

PPP FOR CITIES CASE STUDIES

COMPREHENSIVE MAINTENANCE OF THE BARCELONA RING ROADS



Hugo Ferradans, Joan Enric Ricart,
Francesc Trillas & Miquel Rodríguez Planas

With the collaboration of Àrea Metropolitana de Barcelona (AMB)

July 2017

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It is also a partnership platform between companies and administrations from all over the world where they can further explore the dynamics of public-private partnerships, create guides to good practices and standards and design solutions to the issues facing cities.

The center is led by IESE Business School and is part of the United Nations' International Centre of Excellence on PPPs program. It has the support and sponsorship of Barcelona City Hall and other public administrations and private companies.

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Quick Facts

Highlights

Barcelona's ring roads were created with the goal of reducing traffic in the center of Barcelona and creating points of connection between Barcelona and the metropolitan area. Maintenance of the ring roads and the municipal stretch of Gran Via Nord has been a crucial factor in ensuring their proper function by guaranteeing their conservation and their ability to absorb the large volume of traffic they have seen since they were built.

The comprehensive maintenance of the ring roads has been awarded to concessionaires through public contracts in which AMB (along with the Catalan government [Generalitat de Catalunya] and the city councils of the municipalities in the 2016 contract), via the Comarcal Council of the Barcelonès (CCB), grants a private entity or entities the comprehensive maintenance and conservation of the infrastructure. These contracts include operations to aid in highway administration and surveillance, cleaning and pruning, and programming, tracking and monitoring traffic, among others. In the 2007 contracts, the CCB awarded the execution of these services to the companies Indra and Matinsa. The tender for the period 2017-2021 has also been announced, although the awarding of the 2016 tender is still pending.

The main goal of the project is to ensure that the infrastructure is kept in a sound state of maintenance, to minimize the potential accidents that could occur on the road because of poor conditions, and to lower traffic jams and the average wasted travel time for drivers to reach their destination.

Location: Metropolitan area of Barcelona: Barcelona, Hospitalet de Llobregat, Badalona, Santa Coloma de Gramenet, Cornellà de Llobregat, and other municipalities. All together, the municipalities have a total of 3,250,000 inhabitants.

Characteristics of the PPP contract

	2007 call for proposals	2011 call for proposals	2016 call for proposals
Type of project	Brownfield project ^a	Brownfield project	Brownfield project
Size and characteristics	41.17 km or roads		
Daily commutes	274,390 veh./day	262,559 veh./day	
Total estimated budget	€11,241,618	€10,411,296	€21,496,548
Budget that won the tender	€9,501,556.86	€8,203,030.15	
Total estimated budget (per year)	€5,620,809	€5,205,648	€5,374,137
Annual budget per km (€/km)	€136,527	€126,443	€130,535
Provisional guarantee	€224,832	€150,000	€160,000
Definitive guarantee	€380,062 (4% of the awarded budget)	€410,152 (5% of the awarded budget)	5% of the awarded budget
Announcement of the contract	8/1/2007	8/6/2011	5/13/2016
Submission deadline	10/30/2007	10/17/2011	7/4/2016
Awarding of the contract	11/28/2007	12/19/2011	
Start of operations	1/1/2008	1/1/2012	1/1/2017
End of contract	12/31/2009	12/31/2013	12/31/2021
Number of bidders	14	17	
Contracting system	Open public tender		
Method of payment	Monthly certifications		
Duration	2 years, can be extended 2 more years	2 years, can be extended 2 more years	4 years, can be extended 2 more years
Winning companies	Matinsa/Indra Sistemas, SA	Joint venture: Mantenimiento de Infraestructuras, SA and Indra Sistemas, SA	
Contracting authority	Comarcal Council of the Barcelonès		

^a "Brownfield project" refers to a project that is already in operation – in this case the comprehensive management of a service that was already taking place, although independently in each of the city councils.

Bid-winning companies in 2011

Winning joint venture: Joint venture: Mantenimiento de Infraestructuras, Sociedad Anónima, and Indra Sistemas, Sociedad Anónima.

Members of the winning joint venture: Mantenimiento de Infraestructuras, SA (Matinsa): www.matinsa.es/es. Indra Sistemas, Sociedad Anónima: www.indracompany.com.

Project and site management: SGS Tecnos, SA.

Contractor: Comarcal Council of the Barcelonès on behalf of AMB in 2016, and on behalf of the city councils of Barcelona, Sant Adrià de Besòs and Santa Coloma de Gramenet and the Generalitat de Catalunya in 2011.

