economic crisis on unemployment due to the Spanish real estate crisis that took place during these years.

Figure 2. *Total purchase of cleaning activities by country (2015)*



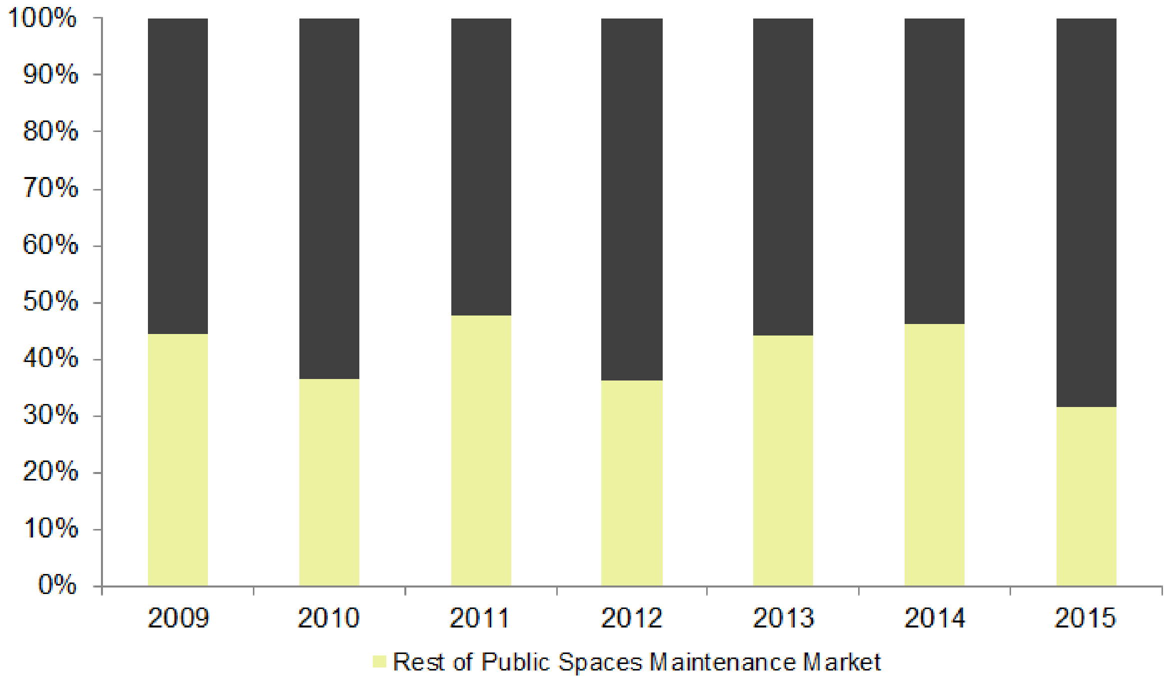
Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

As shown in Figure 3, the weight of cleaning activities within the maintenance of public space sector is very high in the European context. These activities maintain an average relative weight in relation to the rest of activities of approximately 59% of the total, surpassing in the years 2010, 2012 and 2015 the 60% of contract award notices registered at the European level. The average of the CAN total volume for the study period is 1,410 million euros. By contrast, the cleaning activities under the scope of the study registered a total average 831 million euros.

It should be noted, on the other hand, the steady evolution of the volume of cleaning activities collected under the scope of the study. By maintaining a constant weight within the maintenance of public spaces sector, the importance of this sector for the periodic maintenance should be remarkable. After the research of the market conditions for the cleaning activities under the scope of this study could be concluded that these activities are essential for the maintenance of public spaces in the European context.

In the following sections we will study the market share of the rest of the activities identified: gardening and landscaping activities, repair and replacement and equipment items.

Figure 3. *Cleaning activities market share*



Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

2.1.2.2 Gardening and landscaping activities market overview

Regarding the gardening and landscaping activities, the relevant CPV-codes included for the market analysis are listed under three main divisions: Division 77 Agricultural, forestry, horticultural, aquacultural and apicultural services, Division 03 Agricultural, farming, fishing, forestry and related products and Division 45, Construction work. Specifically, under the groups 7731 Planting and maintenance services of green areas, 7734 Tree pruning and hedge trimming, 0345 Tree-nursery products and 4511 Building demolition and wrecking work and earthmoving work. Within these divisions are included the following categories:

— 77341000, Tree pruning

— 77342000, Hedge trimming

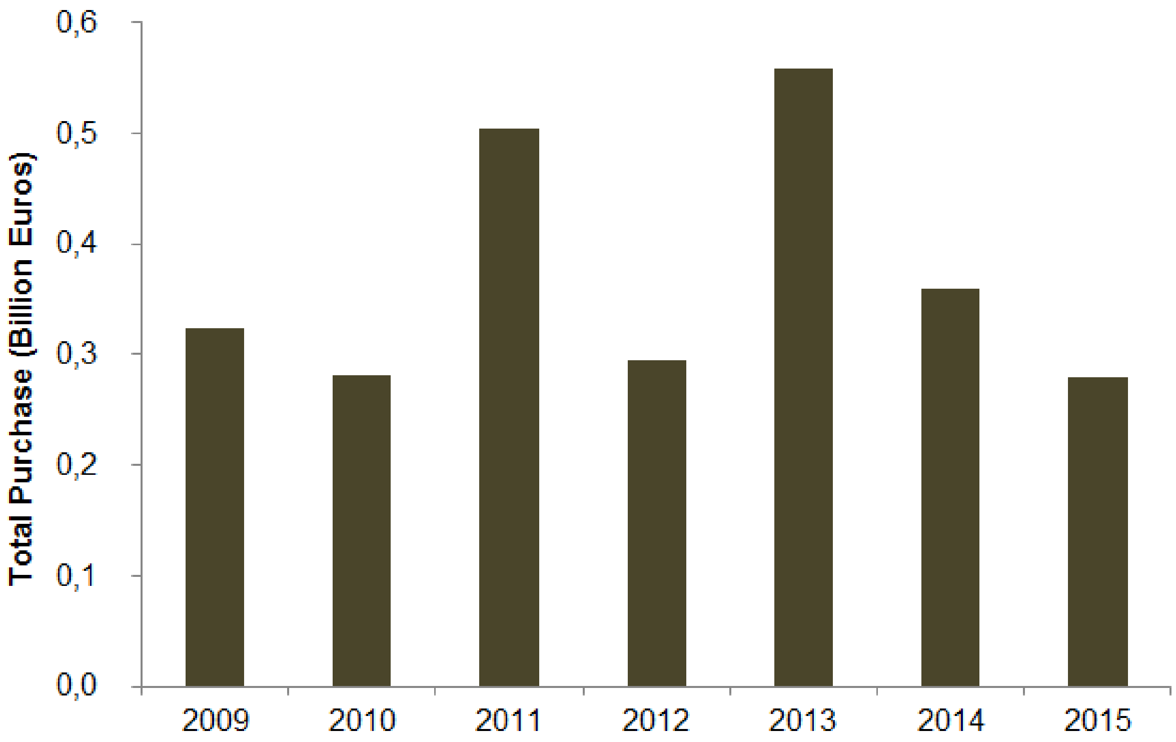
— 77313000, Parks maintenance services

— 77314000, Grounds maintenance services
— 45236230, Flatwork for gardens
— 45236250, Flatwork for parks
— 77311000, Ornamental and pleasure gardens maintenance services
— 77330000, Floral display services
— 77312000, Weed-clearance services
— 03121100. Live plants, bulbs, roots, cuttings and slips
— 03440000, Forestry products
— 03441000. Ornamental plants, grasses, mosses or lichens
— 03451000, Plants
— 03451100, Bedding Plants
— 03451200, Flower bulbs
— 03451300, Shrubs
— 03452000, Trees
— 77314100, Grassing services
— 77315000, Seeding services
— 45112710, Landscaping works for green areas
— 45112711, Landscaping work for parks
— 45112712, Landscaping work for gardens
— 45112713, Landscaping work for roof gardens
— 45112714, Landscaping work for cemeteries

In 2015, the gardening and landscaping activities regarding the maintenance of public spaces involved 279 million euros of Contract Award Notices. Similar to cleaning activities between 2009 and 2015, the total values of the services included under this category maintained an irregular pattern, exposed to the ups and downs based on budget constraints (Figure 4). Although the volume of contracts experienced an increase of 89% in 2013, it suffered a decrease of 41% in the volume of CAN in 2012. During this entire period the average total purchase of cleaning activities was 371 million euros. On the other hand, the average number of CAN published on TED about this topic was 494 contracts. Since the geographical coverage included in the dataset (Former Yugoslav Republic of Macedonia, Iceland, Norway, Switzerland, Liechtenstein and EU28) the value distribution of gardening and landscaping activities contracted, registered remarkable differences between each country.

The following figures present the market share of the gardening and landscaping activities in relation to other activities under the scope of the research. Additionally, the contribution of each European country in relation to these activities is illustrated.

Figure 4. *Total purchase of gardening and landscaping activities*

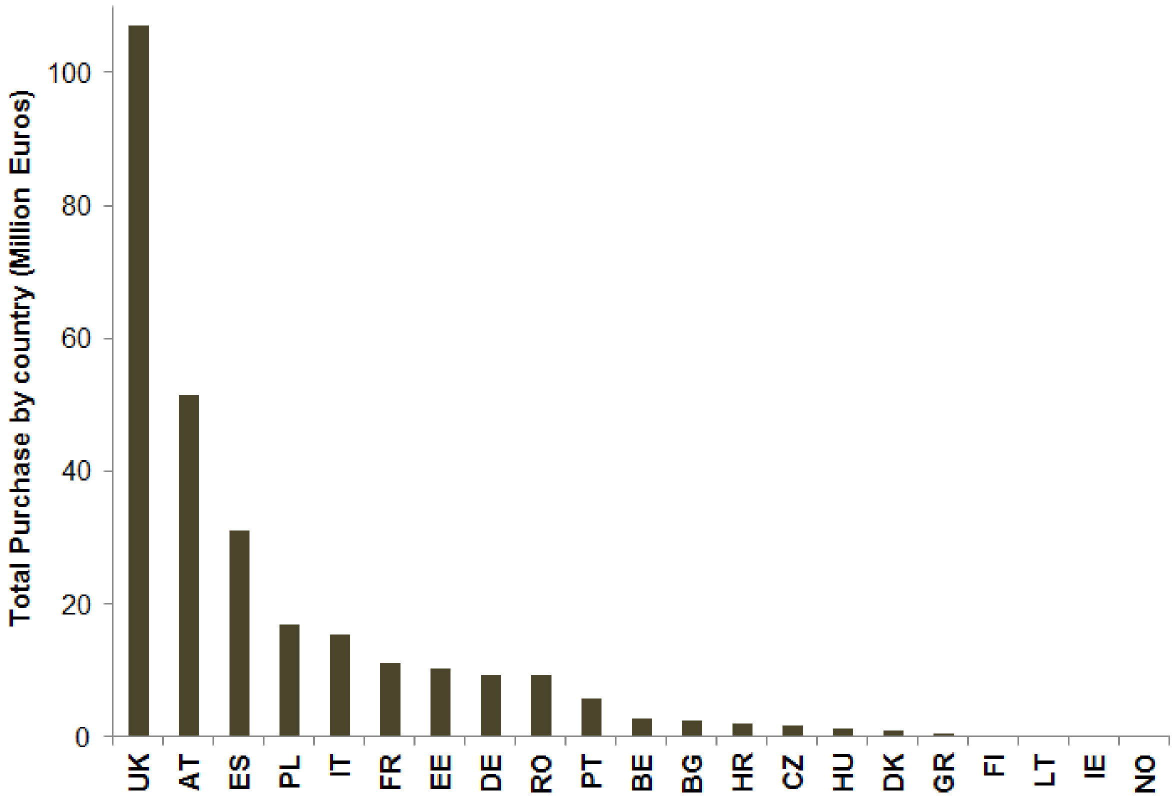


Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

As seen in Figure 5, the highest value spent on cleaning activities by the public authorities contracting in the year 2015 belongs to the United Kingdom, registering more than 100 million euros. Following the United Kingdom, are the public contracting authorities of Austria, Spain and Poland, each registering 51, 31 and 17 million euros respectively. Above 10 million euros in volume of contracts are Italy, France and Estonia, while countries like Germany, Romania and Portugal are above 5 million euros in volume of contracts for the year 2015. The weight of each country within the total percentage fluctuates remarkably for each year analyzed; however countries such as United Kingdom, Poland, Spain, Italy, France and Germany maintain a predominant weight throughout the period 2009-2015.

In addition, and similar to the case of cleaning activities, despite the fact that these services are contracted periodically, the volume and number of cleaning activities and services contracted by the public authorities in each country vary widely between different years.

Figure 5. *Total purchase of gardening and landscaping activities by country (2015)*

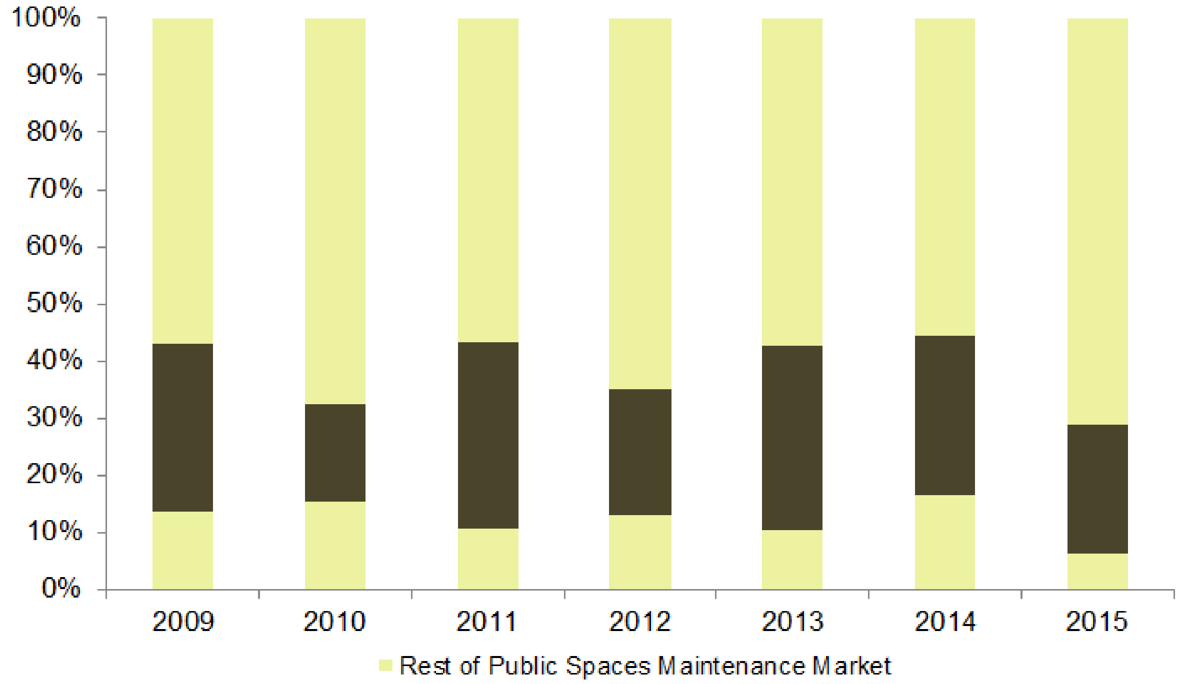


Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

As noticed in Figure 6, the weight of gardening and landscaping activities within the maintenance of public spaces sector is quite high in the European context, placed just behind the cleaning activities, which as mentioned before represent a greater volume of activities included within the public space maintenance. These activities maintain an average relative weight in relation to the rest of activities of approximately 26% of the total, surpassing in the years 2011 and 2013 the 30% of contract award notices registered at European level. The average volume of gardening and landscaping activities for the study period is 371 million euros. By contrast, the repairing and replacement activities under the scope of the studio register a total average of 189 million euros.

Unlike the steady evolution of cleaning activities, the evolution of the volume in gardening and landscaping activities collected under the scope of the study shows fluctuations. While in 2011 the activities of gardening and landscaping accounted for almost 35% of the total of CANs, in 2010 these activities only constituted for 17% of the total. Thus, in 2012 a greater share of CANs belonged to Italy with 70 million euros. By contrast, in 2014 the Spanish public authorities made an expenditure of 110 million euros making it the highest market share of that year.

Figure 6. *Gardening and landscaping activities market share*



Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

2.1.2.3 Equipment items: Vehicles market overview

Regarding the vehicles employed for the maintenance of public spaces, we identified the following CPV-groups included under the division 16, Agricultural machinery:

- 16500000, Self-loading or unloading trailers and semi-trailers for agriculture
- 16510000, Self-loading trailers for agriculture
- 16520000, Unloading trailers for agriculture
- 16530000, Self-loading semi-trailers for agriculture
- 16540000, Unloading semi-trailers for agriculture
- 16700000, Tractors

Each of these categories include many statistical items that should not be considered within the public space maintenance sector. Thus, many of the statistical items studied under this statistical frame could be committed to agricultural or livestock purposes. The introduction of such data within the vehicles category would cause great distortion. Therefore, those CPV-groups have been put aside for the current study.

By contrast, the procurements collected under the CPV category 163110, Lawnmowers and its subcategory 16311100, Lawn, park or sport-ground mowers; also considered as vehicles, sustain a great proportion of the services assigned to the maintenance of the parks and public gardens. On the other hand, when considering the study of the vehicles involved in the maintenance of public spaces sector, the EU Green Public Procurement Criteria for Transport developed in 2016, should be taken into account. Many of the statistical categories collected under these criteria are devoted to the maintenance of public spaces.

In this regard, and as stated in the EU Green Public Procurement Criteria for Transport, the relevant CPV codes for cars and Light Commercial Vehicles (LCVs) are listed under the division 34, Transport equipment and auxiliary products to transportation. Motor vehicles for the transport of machinery, goods and services used on the maintenance of public spaces fall within category 3413, Motor vehicles for the transport of goods. Thus, we identify the following subgroups:

— 34131000, Pick-ups

— 34134200, Tipper trucks

— 34136000, Light vans

— 34136200, Panel vans

In addition, specific vehicles employed on the maintenance of public spaces as parks, streets or gardens; could be identified under the group 341440, Special-purpose motor vehicles:

— 34144410, Gully emptiers

— 34144420, Salt spreaders

— 34144430, Road-sweeping vehicles

— 34144431, Suction-sweeper vehicles

— 34144440, Gritter vehicles

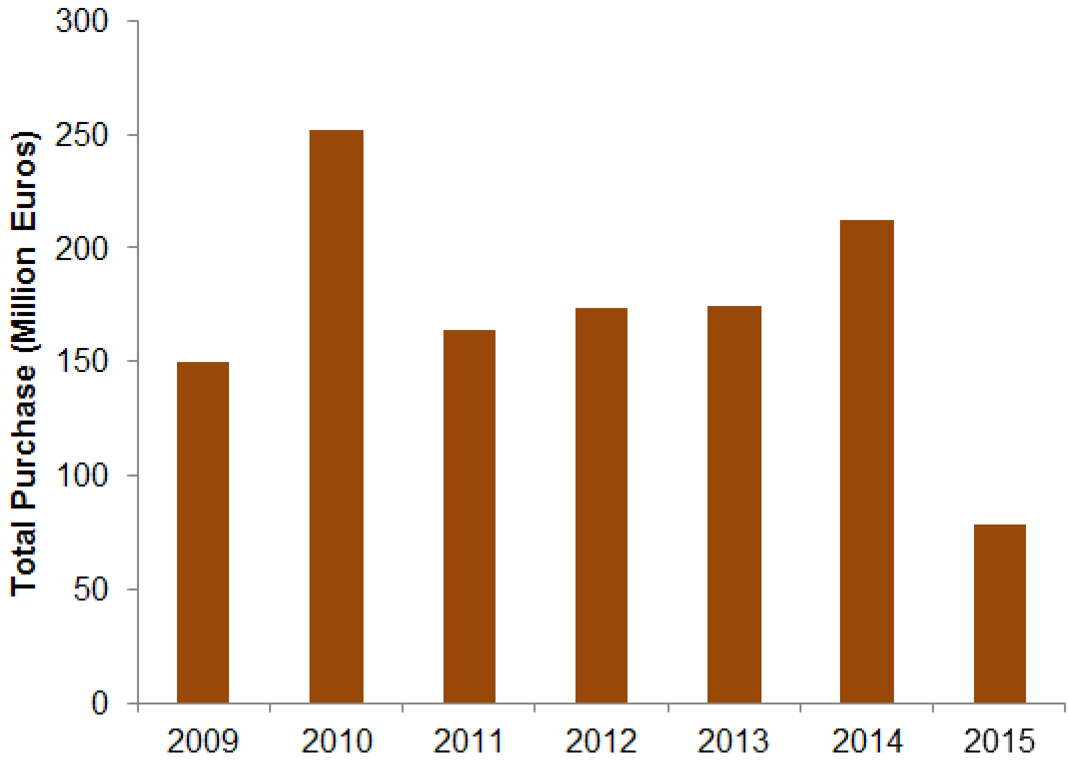
— 34144450, Sprinkler vehicles

— 34144900, Electric vehicles

In year 2015, the equipment vehicles regarding the maintenance of public spaces involved almost 79 million euros of CANs. As happened with the activities included under the scope of the market overview, equipment vehicles maintained an irregular evolution between 2009 and 2015. Thus, the total values of the services included under this category maintained an irregular pattern, averaging 172 million euros with major fluctuations (Figure 7). As a sample of this irregular evolution, 2015 registered a sharp fall with a reduction of 63% compared to the previous year.

During this entire period the total purchase of products under this category was 1.21 billion euros. This volume of contract contrasts sharply with that recorded for the same period on cleaning or gardening and landscaping. The average number of CANs published on TED on this topic was 290 contracts.

Figure 7. *Total purchase of Vehicles*

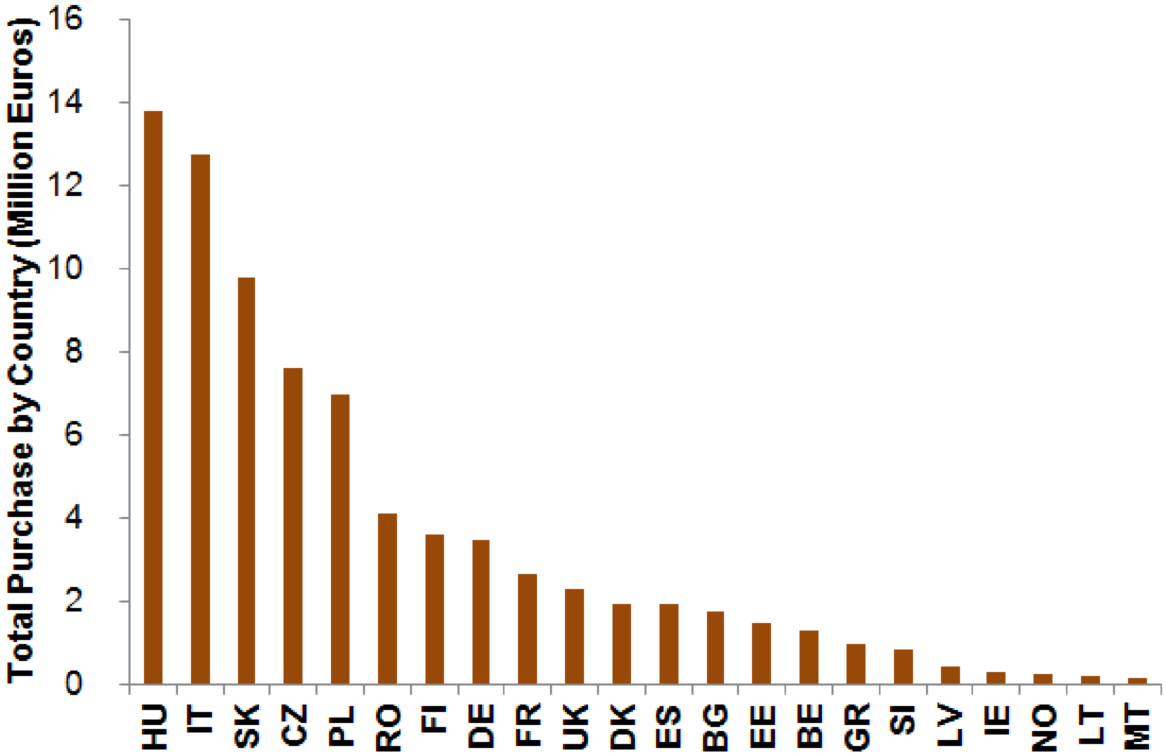


Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

Figure 8 shows the expenditure of every European country on equipment vehicles contracted in the year 2015. The highest expenditure belongs to Hungary, registering more than 13 million euros. Following Hungary, the public contracting authorities of Italy, Slovakia, Czech Republic and Poland; register 13, 10, 8 and 7 million euros respectively. Above 2 million euros in volume of contracts are also Romania, Finland, Germany, France and United Kingdom; while countries like Spain, Denmark, Estonia or Belgium are above 1 million euros in volume of contracts for the year 2015. The weight of each country within the total percentage does not fluctuate considerably between different years. Accordingly, countries such as the United Kingdom, Poland, Spain, Italy, France and Germany maintain a predominant weight throughout the period 2009-2015.

Unlike the services and activities included within the scope of the study, the purchase of vehicles by the European public authorities seems to show a periodicity. Hence, the volume and number of vehicles contracted in each country does not vary widely between different years.

Figure 8. *Total purchase of Vehicles by country 2015*

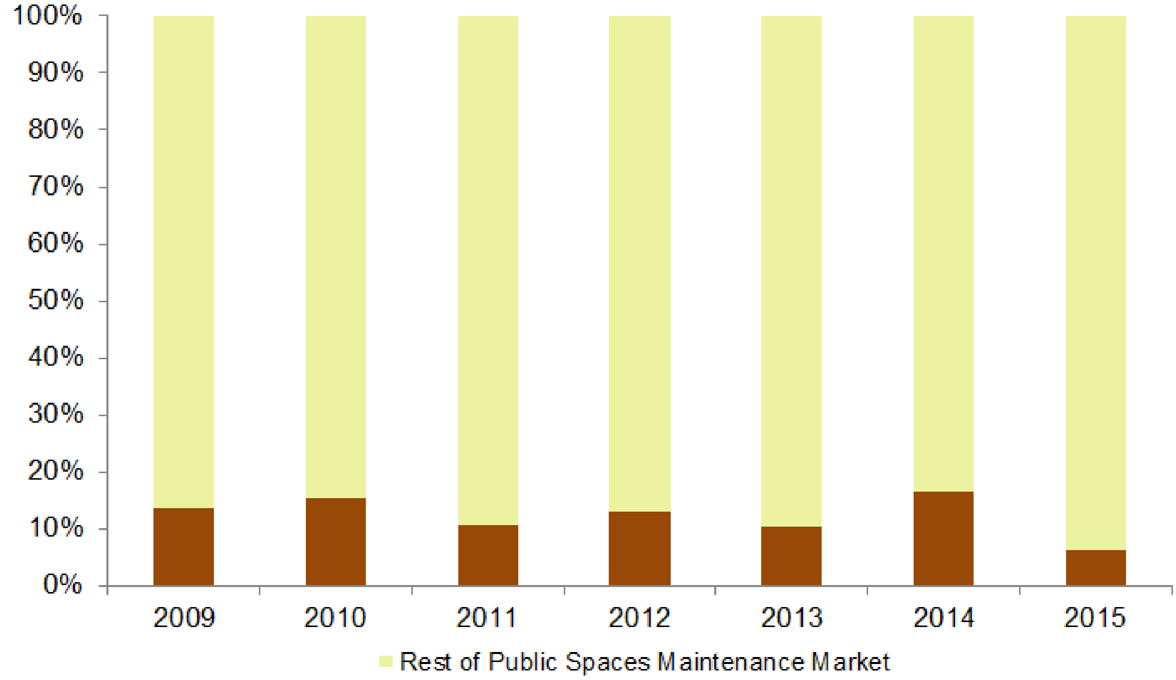


Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

The weight of vehicles purchased within the maintenance of public spaces sector maintained an average market share of 12% for the entire study period. Hence, the evolution of vehicles within the maintenance of public spaces sector showed a regular behavior for the period 2009-2014. By contrast, 2015 registered a sharp fall on the vehicles purchase market share, showing a relative weight of 6%. As previously stated, these activities maintained an average relative weight in relation to the rest of activities of approximately 12% of the total, reaching in the years 2010 and 2014, 15% and 16% respectively, of contract award notices registered in the European context. 2015 recorded the lowest market share of the vehicles on the total purchase of items dedicated to the maintenance of public spaces. The average volume of equipment vehicles for the study period is 172 million euros. Below the data on equipment vehicles market share is presented graphically.

The main conclusion that can be drawn from these data is that the steady behavior in the procurement of products by the European public authorities on the maintenance of public spaces. It should be noted, however, that the highest share of contract number and market volume belong to the vehicles identified under the group 341440, maintaining an average market share of almost 70%. Thus, the Special-purpose motor vehicles employed on the maintenance of public spaces as parks, streets or gardens, register the most important turnover within this category. By contrast, within the category of equipment vehicles employed on the maintenance of public spaces, those which fall under the category 3413, Motor vehicles for the transport of goods; represented a smaller percentage of the total.