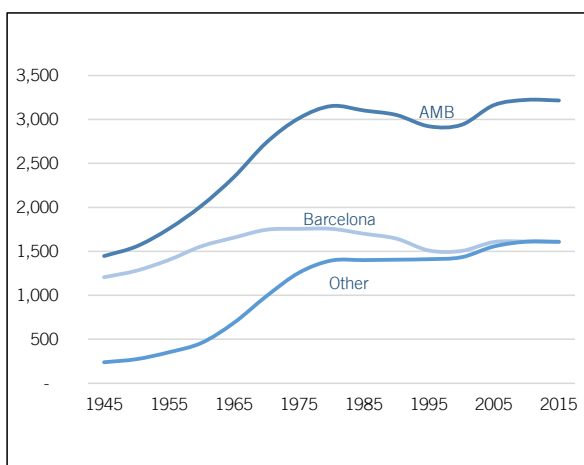
1. Introduction: Background and Description of the Tender

1.1. The Construction of the Ring Roads

During the mid-1980s, the urban plan for Barcelona shifted from a conception of the urban grid geared towards development to a vision that fostered the reconstruction and rehabilitation of the city center, as well as the recovery of public spaces and traditional neighborhoods. Even though the urban development plans from that era began to include small projects like building squares, gardens, parks, and civic and cultural centers, the lack of financing thwarted structural changes in the infrastructures and city organization, projects which were so necessary for the orderly growth of Barcelona. Fortunately, the choosing of Barcelona as a host for the Olympics in 1986 catalyzed investment in large-scale projects by the public institutions, which helped the city to undergo a profound restructuring and to improve its urban planning in both the middle and long term.

The construction of the ring roads is a clear example of a project that helped organize and manage traffic on both the metropolitan scale and within the city. Indeed, the increasing volume of traffic that the metropolitan area had experienced during the 1970s and 1980s, primarily because of an incremental increase in the population (see Figure 1), made it necessary to reconsider the traffic planning, which revealed the multiple traffic jams that routinely occurred in the city's entrances and exits (see Figure 2).

Figure 1. Evolution of the population of the metropolitan area of Barcelona (in thousands)



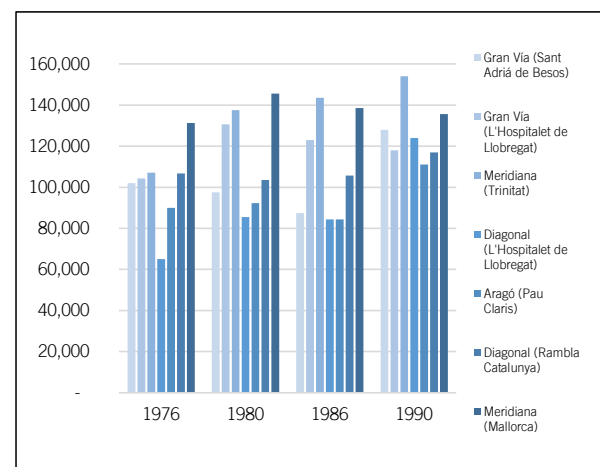
Source: Information provided by Ajuntament de Barcelona (2017). Available at: <http://www.amb.cat/web/area-metropolitana/dades-estadistiques/demografia/serie-historica>. [Accessed July 2017].

Given this, the ring roads were envisioned as an urban structure whose goals were:

- To increase the traffic capacity of both Barcelona and its metropolitan area by giving the city of Barcelona approximately 25% more kilometers of roadway open to circulation (Riera 1991).
- To improve the periphery-center connection, alleviating congestion that occurred at the entrance to the city, especially along stretches like Diagonal-L'Hospitalet de Llobregat and Meridiana-Trinitat (Figure 2).
- To serve as roads that collected-distributed both municipal and metropolitan traffic, increasing the number of vehicles that could enter the city every day from 588,000 to 880,000.
- To lower the traffic in the center of Barcelona, which had increased in stretches like Aragó-Pau Claris and Diagonal-Rambla Catalunya (Figure 2).
- To harmonize, integrate, and reactivate neighborhoods within the urban grid.

After they were built, the traffic in the center of Barcelona dropped by 15% (Díaz 2015), lowering the amount of congestion at the entrance to Barcelona and consequently the amount of time wasted by daily users. The construction of the ring roads is estimated to have lowered the average ride time by 8 minutes because of the increase in the average speed per journey (from 16.3 km/h to 24.8 km/h) (Riera 1994).

Figure 2. Volume of traffic in the city center



Source: Díaz, S. (2012) - *Espacio público e Infraestructura Viaria en la Ronda de Dalt*. Available at: http://diposit.ub.edu/dspace/bitstream/2445/66383/1/01_treball%20final_DIAZ_SANDRA.pdf. [Accessed July 2017].

The effects of the ring roads were also felt beyond just traffic, given that the stretches that used to be saturated, like Meridiana and Gran Via, were recovered for use by pedestrians and bicycles or as public spaces, generating new alternative mobility behaviors instead of just private vehicles (Díaz 2015). Likewise, neighborhoods like Poble Nou and Nou Barris benefited from this project in that the ring roads became hubs joining them with the city center and the entire metropolitan area.