Figure 9. *Vehicles market share*



Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

2.1.2.4 Equipment items: Machinery market overview

The relevant CPV-codes for machinery used for the maintenance of public spaces are listed under three main divisions 16, Agricultural machinery; 39, Furniture (incl. office furniture), furnishings, domestic appliances (excl. lighting) and cleaning products and 42, Industrial machinery. The division 16, Agricultural machinery includes the following groups 1610, Agricultural and forestry machinery for soil preparation or cultivation; 1640, Spraying machinery for agriculture or horticulture and finally the group 1680, Parts of agricultural and forestry machinery. Each category contains the following groups:

— 16120000, Harrows, scarifiers, cultivators, weeders or hoes

— 16130000, Seeders, planters or transplanters

— 16150000, Lawn or sports-ground rollers

— 16160000, Miscellaneous gardening equipment

— 16400000, Spraying machinery for agriculture or horticulture

— 16820000, Parts of forestry machinery

The pertinent groups for the study of the cleaning products and machinery used on the maintenance of the furniture within the public spaces are under division 39, Furniture (incl. office furniture), furnishings, domestic appliances (excl. lighting) and cleaning products:

— 39830000, Cleaning products

— 39713400, Floor-maintenance machines

— 39713430, Vacuum cleaners

— 39224000, Brooms and brushes and other articles of various types

Finally, the division 42, Industrial machinery contains the last categories under study:

— 42924730, Pressurised Water Cleaning Apparatus

— 42924740, High-Pressure Cleaning Apparatus

Just as it happens with vehicles equipment items, it is necessary to take into account that each of these categories include many statistical items that should not be considered within the public space maintenance sector, since items included under this scope could be used as well for the maintenance of indoor public spaces, or agricultural and livestock purposes. Nevertheless, all the agricultural and forestry machinery, and the cleaning machinery procured by the public authorities could not be distinguished from the machinery used in the maintenance of public spaces when the study is based on the CPV-system classification.

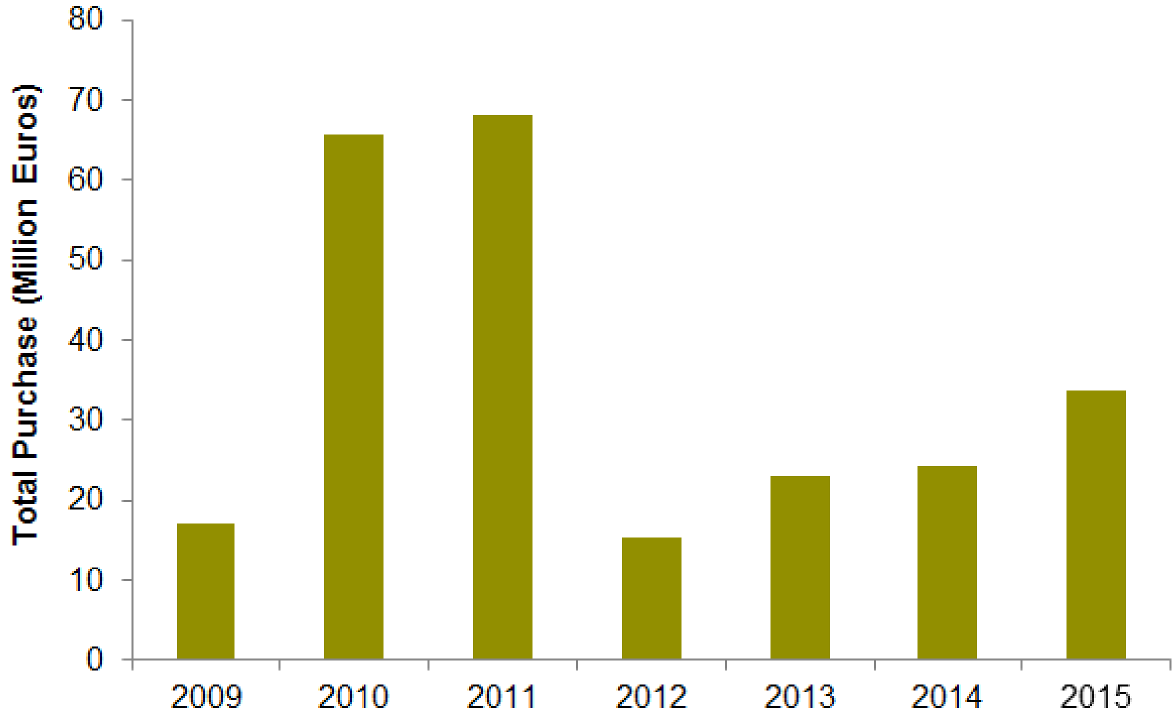
On the other hand, most cleaning products (detergents, anti-dust products, etc.) have been dispensed due to its high volume of CANs. In spite of having a residual weight in the maintenance of public spaces their relative volume distorts the rest of the data. Therefore only cleaning products under division 39 related to the following activities have been included on the study:

- Housing and community amenities
- General public\services
- General public\services, Other
- Environment, General public\ services, Other
- General public\services, Housing and community amenities
- Public order and safety
- General public\services, Public Order and Safety
- General public\services, Recreation, culture and religion

The equipment machinery regarding the maintenance of public spaces involved almost 34 million euros of Contract Award Notices in year 2015 (Figure 10). Unlike the equipment vehicles included under the scope of the market overview, the machinery maintained an irregular pattern between 2009 and 2015, exposed to the ups and downs based on budget constraints. While in 2010 the volumes of contracts show an outstanding increase of 286%, 2012 suffered a decrease of 78% in the volume of CANs. During this entire period the average total purchase of cleaning activities was 35 million euros. The average number of CANs published on TED on this topic was 110 contracts. Since the geographical coverage included in the dataset (Former Yugoslav Republic of Macedonia, Iceland, Norway, Switzerland, Liechtenstein and EU28) the value distribution of the equipment machinery contracted, registered remarkable differences between each country.

During this entire period the total purchase of products under this category was 274 million euros. This volume of contract contrasts sharply with that recorded for the same period on equipment vehicles.

Figure 10. *Total purchase of Machinery*

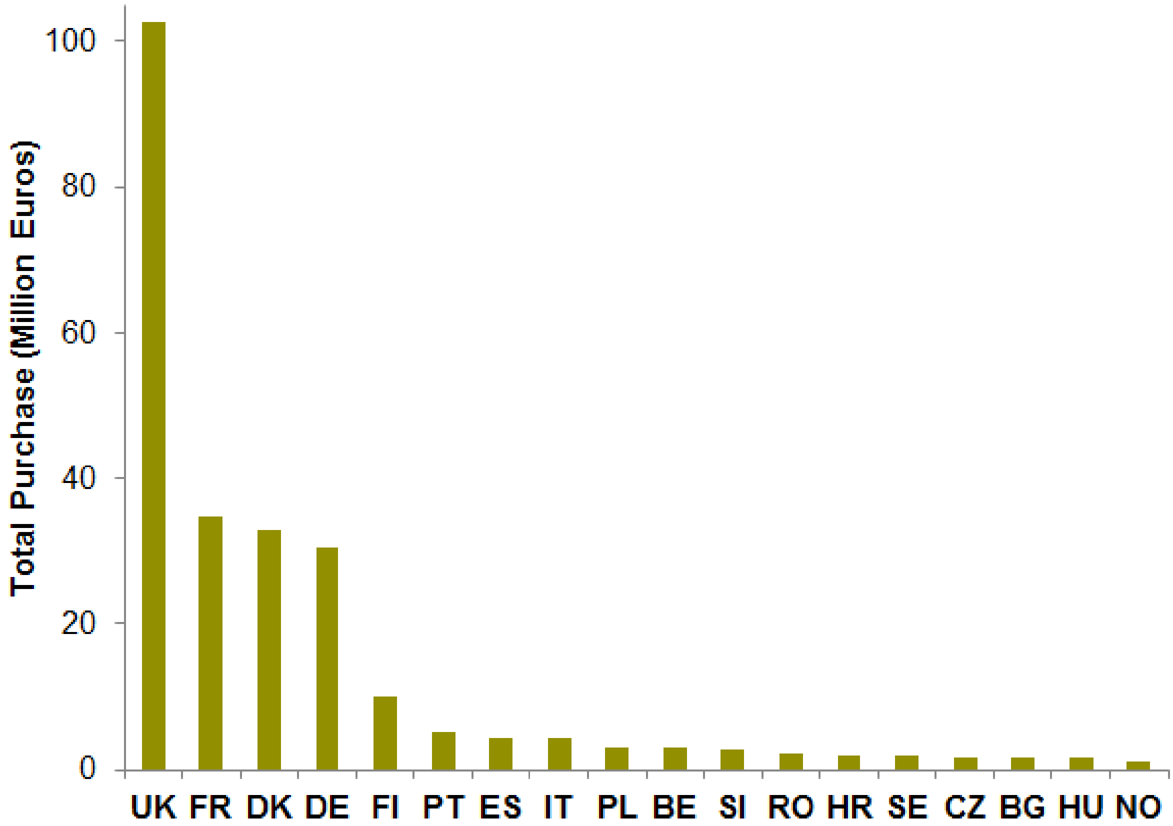


Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

Figure 11 shows the amount contracted by every European country on equipment vehicles for the period 2009-2015. The highest expenditure belongs to the United Kingdom, registering more than 102 million euros. Following the United Kingdom, the public contracting authorities of France, Denmark and Germany; register 35, 33 and 30 million euros respectively. Above 4 million euros in volume of contracts are also Finland, Portugal, Spain and Italy. As happens with the rest of categories, countries such as the United Kingdom, France, Germany, Italy and Spain maintain a predominant weight throughout the period 2009-2015. In any case, it must be emphasized the big difference existing between the volume of contract award notices between the United Kingdom and the rest of the European countries, in such a way that its amount is above the sum of the CANs for France, Denmark and Germany.

Unlike the vehicles included within the scope of the study, the purchase of machinery for the maintenance of public spaces by the European public authorities does not seem to show any trend. Hence, the volume and number of machinery contracted in each country vary widely between different years.

Figure 11. *Total purchase of Machinery by country 2009-2015*



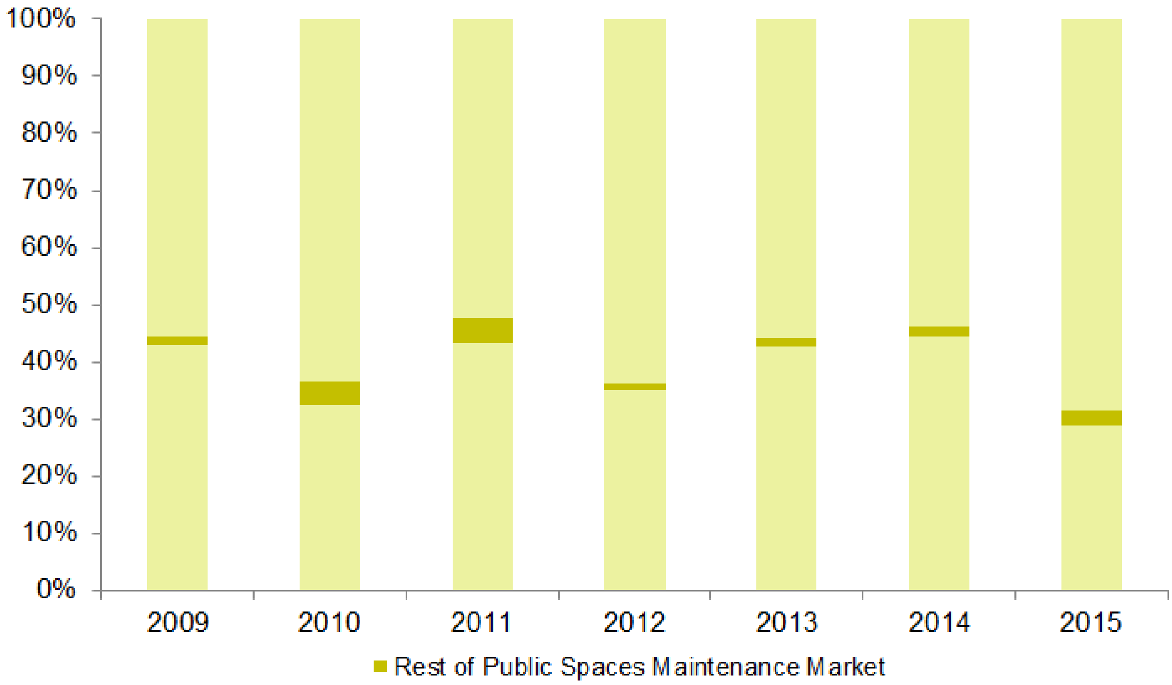
Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

The weight of machinery purchase within the maintenance of public spaces sector maintained a market share of 2% for the entire study period. As happens with other categories involved on the public spaces maintenance like the assembly and removal of temporary elements its market share is almost negligible related to the rest and products and activities covered under the scope of the research. Despite the remarkable ups and downs for the period 2009-2015, these changes have not affected the evolution of the total volume of contracts purchased by the public authorities at the European context. The average volume of machinery during the study period is 35 million euros. By contrast, the vehicles under the scope of the studio register a total average of 172 million euros.

Thus, the evolution of machinery within the maintenance of public spaces sector showed an irregular behavior for the period 2009-2015. As previously stated, these activities maintained an average relative weight in relation to the rest of activities of approximately 2% of the total, reaching in the years 2010 and 2011 a 4% of the total volume of contract award notices registered in the European context. On the contrary, 2009, 2012, 2013 and 2014 recorded less than 2% of market share on the total purchase of items dedicated to the maintenance of public spaces. The total volume of machinery for the study period is 247 million euros. Below the data on equipment vehicles market share is presented.

It should be noted that the highest share of contract number and market volume obey to the machinery identified under the group 3983, Cleaning products; employed on the maintenance of public spaces as parks, streets or gardens. By contrast, within the category of equipment machinery employed on the maintenance of public spaces, those which fall under the division 42, Industrial machinery; represented a smaller percentage of the total.

Figure 12. *Machinery market share*

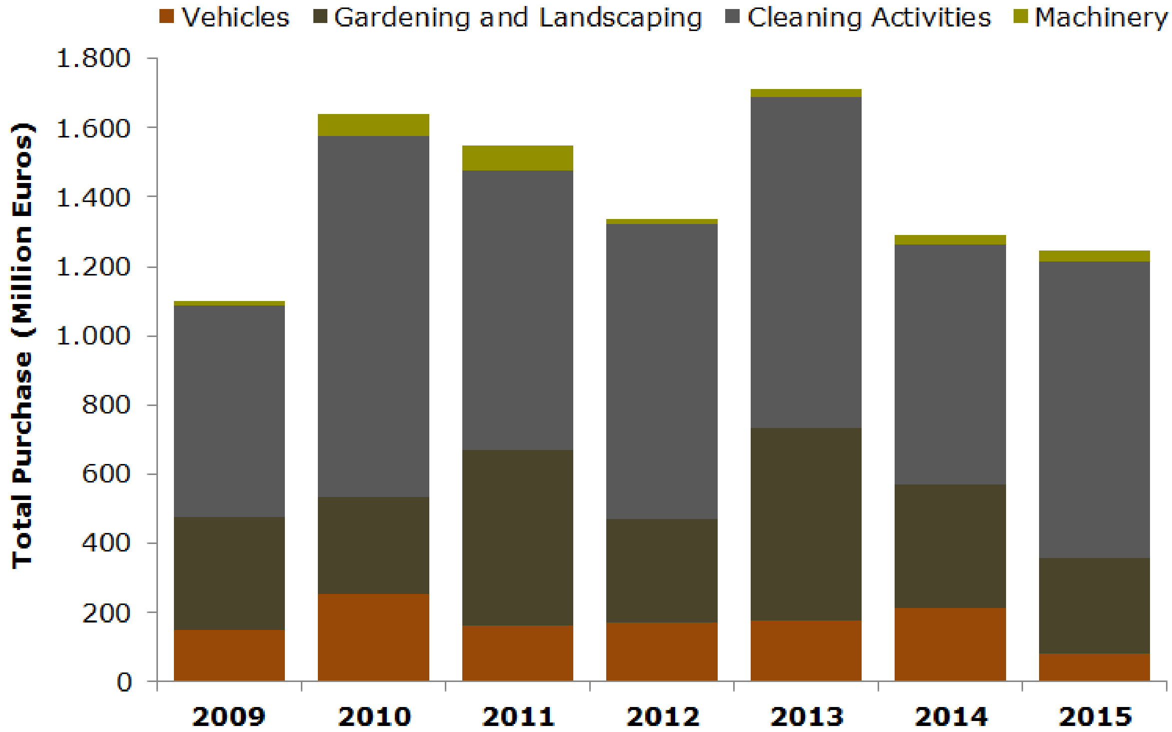


Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

2.1.3 Global overview of the European Market

For the period 2009-2015, the total purchase of services and products regarding the maintenance of public spaces involved more than 12 billion euros of CANs. As reflected in Figure 19, between 2009 and 2015, the total values of the services and products included under the scope maintained an irregular pattern, exposed to the ups and downs based on budget constraints. While in 2013 the volume of contracts experienced a remarkable increase of 34%, 2014 saw a decrease of 20% in the volume of CANs. During this entire period the total purchase of public space maintenance activities was never below 1,5 billion euros. The total average number of CANs for these 7 years was 1,7 billion euros, reflecting the large volume of this market in the European context. As has happened for every service and product group the value distribution of cleaning activities contracted registered remarkable differences between each country.

Figure 13. *Total purchase of Maintenance of Public Spaces (2009-2015)*

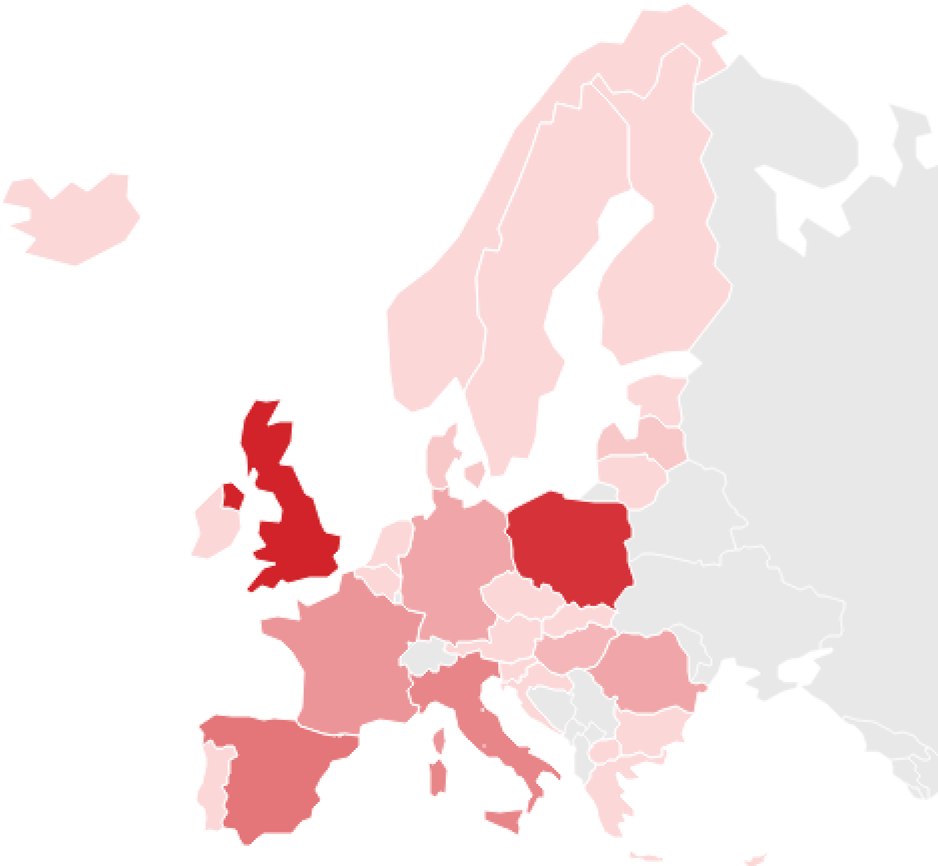


Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

As shown in Figure 14, the highest value spent on maintenance of public spaces by public contracting authorities for the period 2009-2015 belongs to the United Kingdom with 2,6 billion euros. Following the United Kingdom, the Polish public contracting authorities, register more than 2,3 billion euros. Spain and Italy exceed one billion euros (1,3 and 1,1 billion respectively) on the purchase of products and services for the maintenance of public spaces. While France, Romania and Germany are above 500 million euros in volume of contracts for 2009-2015. The weight of each country within the total percentage fluctuates remarkably for each year analyzed; however countries such as Poland, France, Italy, United Kingdom, Germany or Spain maintain a predominant weight throughout the entire period 2009-2015. Furthermore, it is important to highlight the market share of countries like Hungary, Romania or Denmark within the maintenance of public spaces sector, which public purchase volume contrasts with the country size.

By contrast, and as it happens with every single activity analyzed, the volume and number of activities and services for the maintenance of public spaces contracted by the public authorities in each country vary widely between different years. In 2015, Austria registered a contracting volume of gardening and landscaping services and activities of 51 million euros. During the previous six years, total public procurement in Austria for these services was approximately 5 million euros, eleven times the procurement volume than the volume registered for the period 2009-2014. On the other hand, in 2010 the Spanish public authorities recorded a contracting volume of 400 million euros of cleaning activities related to the maintenance of public spaces. This contracting volume represents 65% of the total activities contracted for the period 2009-2015. This irregular evolution could be explained by the role of public expenditure as an instrument to counteract the effects of the economic situation.

Figure 14. *Total purchase of Maintenance of Public Spaces by Country* ([1]) *2009- 2015*



Note: ([1]) Red darkness is determined by Contract Awards Notices values for every country (2009-2015).

Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

2.2 Market structure

Urban public spaces are mostly provided by the public sector. This is because such spaces are among the public goods and services, which are not normally produced by the private sector as they do not provide any tangible rewards to a private investor. When the private agencies invest in the public spaces of their urban development schemes, their tendency is to limit access so that these spaces can be controlled, so that use and maintenance costs can be limited. By contrast, the provision and maintenance of public spaces is part of the delivery of public services, which in turn is one of the central ways with which social challenges can be addressed. Furthermore, it is part of the quality of the urban environment, which is a social asset for all. In particular, the quality of urban environment in deprived neighborhoods has been one of the priorities set by the Leipzig Charter on Sustainable European Cities agreed by the Member States Ministers responsible for urban development. Thus, other European strategies and policy documents consider the quality and maintenance of public spaces as a necessary ingredient of sustainable development and social cohesion.

To understand the structure of the maintenance of public spaces market, it is necessary to interpret first the different forms of public space management that have emerged recently across Europe, notably at the local authority level, and their significance for such spaces and their governance. The episodes of successful innovation that have been found in the academic research point towards an emerging public space agenda with top-down but also bottom-up influences, which seem to suggest a potential way forward in bringing public space management forward as a more coherent and effective area of government activity.

Based on the research carried out by Claudio de Magalhaes and Matthew Carmona[3] on public space management in 290 local authorities in England, public space management occurs in different structures in different local authorities demonstrating the confusion that the concept of public space creates in local authorities, and the fragmented management structure that result. This diagnosis made by the two academics from the Bartlett School of Planning on the structural management of public spaces in England could be transferred, taking into account the specific characteristics of each country, to the European context. Very few local authorities possess departments dedicated to public space management in a holistic way. Most typically, public spaces are either managed within a much larger unit taking in many non-public space functions as well, or in much smaller units that break public space and its management down into separate public space types and management functions.

Historically, green public spaces have tended to be treated as a single entity, but streets and other hard urban public spaces have lacked an integrated approach. Therefore, most local authorities continue to have separate lines of responsibility for the management of open spaces and the street scene. Having a single supra-department responsible for public space would help to the co-ordination, but could also act like three or four separate departments if divisions within the larger unit do not coordinate their activities.

In addition, regarding the local authorities involved in the maintenance of public sector, De Magalhaes and Carmona found in their research for 290 local authorities in England, that the community and the private sector were taking a more active role in the case study areas, as local authorities attempted to harness the expertise and knowledge of key stakeholder groups. This trend is also transferable to the European context. They also found that authorities identified a number of major process problems relating to the maintenance of public spaces. Perhaps the most fundamental was the insufficient level of investment in maintenance: because this activity has historically not been recognized as important by council members. This is one of the most pressing problems faced by public authorities in the management of public spaces. Besides, an associated squeeze on local authority finances, as consequence of the recent crisis, have driven costs, and therefore service levels, right down.

Within the maintenance of public spaces market another pressing problem lies in procurement practices and the relationship between client and contractor functions within local authorities, and between the authority and external contractors. The practice of tendering out services led sometimes to a lack of ownership of maintenance process, as there might be several layers of management, and reduced responsiveness due to long lines of communication between council management and those actually doing the work. Local authority officers also highlighted barriers to the coordination of maintenance routines and standards in areas where two-tier local government regimes are in place, and between local government and other organizations. To avoid this, some local authorities try to coordinate maintenance between itself and its district authorities by promoting the use of shared contracts.

A final set of problems relate to conflicts between the maintenance of public spaces and its management objectives, for example street cleaning versus tree planting, and short-term development costs versus long-term maintenance concerns. These challenges are regarded as structural, and are not amenable to easy solutions.

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[3] Carmona, M. & De Magalhaes, C. 2006.

Structural barriers impacting on maintenance of public spaces market:

- An insufficient level of investment in maintenance.
- Problematic relationships between client and contractor functions, reinforced by Compulsory Competitive Tendering (CCT) practices.
- A lack of coordination of maintenance routines and standards between agencies (internal and external to the local authority).
- A mismatch between community expectations in terms of standards and what can be accommodated within the local authority's budget.
- Design conflicts and lack of concern with maintenance during design.
- Intensive use of certain spaces leading to conflict between maintenance routines and some users/uses.

2.2.1 Public spaces maintenance market: supply side

The most reliable information source in relation to the maintenance of public spaces market is provided by corporate entities and professional institutions. These institutions (mostly private companies) give us the opportunity to explore the public space maintenance market from the supply side.

Furthermore, as the maintenance of public spaces sector is very broad, it is difficult to explain the operation of such a heterogeneous market. In order to simplify our approach to the maintenance of public spaces sector, we will focus on the supply side of the urban furniture elements employed in public spaces. This will include the following elements of macro and micro public spaces: public services, garden services, lighting, signage or wayfinding and cleaning machinery that contribute to the ordinary functioning of a city. To analyze the provision of these services within the public spaces maintenance market, we have focused on the main qualitative aspects of supply, as well as on the operation of the tender process by the main customer at European level, Public Administration.

There are many differences between each European public spaces maintenance market. However, there is a common typology that serves to explain every country market. Within each marketplace exists a large number of local small and medium-sized enterprises and a smaller number of large international companies with a large share of the European market[4]. Taking Italy as an example, the production share of the first four operators within the urban furniture market is 30.2%, while the top eight operators in the market account for 45% of the market. Many companies in this sector follow different market strategies such as diversifying or specializing in some of the subsectors of maintenance of public spaces or urban furniture. In this way, few companies are specialized in a unique segment and are in a position to propose a wide and coordinated offer, which generates a high level of competition.

Most small and medium-sized enterprises work primarily at the local and regional level, and competition is based on price, breadth of product and product innovation policies; all of these features are mandatory taking into account the current competitive environment. Lastly, the added advantage that companies can provide is the possibility of offering a pre and post-sale service, with a pre-sale and post-sale service. In order to adapt and customize the product or service according to the needs of the customer, usually the maintenance service providers work together with the public administration to adapt the needs to the offer.

The evolution of the maintenance sector does not depend to a great extent on the economic situation of every European country. On the contrary, it seems to be

[4] Amec-Urbis (http://www.amec.es/comunicacion/publicaciones/)

characterized by some independence because these are recurrent expenses. However, and due to the heterogeneity and extent of the sector, certain services such as the replacement of urban furniture, machinery or vehicles included within the maintenance of public spaces, could depend, such as investment products, on the economic situation of the country and the budget forecast of the public administration. Through the procurement process, the public administration imposes on the tender participants the specific requirements and technical characteristics of the materials to be used through the specifications. The latter acts as an internal barrier to foreign companies that avoids the free participation of companies at European level.

Besides, access to public tenders by foreign companies on the maintenance of public spaces market is not easy. Thus, it is essential in most European countries to have offices in the country where the subject of the public contract takes place. On the other hand, it is necessary to find out how the operation of the general administration works in every country with the aim of knowing the main responsible for the largest number of purchases of maintenance of public spaces services.

2.2.1.1 European cities public management on maintenance of public spaces

To explain the market structure of the maintenance of public spaces sector, it is required to focus on the organizational structure of public spaces, and its planning and management features. Most public space management departments in Europe have undergone large organizational changes in the past two or three decades in the framework of New Public Management (NPM). The main idea of NPM is that public organizations become more like companies and become more focused on outputs and customer service. A second NPM idea is that the role of public organizations should become smaller and that more tasks should be taken over by private companies. These changes have often resulted in separation of public space maintenance from public space management. A Nordic study by Randrup and Persson[5] showed that a public space management organization typically is responsible for the descriptions of the maintenance tasks, and controlling the results. The actual maintenance tasks have been usually outsourced to private contractors, or they are purchased from an in-house maintenance provider. Public space management organizations are often part of a larger technical or leisure department in the municipalities, up to two organizational levels removed from the political system.

According to the studio of Randrup and Persson, the maintenance of public spaces within the Nordic countries is clearly the most important task for the average municipal space management organization. They spend the majority (70-85%) of their resources (time and money) on maintenance tasks. However, many Nordic cities have experienced budget cuts in the past five years. Budgets for public space management are determined by municipal politicians, and the strong maintenance focus seems to have led to a relatively low interest from politicians in urban public spaces.

2.2.1.1.1 Urban Green Space Policies: Performance and Conditions in European Cities

Based on the information contained on another study carried out by the researchers Tüzin Baycan Levent and Peter Nijkamp[6] we can explore the annual public expenditure on green spaces related to the total budget of the city in 23 European cities. This study emerged with the aim of comparing and evaluating the current management practices in European Cities on the basis of the performance of urban green space policies. The data and information that they have used for comparison and evaluation are based on extensive survey questionnaires filled out by relevant departments or experts of

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[5] Randrup, T.B. & Persson, B. 2009.

[6] Baycan-Levent, T & Nijkamp, P. 2009.

municipalities in European cities that aim to share their experience in innovative green space policies and strategies.

According to the information collected on these surveys questionnaires, they developed a comprehensive framework where seven explanatory variables based on management and planning of urban green spaces were described to identify the green performance of cities from proper evaluation perspectives. Between these seven variables there are two relevant for our market study, Annual budget for urban green spaces related to the total budget of the city (%) and changes in the budget for greenery in the last 2 years. This data was obtained directly from the representatives of municipalities by questionnaires. The changes are defined as an increase, a decrease or no change in the budget for greenery in the years 2002 and 2003.

According to Table 3, the proportion of the local budget allocated to the urban green spaces is very low, representing in most cases only 1% of the budget. Only the case of Alphen aan den Rijn stands out for devoting 34% of its total budget to the urban green spaces. However, there are many cities where the budget for greenery has increased from the previous year. This could mean an increasing trend on the budget allocated to the public space maintenance.

Table 3. Annual Budget for Urban Green Spaces in 23 European Cities.

Annual Budget for Urban Green Spaces in European Cities					
Cities	Country	Population	Availability of green spaces	Budget for green spaces	
			Proportion of green areas per 1000 inhabitant (m2)	Annual budget for urban green spaces related to the total budget of the city (%)	Changes in the budget for greenery in the last 2 years ([1])
Alphen aan den Rijn	NL	10.5579	57.153	34	1
Antwerp	BE	455.148	51.509	1,59	2
Berlin	DE	3.388.477	37.846	0,7	2
Bern	CH	127.519	30.510	-	2
Birmingham	UK	994.300	20.000	1,14	2
Budapest	HU	1.701.000	61.800	1	1
Cracovia	PL	757.430	65.455	-	1
Dublin	IE	1.144.800	40.000	3	1
Edinburgh	UK	453.700	144.592	-	2
Espoo	FI	227.472	140.000	1,3	1
Genoa	IT	601.338	49.394	1	3

Helsinki	FI	980.412	102.867	-	2
Leipzig	DE	497.531	93.652	1,27	2
Ljubljana	SI	267.563	25.971	-	1
Lodz	PL	774.004	65.600	0,5	1
Malaga	ES	547.731	7.790	1	1
Marseilles	FR	852.396	118.225	1	1
Montpellier	FR	257.092	33.000	4	1
Salzburg	AT	145.680	13.440	1,3	2
Turin	IT	867.857	19.444	1	3
Vienna	AT	1.598.626	125.441	1	3
Warsaw	PL	1.692.854	68.499	0,79	1
Zurich	CH	364.528	111.919	0,01-0,03	1

Note: ([1]) Changes in the budget for greenery in the last 2 years: (1) increase; (2) decrease; (3) no change.

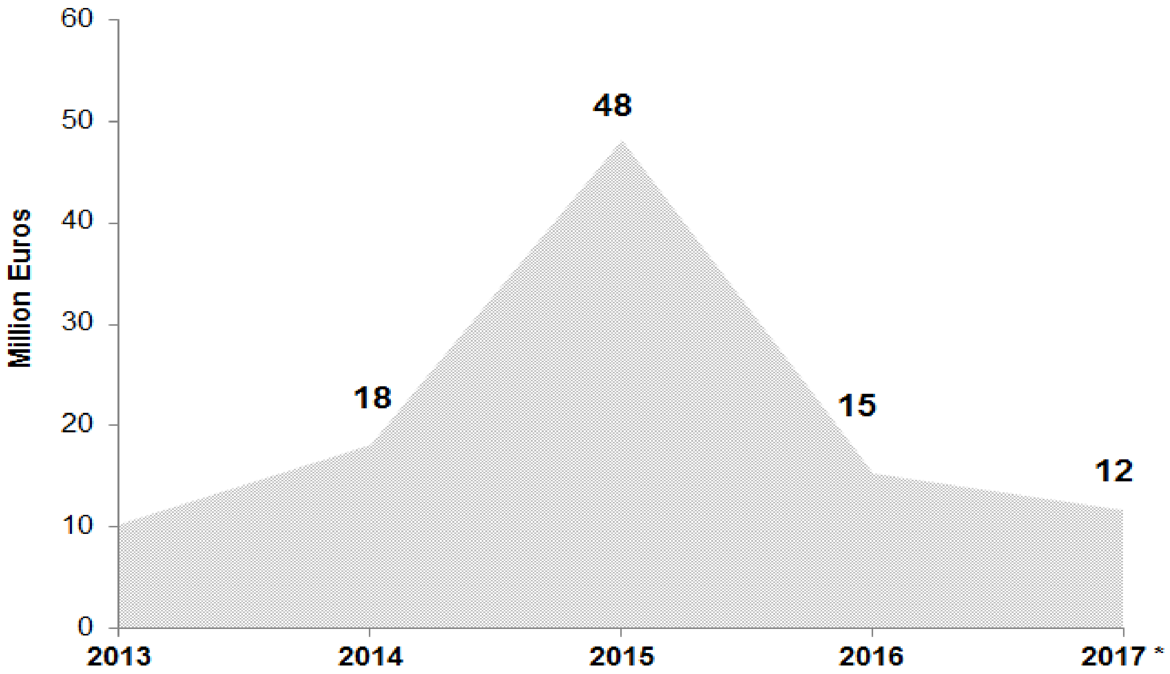
Source: Baycan-Levent, T & Nijkamp, P. 2009.

2.2.1.1.2 Barcelona City Council

Furthermore, the data provided by the Barcelona City Council on maintenance and improving of public spaces is extremely relevant in understanding the structure of public expenditure in a European large city. According to the new transparency policy established, disaggregated data on the local budget must be published annually. In light of the data published on the open data portal of the Barcelona City Council, the volume of public expenditure dedicated to the maintenance and improving of public spaces reached 15 million euros in the year 2016. As shown in Figure 15 the evolution of public expenditure on maintenance of public spaces vary widely between different years. While in 2015 the public space maintenance expenditure in the city of Barcelona was almost 50 million euros, for the year 2013 this expenditure was less than 10 million euros. The evolution of public expenditure in the city of Barcelona shows the absence of periodicity in the purchase of public spaces maintenance services. This absence of regularity suggests several key ideas on the structure and the specific characteristics of the maintenance of public spaces sector:

- Public procurement according to specific maintenance needs
- Absence of planning in the contracting of maintenance of public spaces services
- Improper use of the maintenance of public spaces sector with electoral purposes
- Counter cyclical economic role
- Public spaces maintenance services purchase based on the public financial situation

Figure 15. *Expenditure on maintenance and improving of public spaces in Barcelona*



Note: The 2007 data reflects the budgeted amount.

Source: Barcelona City Council, 2017; http://ajuntament.barcelona.cat/estrategiaifinances/pressupostobert/en/programas/1534/public-space#view=functiona l.

According to the data published on the open data portal of the Barcelona City Council, the highest proportion of maintenance costs of public spaces is dedicated to other property investments, followed immediately by the current expenditure on goods and services. The category other property investments is comprised of three subcategories: New investment in infrastructures and assets for general use, Replacements investments for infrastructures and assets for general use and Replacement investments for operational running of public services. Moreover, the category current expenditure on goods and services include three subcategories: Materials, supplies and other; Maintenance, repairs and conservation and finally Compensation for services. The table shows the evolution of every category for the period 2013-2017.

Table 4. Maintenance of public spaces expenditure, Barcelona City Council.

	2013	2014	2015	2016	2017 *
Other property investments	**9.163.773**	**16.316.705**	**45.533.076**	**13.130.353**	**8.775.935**
New investment in infrastructures and assets for general use	6.546.119	-	30.991.733	5.301.054	-
Replacement investments for infrastructures and assets for general use	2.617.654	16.316.705	14.336.024	7.807.878	8.775.935
Replacement investments for operational running of	-	-	205.319	21.421	-

public services					
Current expenditure on goods and services	**787.986**	**1.581.078**	**2.281.509**	**2.030.132**	**2.727.109**
Materials, supplies and other	782.341	1.559.423	2.281.509	1.892.213	2.704.779
Maintenance, repairs and conservation	-	12.499	-	137.919	22.330
Compensation for services	5.645	9.157	-	-	-
Staff expenses	**145.978**	**135.459**	**156.446**	**96.159**	**37.785**
Government bodies and executive staff	61.763	61.934	63.858	18.210	-
Civil servants	29.791	22.981	30.796	22.979	-
Social-security contributions, benefits and expenses paid for by the employer	28.584	26.328	30.704	19.347	8.919
Workers	22.268	20.249	26.977	31.125	26.940
Performance incentives	3.571	3.967	4.110	4.499	1.925
Current transfers	**-**	**7.644**	**114.546**	**11.505**	**33.104**

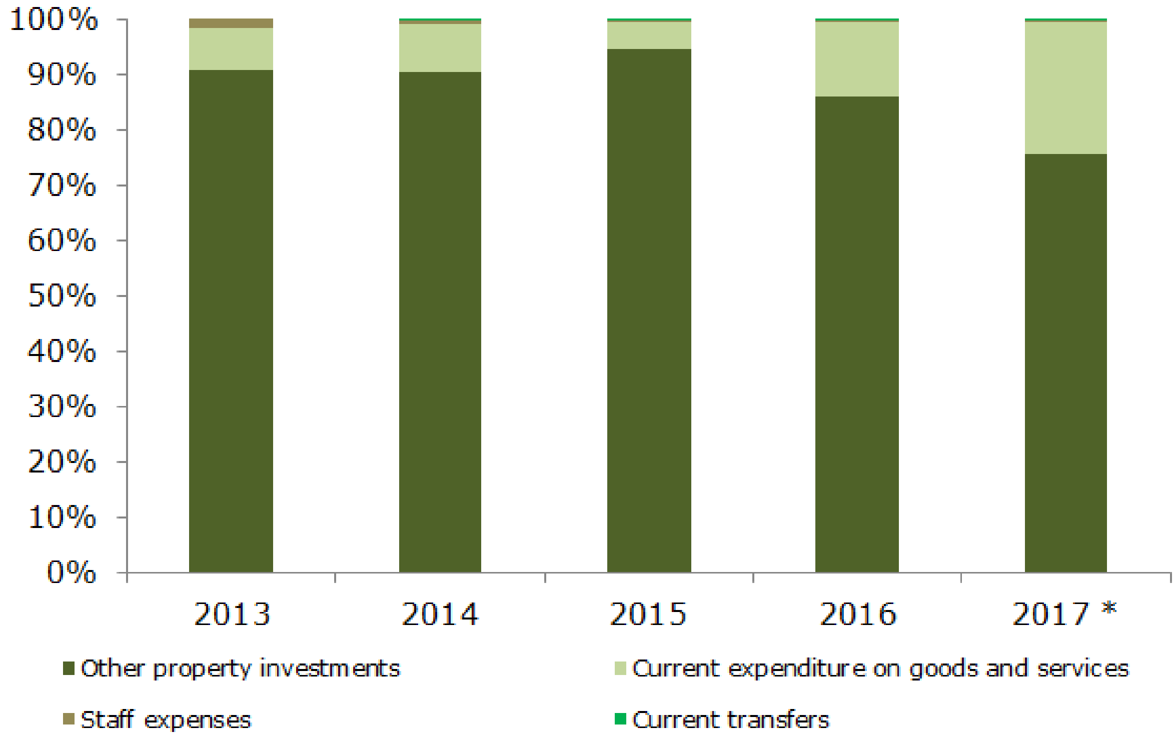
Note: The 2007 data reflects the budgeted amount.

Source: Barcelona City Council, 2017; http://ajuntament.barcelona.cat/estrategiaifinances/pressupostobert/en/programas/1534/public-space#view=functional .

The average weight of the category current expenditure on goods and services within the maintenance of public spaces of Barcelona was 12% for the study period. The staff expenses and current transfers market share is almost negligible related to the category other property investments. By contrast, the average volume of other property investments during the study period is 18 million euro. As has happened on the European global market overview accomplished on the section 2.1.1, the remarkable ups and downs registered for the categories other property investments and current expenditure on goods and services between different years for the period 2013-2017 reinforce the perception that these expenditures obey to specific maintenance needs.

Thus, the evolution of public spaces maintenance activities for the city of Barcelona showed an irregular behavior for the period 2013-2017. The average volume of public space maintenance expenditure is 20 million euros.

Figure 16. *Evolution of the maintenance and improving of public spaces in Barcelona*



Note: The 2007 data reflects the budgeted amount.

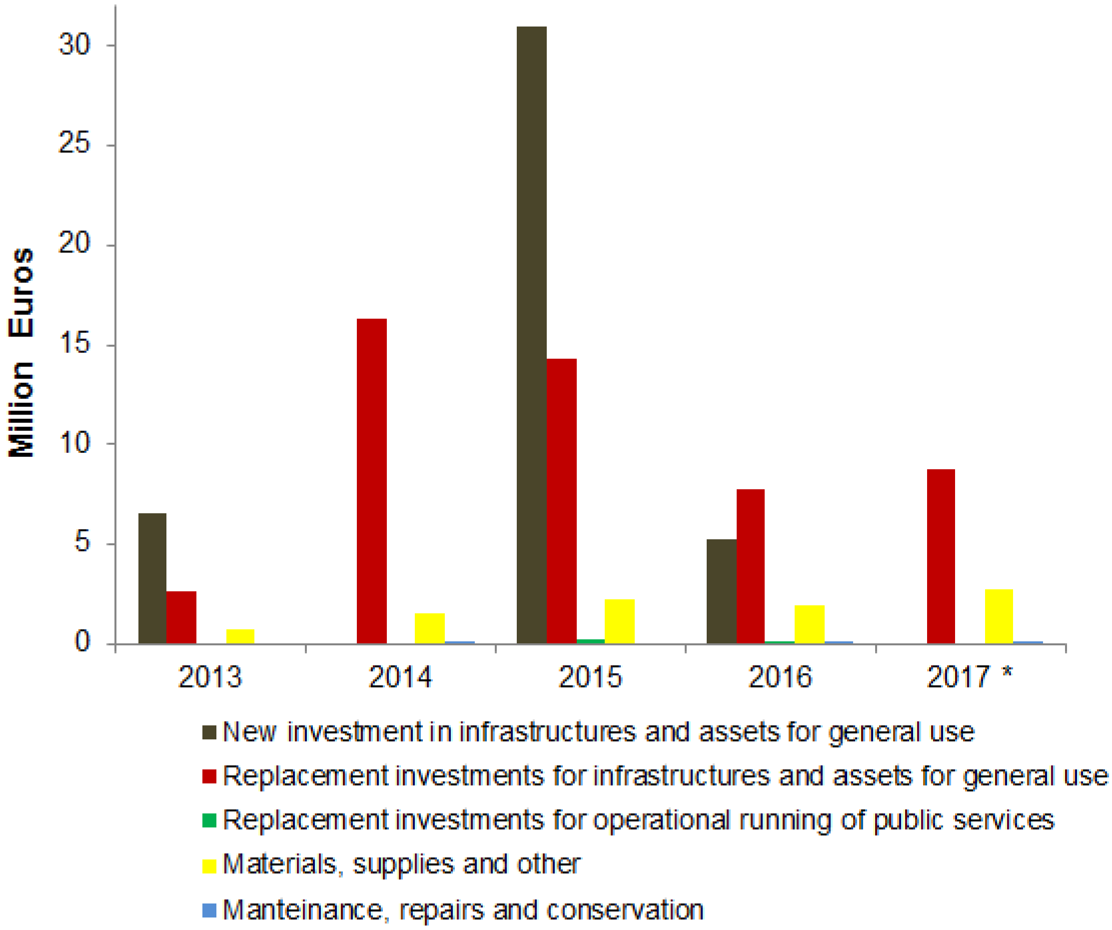
Source: Barcelona City Council, 2017; http://ajuntament.barcelona.cat/estrategiaifinances/pressupostobert/en/programas/1534/public-space#view=functional.

Figure 17 shows how expenditure on maintenance of public spaces evolved in a disaggregated way according to the data collected by the Barcelona City Council. The most important expenditure items in quantitative terms are new investment in infrastructures and assets for general use and the replacement investment for infrastructures and assets for general use.

Although market share of current expenditure on goods and services is smaller than the expenditure allocated on Other property investments, the latter years have increasingly been drawn to expenditure on goods and services because of the material and supplies acquisition. In 2017, 23% of the budgeted expenditure on maintenance of public services corresponds to the acquisition of materials, supplies and other. Only 1% of the market share is assigned to the staff expenses. The item new investment in infrastructures and assets for general use included within the category other property investments keeps a big share of the market. By contrast, the items replacement investments for operational running of public services and maintenance, repairs and conservation; do not reach a significant share of the total expenditure on the Barcelona public space maintenance.

During this entire period the total expenditure on new investment in infrastructures and assets for general use was 42 million euros. This volume of expenditure contrasts sharply with that recorded for the same period on the item maintenance, repairs and conservation (only 172.000 euros for the whole period). Probably due to the election year, 2015 shows a significant rebound in spending on all items, highlighting above the others the investment for infrastructure and assets for general use.

Figure 17. *Disaggregated evolution of the maintenance of public spaces in Barcelona*



Note: The 2007 data reflects the budgeted amount.

Source: Barcelona City Council, 2017; http://ajuntament.barcelona.cat/estrategiaifinances/pressupostobert/en/programas/1534/public-space#view=functional.

2.2.2 Market segmentation by type of maintenance of public spaces

The maintenance of public spaces sector is very diverse and rich in typology of companies, business segments and local roots degrees. The heterogeneity hinders integration. The common element for the majority of European countries is the final customer: the municipalities, which have as well as client / beneficiary of their services as the citizens.

Regarding the public spaces maintenance sector there are two types of companies:

— Companies 100% focused on cities (less common)

— Companies that sell products and services for the maintenance of public spaces within the cities, among a portfolio of different products and services.

Another characteristic of the sector is the coexistence and constant interaction between private and public actors. Most companies are small and medium-sized companies, which is a limiting factor for certain projects. The role of the stakeholders is essential (architects, consultants, public officials, etc) to define the equipment, products and services that will be included in the projects. Within this sector there is also a coexistence of public and private clients. This heterogeneity has a big influence on the level of exigency: terms, specifications, technical requirements and others. The public space maintenance sector is increasingly becoming an international sector.

As previously stated, one critical characteristic of the sector is the different role which plays the public administrations throughout the European context. Thus, the private market is totally linked to the evolution of construction and major projects: shopping centers, real estate developments with public spaces, public housing promotions, etc. Furthermore, the added value of the sector integrators is becoming less relevant due to the price pressures on the final customers in public tenders. The trend drivers lead to a demand focused service and production instead of being focused only on the product. The sector evolves from the four Ps (price, promotion, product and point of sale) to the two Ss (solution and service).

Taking into account the most relevant sector characteristics and according to the scope of the study, we have segmented the market according to the following items:

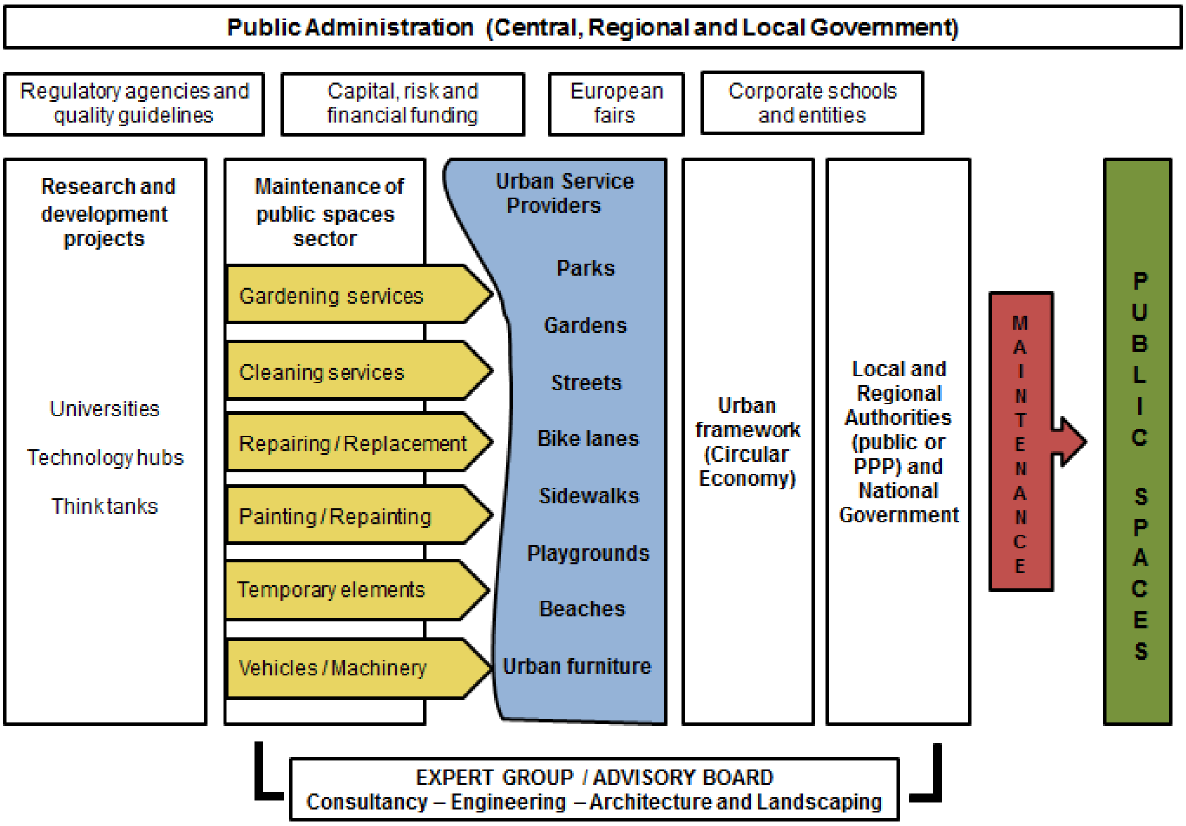
— **Activities**, related with Public Space Maintenance, organized around two main categories, which in turn include specific subservices, namely:
  - Cleaning services (Street-cleaning services, sweeping services, gully cleaning and emptying services, deleading services, etc.)
  - Gardening & landscaping (Tree pruning, hedge trimming, parks maintenance services, weed-clearance services, grassing services or landscaping works)

— **Equipment Items**, needed to accomplish maintenance activities, which in turn include specific subcategories, namely:
  - Vehicles (Gully emptiers, salt spreaders, road-sweeping vehicles, sprinkler vehicles)
  - Machinery (Harrows, scarifiers, cultivators, weeders, seeders, planters, lawn or sports-ground rollers, miscellaneous gardening equipment, cleaning machinery)

2.2.3 Maintenance of public spaces services supply chain

The activity of public spaces maintenance comprises a big business volume today. This business sector has a myriad of components across several European countries. Among them are, as main stakeholders, the government (national or regional authorities) and local authorities; a few main contractors (big companies specialized in gardening, urban furniture replacement, street cleaning and other maintenance activities), and a host of smaller contractors which are often linked to the larger contractors in supply chain relationships.

Figure 18. *Maintenance of public spaces supply chain*



Source: Own elaboration based on the cluster research carried out by AMEC-URBIS.

Along with the government, the local authorities, the main transnational contractors and a few hosts of smaller contractors, there are research and academic institutions developing a parallel task on designing the future trends and guidelines on the maintenance of public spaces. This role is performed by universities, think tanks and technology hubs. Furthermore, within the maintenance of public spaces sector the regulatory agencies and quality guidelines established by the public authorities at several levels play a key role on the definition of the technical and performing characteristics of the maintenance products and services. Another relevant feature to explain the context of the maintenance of public spaces sector is the availability of financial funding. This feature will determine the design and performance of the maintenance services as well as introduce constraints on the public spaces maintenance municipal management. Due to these financial constraints, usually across Europe the public authorities cannot set up a periodicity on the maintenance of public spaces procurement. This lack of regularity could show the degree of importance of this sector among the different public services.

One of the main agents operating in this market are specialized commercial fairs on public spaces maintenance. Across Europe several specialized fairs on this topic exist. Some examples of European fairs specialized on this topic are: Indumation (Kortrijk, Belgium), Intertraffic (Amsterdam, Netherlands), specialized in the sector of infrastructures and management of traffic, road safety and parking; and Astrad & AustroKommunal (Wels, Austria), specialized in the sector of the equipment for the municipal maintenance and road.

2.3 Future trends in maintenance of public spaces

At a time of shrinking budgets due to the latter financial crisis and with the threat of climate change, city authorities and other organizations are challenged with engaging the quality of public spaces and its environmentally friendly maintenance production. Occasional investment decisions will require professional and integral maintenance and management using data increasingly more often. Local authorities are facing a complex task in the years ahead. Cut-backs, mergers and a new way of working with people and business are all making transparency become more and more important. The translation of management ambitions and budgets into the practical management of public spaces demands an integrated approach, across all sectors, with a focus on the entire life cycle and in collaboration with people and business.

On the other hand, the acquisition of new tools for the daily management of public spaces will be needed to improve the environmental efficiency of its daily maintenance. Therefore, implementing technological systems to transform every European city into a greener city will be necessary to compete in the global knowledge-based economy. With the aim of increasing the quality of public spaces and their inhabitants, the information and communication technologies should be applied while providing environmentally friendly public spaces maintenance. Through implementing information and communication technologies into maintenance of public spaces services, cities turn into being more intelligent in their management of resources. To achieve this, the transformation of urban spaces management should lay on three pillars: ubiquitous infrastructures, information and human capital.

In terms of ubiquitous infrastructures, every European city needs to be equipped with advanced infrastructures to evolve the Smart City concept from pure theory to reality, providing citizens and enterprises with a powerful platform to connect public spaces and let them interact effortlessly with each other and with their administration through electronic means. Stable sturdy infrastructures, from optical fiber networks covering the city act as a backbone to the installation of sensors, are the key for the development of intelligent solutions in the maintenance of public spaces.

In terms of information, it is the raw material to fuel innovation factories. Information coming from daily activity in the public spaces is an invaluable asset that needs to be collected and interpreted, creating an accurate public spaces information database that acts as the source to deliver smart-tailored maintenance services and better public space management. Several sources have been identified as those that follow the most important ones to construct the concept of smart public spaces. There are two main information sources: (1) information coming from the public space furniture or other city elements that involves sensors and Open Data (public sector information) and (2) information coming from the citizens as digital footprint, social media and crowdsourcing.

Regarding the first information source, some companies are developing digital furniture to integrate technology within street furniture and objects with the goal of creating smart and connected public spaces. For example, the Paris based French company, SmartUp Cities, is building smart recycling bins able to monitor the quantity of each waste fraction collected and then report it securely in a system through Blockchain technology. In addition, they build public smart benches equipped with solar powered Wi-Fi; smart planters able to monitor the flowers´ soil and start watering when needed and much more.

As a way to improve the maintenance of public spaces management they have introduced the following services:

- ***Smart Waste Containers & Recycling Bins***

Smart Waste Containers equipped with Ultrasonic Fill-Level Sensors for Optimized Waste Management and Logistics. Their smart waste containers are equipped with internet connected ultrasonic sensors able to "feel" and report the level of waste in each bin. Knowing the exact level of waste from each container, the truck drivers can choose which containers must be picked and which not thus decreasing the use of fuel and service hours by up to 50% per day. Based on the data received from the waste containers sensors, the local authorities could create smart collecting routes, selecting the containers for the most efficient and optimized routes.

Figure 19. *Smart Waste Containers & Recycling Bins*

Source: SmartUp Cities webpage, http://www.smartupcities.com/smart-waste-containers/

- ***On-street Parking Sensors & Guidance Systems***

Intelligent On-street & Off-street Smart Parking Sensors and Parking Guidance Systems providing real-time information on parking space occupancy, guiding drivers quickly and efficiently to the nearest available parking space in the area. Thus, every parking space is equipped with a smart sensor capable of detecting its occupancy status.

Figure 20. *On-street Parking Sensors*

Source: SmartUp Cities webpage http://www.smartupcities.com/smart-city-parking-sensors-guidance-systems/

The parking sensors can analyze the number of parking rotations thus able to create comprehensive reports and predictions about the parking needs of the area.

In addition, relating to the smart urban furniture within green public spaces, in February 2017 the City of London Corporation has launched an ideas competition to explore how smart technologies might enhance its green spaces.

On the other hand, it is urgent to employ the information coming from the citizens as the digital footprint, social media and crowdsourcing; as a tool to transform the public management of public spaces to a more efficient way. The public authorities should lead the digital transformation on cities, enabling the introduction of new technologies into the local public management. Finally, in terms of human capital, actors actively participating in the daily activity of the city are the ones that potentially could make a city smarter. The implementation of the Smart City is not only a concern of public administration but it should also involve the population, innovation centers, companies and entrepreneurs. Faculties and society are knowledge producers, while companies and entrepreneurs generate new business opportunities.

2.3.1 In-house vs. outsourced services

Contracting out, where private companies, through law-regulated procedures for procurement, are delegated temporary responsibilities for providing various services in the public sector can be regarded as an innovation in the public sector on the same level as other recent reform elements such as performance management or user choice. Successful public sector innovations include phases of developing, testing, utilization and dissemination of new ideas within an organization or organizational field. Seen in the light of the increasing use of public procurement and contracting out in the Nordic municipalities since the beginning of the 1990s, it can be argued that public procurement and contracting out have been relatively successful innovations. However, ongoing political declarations, objectives and agreements regarding increased usage of contracting out on the municipal level continue to spur explorations of the innovative potential of contracting out.

Historically, contracting out has contributed to organizational change and development with respect to the opportunities offered by a 'standard' – or 'conventional' – approach characterized by standardization of services, a strategic focus on cost minimizing, arm-length managerial relations and the use of competitive markets. Today, it is also possible to ask whether and how a number of new ideas, approaches and forms for organizing contracting out can create new changes and directions for the development and reform of the public sector. In an organizational perspective, the differences in approach can be framed as a difference between 'competitive' strategies and 'cooperative' strategies to engagement in and utilization of inter-organizational relations.

Academic studies which measure cost change at the level of individual contracts all find that cost savings has been a result when services are contracted out. In addition, studies which measure cost change at the level of overall budget/spending levels and provide analysis based on statistical analysis of quantitative data do not find any relationship between contracting levels and spending levels. In sum, an academic review finds supportive evidence for an assumption that contracting out in contrasts to in-house provision reduces operational costs for maintenance services. However, no evidence is found in support for the assumption that contracting out should also reduce overall spending levels within the overall service delivery systems. The evidence furthermore suggests that technical efficiency is improved while some long-term problems with allocative efficiency may arise. The evidence also indicates that substantial changes are involved for management, organization and staff. In particular the number of operational staff are reduced, some aspects of management is improved (e.g. 'effectiveness') while new organizational principles are introduced (e.g. 'strategic centralization' and 'operational decentralization').

The findings need to be generalized only with careful reservations. Findings may, for example, be a result equally from contextual particularities or methodological limitations (e.g. confounding factors or 'lurky' variables). Contextual particularities may include policy context, market structure or administrative structure.

2.3.2 Possible impacts on costs and environment by outsourcing

Cost and environment effects from the use of public procurement when public spaces maintenance services are contracted out vary greatly. In Denmark, the INOPS[7] study showed that almost one-half of all municipalities (45%) have gained a reduction in operational cost the last time they procured a park or road maintenance service. The variation was found both between municipalities within an individual country and between the Nordic countries. The average cost change was found to be a cost reduction around 5.5 % (un-weighted mean) for public spaces combined. By contrast, and according to the INOPS study, in Sweden, the average cost change was found to be a cost reduction around 2.7% (un-weighted mean) for public spaces. 33% of Swedish municipalities experienced a cost decrease. In Norway, the average cost change was found to be a cost increase around 10.3% while only 12% of the municipalities experienced a cost decrease. For the UK, it was found that 77% of all municipalities experienced a cost decrease last time they publicly procured a public space maintenance service. In Denmark, higher levels of cost reduction in operational costs were found in particular to be related to the first or second time (compared to the third time or more) maintenance services were contracted out, an emphasis on a 'low cost contracting strategy', as well as more well-developed contractual framework (transactional dimension). Also, a larger economic size of private sector involvement was indicated to be related with higher levels of cost reductions.

In Sweden, higher levels of cost reductions were found to be related to higher levels of competition as well as a geographical location in the Southern and Eastern parts of Sweden (compared to the Northern parts of Sweden). In Norway, less detrimental cost effects (in terms relatively lower degrees of cost increases) were found to be related to higher levels of competition established by continued use of public procurement. In other words, municipalities which had used public procurements a greater number of times in the past had 'generated' higher levels of competition. According to this study, in the UK, a higher chance of cost reduction in operational costs were found to be related to the lowering of quality standards (but not with a negative influence on managers' satisfaction with provided quality levels) as well as a greater emphasis on a 'low cost contracting strategy'.

Several contextual characteristics of importance were highlighted on another study about contracting out of public space maintenance in Denmark, Sweden, Norway and the United Kingdom[8]; when differences in cost effects were compared across countries. Denmark was found to be characterized by a relatively competitive and 'matured' context for contracting out (evenly distributed across the country). Sweden was found to be characterized by a longer tradition for contracting out and well-developed markets within certain regions while Norway was found to be characterized by generally less well developed markets. In comparison, local authorities in the UK, Danish municipalities, and Swedish municipalities to some extent, have been able to tap directly into already established markets when they procured the last time. In contrast, Norwegian municipalities have been challenged by using public procurement in poorly functioning markets.

Across the four country contexts it was found that a 'low cost contracting strategy' in general has worked out well, i.e. produced cost savings, for municipalities in Denmark and the UK, but not for municipalities in Norway and Sweden. Competition, and in particular a lack of competition, was also found to be important for cost effects.

In terms of environmental benefits, the practice of contracting out public space maintenance services can differ in some extent between municipalities as well as across European countries. The high level of competition between the private companies could lead to avoid environmental concerns. Thus, in order to provide cheaper solutions, many

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[7] Lindholst, A. C. (2017)

[8] INOPS Technical Report

small and medium enterprises sacrifice environmental considerations. By contrast higher levels of collaborative norms as well as more elaborative contractual frameworks could counteract these negative effects on environment[9]. At an aggregate level, local government procurers have adopted a wide range of initiatives to address environment issues. These are condensed into a typology of environmentally friendly supply chain management for the public sector.

2.3.3 Possible impacts on costs and environment by outsourcing

The last decade saw a renewed policy interest in the quality of public spaces. Public spaces have become urban policy tools with a much wider and pervasive significance. This acceptance of a broader role for public spaces, from the iconic parks and gardens to the ordinary streets and squares of urban areas, is related to changes in the nature of our understanding of contemporary policy issues in general, and urban policy issues in particular. More to the point, this broadening of policy concerns to encompass public space and its quality is the result of a number of interrelated processes. Foremost amongst these are a renewed concern with the local physical environment and its impact upon the social and economic well-being of its inhabitants. Public realm is a common tool of global and local inter-city competition and as a potential catalyst of urban regeneration, through a demonstrable relationship between the quality of urban life and urban spaces, and the investment decisions and locational choices of business, employment and the workforce.

The concern with those broader linkages between the quality of public spaces, its sustainability and urban policy objectives has been made more urgent by a pervasive perception that public spaces, of all types, lack quality and environmental concerns. Issues here include public space cleanliness and tidiness; graffiti; the dominance of motorcar and the constraints and limitations this imposes on environment and other public space users; as well as a general feeling of discomfort and lack of safety.

This policy agenda has taken shape in a variety of national policy initiatives that have attempted to address the issues of public space and the quality of its management. These encompass:

— changes in legislation giving local authorities formal responsibility for environmental quality through their new powers to promote sustainability and community well-being
— the creation of a task force to report and advise on green spaces
— a public-funded organization to champion green design and the sustainable management of public spaces
— the adoption of auditing regimes for local authorities' street-related services with rewards offered to those performing well
— the institution of funding programmes to support community-based management of public spaces in deprived areas
— the introduction of business improvement district legislation

Two things of concern underpin and unify most of these initiatives. The first is a gradual shift in emphasis from a concern with initial design and implementation, to more attention to the life-cycle of public spaces, in which long-term management and maintenance are seen as paramount. Second, there is a widening of the definition of urban public spaces to encompass also the ordinary streets and squares that articulate the living spaces of communities and neighborhoods.

[9] Preuss, L. (2009)

Newcastle Envirocall System

This policy attention to more widely defined public spaces and their management has inevitably led to changes, often quite significant, in the organizational structures and practices through which the management of public spaces takes place. New organizational forms have emerged, responsibilities, power and resources have been redistributed within and beyond government structures and new governing arrangements have been formed.

Despite the decrease in operating costs, the practice of tendering out public spaces maintenance services has led in some cases to a lack of ownership of maintenance process, as there might be several layers of management, and reduced responsiveness due to long lines of communication between council management and those actually doing the work. The Envirocall system in Newcastle is a good example on how to overcome such problems by increasing responsiveness and shortening lines of communication through one point of contact reporting and 45 different public space services. Local authority officers also highlighted barriers to the coordination of maintenance routines and standards in areas where two-tier local government regimes are in place, and between local government and other organizations. To avoid this, some local authorities try to coordinate maintenance between itself and its district authorities by promoting the use of shared contracts.

Furthermore, another British council, Warwickshire, has pioneered potentially one of the most sophisticated systems, a monitoring system called the 'Streetscape Appearance Index' (SAI). This relies on the council and the local community scoring different elements across different types of public space, with the scores being used to highlight where investment is needed. Complementing the SAI is the 'Streetscape Maintenance Log' which identifies responsibilities for spaces, infrastructure and buildings, and helps to ensure that problems on private land are quickly remedied.

The Danish Agency for Palaces and Properties

The Danish Agency for Palaces and Properties and its section for park management in particular has the responsibility of managing, maintaining, and utilizing some of Denmark's most important historical parks and gardens. While first-class design and planning, combined with adequate finance for capital investment and development, are essential for keeping parks and gardens up to date and capable of meeting the diverse demands of the public, it is through the daily provision of public space maintenance that public service facilities, and horticultural and landscape architectural standards are kept up to standard. The Agency's Head Gardeners have the responsibility for managing provisions of green-space maintenance.

Like other Danish public managers exposed to pro-market policies, the Danish Agency for Palaces and Properties (hereinafter the Agency), contracts out the provision of green-space maintenance. Congruently with the New Public Management (NPM) reforms taken in the country and its implied policy of contracting out in the public sector, the Agency arranged its initial approach to contract public spaces management in a standard framework based on the four tenets of specification, pricing, monitoring, and enforcement of service provisions.

Between 1998 and 2004, the Agency achieved remarkable efficiency gains by contracting out virtually all services related to green-space maintenance and thereby abandoning a longstanding in-house arrangement. In 2004, budgets for public space maintenance stabilized at a level 34% lower than in 1998 (measured in 1999 prices), without any experienced decline in standards of work or quality of services. These figures could be explained both by inefficiencies at the outset and by efficiencies achieved by introducing competition.

Despite efficiency gains, government policies continued to force the Agency to consider how further improvements could be achieved. According to the law of diminishing returns to competition, the prospects for further improvements in efficiency by contracting out were limited because competitive pressures were virtually fully implemented. Therefore, the Agency's attention switched to viable alternative arrangements for well-functioning contract design and management of public space maintenance. Fitting in with the emergent partnership approach for public service provisions, the initial objective of improving efficiency through competition came to be accompanied by an objective for improving services through the efficient management of available expertise and resources.

In 2004, the Agency implemented a performance management (PM) scheme to improve the standard framework for managing public space maintenance contracts. The aim of the PM scheme was to address deficits in the standard framework by developing and aligning contractors' behavior and expertise through explicitly acknowledging and (financially) rewarding good performances related to communication and collaboration, adaptation of services, and rationalization of service provisions. In this way, the PM scheme extended the framework with aspects enabling gardeners, sweepers or garbage men to implement a more holistic and inclusive approach in contract management.

In the first three years of the PM scheme, it was continuously refined in an internal trial and error process and it became an integrated part of the head gardeners or the sweepers' manager contract management practice. As it became routine, the Agency felt a need to evaluate the scheme more thoroughly. In 2006, the Agency agreed to participate in an action research intervention with the purpose of evaluating and improving the PM scheme in a systematic way and thus extracting knowledge that in turn could help other urban public space managers' attempts to improve public space maintenance contracts.

The paper *"Improving contract design and management for urban green-space maintenance through action research"* from the University of Copenhagen[10] has carried out a comprehensive research on this framework for contract management. Since the Agency embodies a case of well-functioning contract design and management, it provides valuable insight into the intricacies and issues in contract design and management for urban public space maintenance. In particular, the case provides insights into how the standard framework for contract design and management can be improved in a situation where urban public space management relies fully on contracting out for the provision of public space maintenance.

As stated above, the Agency had established a standard framework for contract public spaces management based on the four principles of specification, pricing, monitoring, and enforcement of service provisions. Thus, the Agency's first version of a PM scheme was introduced and implemented in 2004 on the back drop of experiences with the standard framework. The reasons for the introduction were three-fold. Firstly, the Agency sought to target issues in established contract management practice that could impede performance but at the same time were difficult to address through the standard framework. Secondly, the Agency sought to improve the value of service provisions by fine-tuning provisions to local needs. Thirdly, the Agency sought to utilize and encourage the professional expertise of contractors to a greater extent by spurring them to produce inputs to planning and the coordination processes. Contractors were also invited to suggest alternative performance items. Finally, the Agency sought to make contracts more attractive for skilled and dedicated staff in a situation with a shortage of skilled staff within the business. The PM scheme was formally organized around three headings:

- Collaboration and communication.
- Service adaptations.

[10] Lindholst, A. C. 2008.

— Rationalizations (i.e. making cost reductions).

A list of performance items and measurement mechanisms was drawn up for each of the three headings. Each heading was specified with several sub-items measured on a scale using the scores: 10, 5, 0, -5, and -10, where 0 was given for the average performance. Only a positive score for the sum of all sub-items was transformed into monetary rewards. The maximum bonus size in the first PM scheme was limited to 2% of the annual contract sum. In later revisions, the maximum was increased to 5%. The PM scheme was gradually refined, and at the time of the intervention it had been extended to cover the Agency's seven major service contracts for public space maintenance.

With the general concept of performance management, the implementation of the PM scheme turned contract management into an integrated process of setting expectations, measuring and reviewing results, and rewarding performance in order to improve overall performance. The standard framework only allowed this process to take place when contracts were renewed. In a broader public policy context, the Agency broke old patterns by implementing performance management as a mechanism internal to the contract and not as an external mechanism for contract monitoring and accountability as prescribed by the dominant approaches to performance management in the public sector.

2.4 Limitations of the study

As stated above, there has been a lack of comprehensive data for the maintenance of public spaces sector, especially data that divides public space maintenance between services and products for public or private purpose. Furthermore, data related to import and export on maintenances of public spaces services and productions have also been limited in some aspects. Another issue has been that data available in the different studies is very unclear about what is included and excluded in the scope. There are many studies on urban furniture and even with the raise of the smart cities sector; many reports deepen on the capabilities of the public spaces as a trigger for life quality improvement. However, there are a few less specialized on the maintenance of the public spaces and its management procedures. This has, in some instances, led to a high variance of topics without being able to focus strictly on the maintenance issues and its sustainability features. Furthermore, the information provided by the stakeholders did not help to confirm some findings and values.

Despite the lack of information, there is a comprehensive and disaggregated set of data for each Member State in EU-28 (TED dataset). Those countries with highest spend on public spaces maintenance services have been in focus. Therefore, the results are relevant for the overall findings. Specific noted limitations (which includes data gaps):

— Limited European market data on maintenance of public spaces services has been found; most likely because this is a small subsector within the infrastructure, construction, engineering and environment. It is therefore difficult to find out accurate information on this sector.

— Despite according to European Directives on public procurement, notices for procurement procedures of public authorities must be published in the OJ S. There is much information on procurement opportunities which are not published on TED.

— It was found that public space maintenance is managed within a much larger unit taking included under multiple civic departments. However, it was not possible to specify what kind of maintenance services or products they procure for a range of cities across Europe, except for the case of the Barcelona City Council.

— The estimates of market share between large maintenance services companies and SMEs have been also found as limited.

— There are limited data on best practices for the procurement of Green Public Space Maintenance services. The best practices found are related to the public spaces management according to a life-cycle analysis or with a sustainability focus.

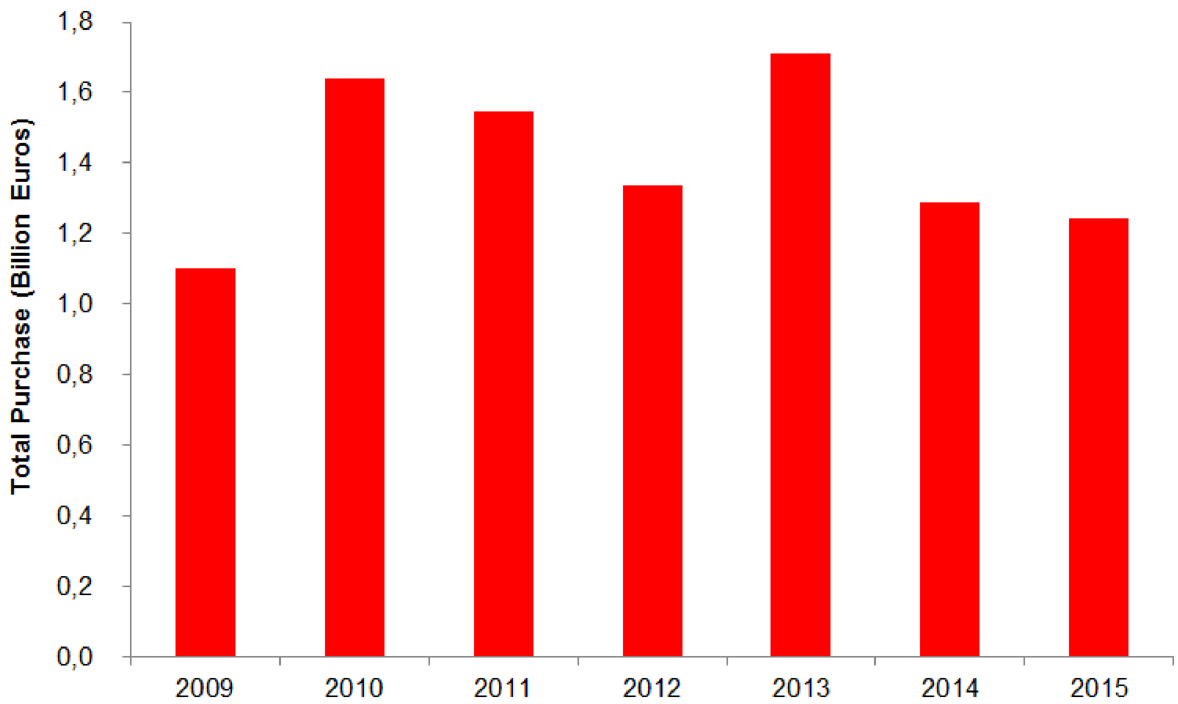
Besides, although the CPV system used on the market analysis was identified as the most reliable, its level of accuracy is not total. In light of an estimate the number of correctly coded tenders is only about 90% of all tenders issued. This means that in roughly 10% of all publishing authorities apply a code that does not describe the nature of a tender correctly. Therefore the accuracy of the data provided is subject to mistakes and misinformation. In addition, another problem due to the use of CPV Codes/System was the lack of the supplier's perspective into the analysis. According to many suppliers, the CPV structure does not represent business sectors – which cause inconsistencies for users.

3 Conclusions and preliminary findings

One of the main findings is the fact that these maintenance services are not contracted periodically. By contrast, the volume and number of cleaning activities and services contracted by the public authorities in each country vary widely between different years. Two specific cases draw a lot of attention. In 2009, Latvia registered a contracting volume of cleaning services and activities of 117 million euros. During the next five years, total public procurement in Latvia for cleaning services was approximately 8 million euros. However, in the year 2015 Latvia recorded a contracting volume of 135 million euros. This irregular periodicity in public contracts can be explained considering the validity of public contracts, being the responsibility of each country to set up their contract terms.

Regarding the market overview, it should be noted that between 2009 and 2015, the total values of the services and activities included under the scope of the study maintained an irregular pattern, exposed to the ups and downs based on budget constraints. However, the business volume of CANs at European level was never below the 1.500 million euros (Figure 21).

Figure 21. *Total purchase of maintenance of public spaces services and activities*



Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv . Version 2.1. Accessed on 2017-03-27.

Furthermore, the evolution of the public expenditure in the European cities shows the absence of periodicity in the purchase of public spaces maintenance services. This absence of regularity at local and national level suggests several key ideas on the structure and the specific characteristics of the maintenance of public spaces sector:

- Public procurement according to specific maintenance based on occasional needs
- Absence of planning in the contracting of maintenance of public spaces services
- Improper use of the maintenance of public spaces sector with electoral purposes
- Counter cyclical economic role

— Public spaces maintenance services purchase based on the public financial situation

Another essential finding is the common typology of European public spaces maintenance between each country. Thus, there is a common typology that serves to explain every country's market. Within each marketplace there are a large number of local small and medium-sized enterprises and a smaller number of large international companies with a large share of the European market. Taking Italy as an example, the production share of the first four operators within the urban furniture market is 30.2%, while the top eight operators in the market account for 45% of the market. Many companies in this sector follow different market strategies such as diversifying or specializing in some of the subsectors of maintenance of public spaces or urban furniture. In this way, few companies are specialized in a unique segment and are able to propose a wide and coordinated offer, which generates a high level of competition.

Most small and medium-sized enterprises work primarily at the local and regional level, and competition is based on price, breadth of product and product innovation policies; these features are mandatory taking into account the current competitive environment. Lastly, the added advantage that companies can provide is the possibility of offering a pre-and post-sale service, with a pre-sale and post-sale service. To adapt and customize the product or service according to the needs of the customer, the maintenance service providers usually work together with the public administration to adapt the needs to the offer.

Besides, the maintenance of public spaces sector is very diverse and rich in typology of companies, business segments and local roots degrees. The heterogeneity hinders integration. The common element for the majority of European countries is the final customer: the municipalities, which have as wells as client / beneficiary of their services the citizens.

Lastly, regarding the contracting out of the public space maintenance services, the academic studies which measure cost change at the level of individual contracts all find that cost savings has been a result when services are contracted out. In addition, the studies which measures cost change at the level of overall budget/spending levels and provide analysis based on statistical analysis of quantitative data do not find any relationship between contracting levels and spending levels. In sum, the academic review finds supportive evidence for an assumption that contracting out in contrasts to in-house provision reduces operational costs for maintenance of public space services.

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List of abbreviations and definitions

AC	Award Criteria
CAs	Contract Awards
CANs	Contract Award Notices
CCT	Compulsory Competitive Tendering
CNs	Contract Notices
CPV	Common Procurement Vocabulary
DG	Directorate General
EC	European Commission
EU	European Union
ESS	European statistical system
GPP	Green Public Procurement
HS	Harmonized System
LCA	Life-Cycle Assessment
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne
NAP	National Action Plans
NPM	New Public Management
OJS	Official Journal Supplement
PM	Performance Management
SC	Selection Criteria
SPP	Sustainable Public Procurement
TED	Tenders Electronic Daily

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Annexes

Annex 1. Public spaces maintenance TED Dataset

Table 5. Public spaces maintenance, European public contracting volume (2009-2015).

2009-2015	Cleaning	Gardening and landscaping	Repairing and replacement	Temporary elements	Vehicles	Machinery
Austria	12.811.553	56.110.611	2.208.958	1.570.865	73.330.735	0
Belgium	23.916.797	33.448.092	7.125.147	452.196	30.879.367	2.833.511
Bulgaria	34.416.861	16.306.041	3.331.573	930.872	9.982.263	1.585.339
Cyprus	1.854.328	1.382.480	0	0	2.379.284	0
Czech Republic	39.084.214	36.226.819	4.267.098	1.449.690	82.873.701	1.674.481
Germany	447.777.988	90.937.233	12.065.259	73.091.643	131.891.588	30.363.078
Denmark	212.728.885	899.720	21.772.735	793.915	28.025.723	32.986.107
Estonia	82.621.853	16.454.395	1.549.128	640.500	8.823.263	217.497
Spain	605.286.528	627.025.647	51.810.253	1.026.367	38.689.023	4.391.721
Finland	112.321.328	1.859.352	2.560.000	1.624.047	17.232.309	9.941.513
France	338.014.722	159.923.198	264.586.470	24.170.976	91.706.670	34.773.844
Greece	17.874.537	3.746.663	8.215.077	4.832.340	88.101.008	0
Croatia	6.200.527	7.075.145	0	602.552	2.131.914	1.860.674
Hungary	22.061.011	41.191.814	31.184.176	10.985.142	352.903.476	1.555.460
Ireland	4.728.184	650.918	0	1.461.157	4.115.793	0
Iceland	5.380.179	78.528	0	0	892.896	930.344
Italy	515.954.128	282.278.891	40.626.540	5.516.658	288.624.434	4.256.951
Lithuania	23.322.332	8.555.400	3.785.149	580.445	6.784.246	67.887
Luxembourg	1.001.591	262.253	0	219.554	0	578.000
Latvia	259.660.927	283.407	0	0	2.367.403	0
Macedonia	55.020	0	0	0	298.388	0
Malta	759.498	0	0	0	328.253	0
Netherlands	13.906.910	45.643.885	21.963.054	2.475.757	15.758.822	190.000

Norway	35.279.992	9.946.318	12.943.519	1.835.553	10.566.172	1.048.841
Poland	1.999.784.918	146.993.804	53.861.162	13.392.122	77.490.824	2.939.670
Portugal	19.390.869	11.924.280	3.229.300	274.978	21.033.228	5.000.000
Romania	497.039.013	109.810.115	126.320.249	436.161	65.109.742	2.164.475
Sweden	56.948.966	33.859.531	52.296.611		3.117.445	1.831.391
Slovenia	5.838.572	322.943	7.664.322	272.378	4.955.750	2.731.840
Slovakia	16.708.609	15.947.542	18.601.037	1.528.600	84.385.082	0
United Kingdom	404.369.183	798.017.962	570.864.551	445.115.185	292.869.681	102.624.226

Source: TED csv dataset (2009-2015), Tenders Electronic Daily, supplement to the Official Journal of the European Union. DG Internal Market, Industry, Entrepreneurship, and SMEs, European Commission, Brussels. Available at https://open-data.europa.eu/cs/data/dataset/ted-csv. Version 2.1. Accessed on 2017-03-27.

Annex 2. Disaggregated maintenance and improved public spaces expenditure, Barcelona City Council.

The data provided by the Barcelona City Council on maintenance and improving of public spaces is particularly relevant in understanding the structure of public expenditure in a European large city. According to the new transparency policy established, disaggregated data on the local budget and its compliance is published every year. In light of this data, below it the disaggregated expenditure on public spaces maintenance and improving for the city of Barcelona in the year 2014 is presented.

Table 6. Maintenance and improved public spaces, Barcelona City Council (2014).

			2014
Other property investments			16.316.705 €
Replacement investments for infrastructures and assets intended for general use			16.316.705 €
		Public streets Maintenance	2.324.684 €
		Public streets Maintenance	2.255.529 €
		Public streets Maintenance	1.893.496 €
		Public streets Maintenance	1.666.028 €
		City pavement	1.178.318 €
		Public streets Maintenance	1.503.846 €
		Public streets Maintenance	1.408.833 €
		Public streets Maintenance	1.137.950 €

		Public streets Maintenance	1.047.045 €
		Public streets Maintenance	884.048 €
		Public streets Maintenance	870.423 €
		Public streets Maintenance	146.506 €
Current expenditure on goods and services			1.581.078 €
Materials, supplies and other			1.559.423 €
	Works carried out by other companies and professionals		1.281.889 €
		Public roads maintenance	470.675 €
		Other infrastructure maintenance	204.393 €
		Other contracts for municipal services	187.232 €
		Public roads maintenance	71.626 €
		Public roads maintenance	70.203 €
		Public roads maintenance	52.746 €
		Public roads maintenance	64.318 €
		Reporting	5.082 €
		Other contracts for municipal services	4.160 €
		Public roads maintenance	31.397 €
		Other contracts for municipal services	2.760 €
		Technical works	9.281 €
	Miscellaneous		277.533 €
		Services purchase	75.409 €
		Services purchase	87.329 €
		Services purchase	6.806 €
		Services purchase	46.736 €
		Services purchase	0
	Supplies		0
		Other consuming material	0
Maintenance, repairs and conservation			12.499 €

Compensation for services			9.157 €
		Locomotion	9.157 €
Staff expenses			135.459 €
	Government bodies and executive staff		61.934 €
	Basic remuneration and other management remuneration		61.934 €
	Social-security contributions, benefits and expenses paid for by the employer		26.328 €
	Social contributions		26.328 €
	Civil servants		22.981 €
	Complementary salary		13.562 €
	Basic remuneration		9.419 €
	Workers		20.249 €
	Staff		20.249 €
	Incentive program		3.967 €
	Productivity		3.850 €
	Bonus		117 €
Current transfers			7.644 €

Source: Barcelona City Council.

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doi:xx.xxxx/xxxx

ISBN xxx-xx-xx-xxxxx-x