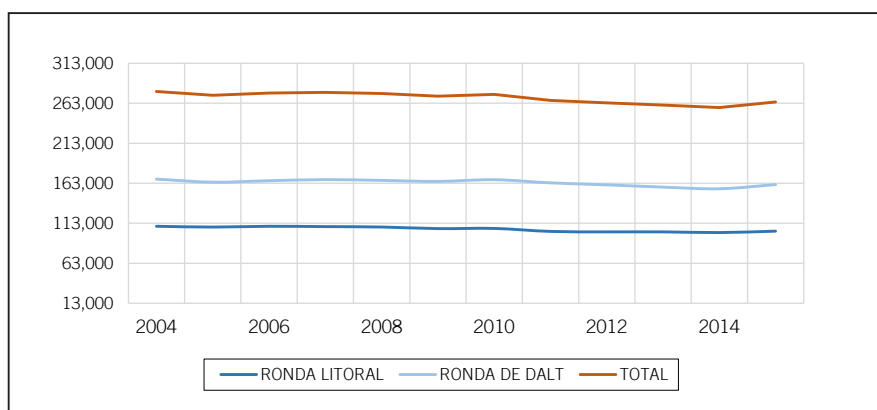
1.2. The Ring Roads Today

Today, the ring roads are a key part of the road infrastructures of Barcelona, and they are used at their maximum capacity by more than 300,000 vehicles and 1.2 million users per day.

Since 2004, the volume of traffic on the ring roads has remained relatively steady, with a slight 5% drop in the period 2004-2015 (Figure 3). Nonetheless, in the past two years there has been an increase in traffic, primarily linked to the slight upswing in the economy.¹

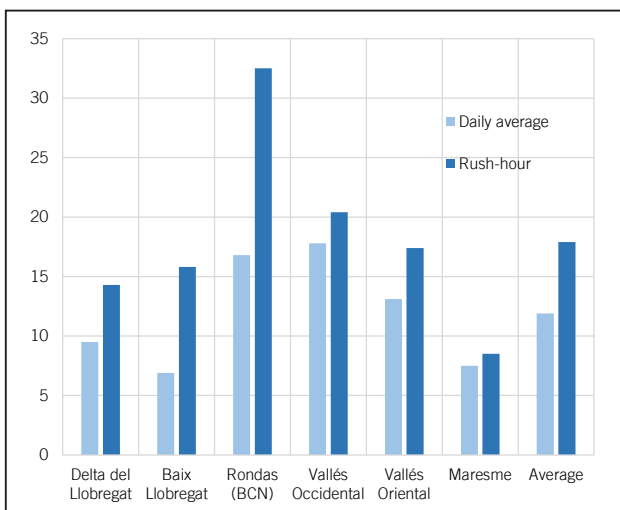
Despite this, the fact is that the ring roads of Barcelona are suffering from a serious congestion problem owing to their overuse. Even though the causes of this congestion fall outside the scope of this article, it is important to note that this congestion is coming at a high social cost via air pollution, and a high economic cost via the users' wasted time. A study by the RACC (2007) found that the ring roads are the entrances to Barcelona where individuals lose the most time due to the constant traffic jams at rush hour, leading to an estimated cost of €120 million per year (see Figures 4 and 5).

Figure 3. Historical evolution of the sum of the intensity of traffic on the ring roads at specific times



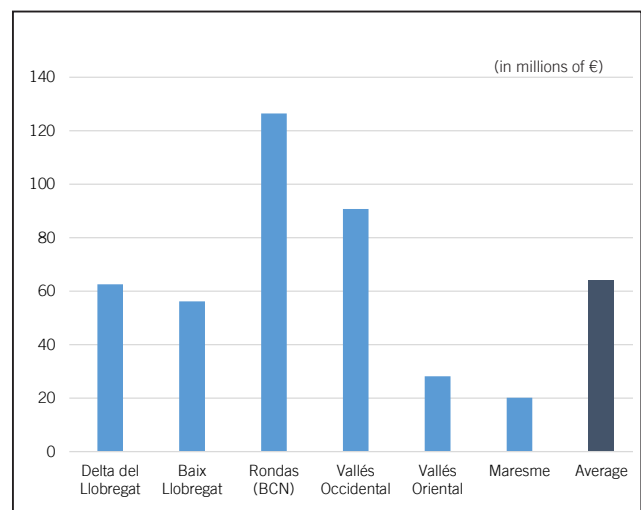
Source: Data provided by Àrea Metropolitana de Barcelona. Not available online.

Figure 4. Time wasted per user per day (in minutes)



Source: RACC, Automóvil Club, 2007. *La congestión en los corredores de acceso a Barcelona*. 1st ed. Barcelona: Fundación RACC.

Figure 5. Annual cost resulting from congestion



Source: RACC, Automóvil Club, 2007. *La congestión en los corredores de acceso a Barcelona*. 1st ed. Barcelona: Fundación RACC.

¹ García Vázquez, D. (2017). Las congestiones de tráfico en Barcelona aumentaron un 29% en 2014. *El País*. [online] Available at: https://elpais.com/ccaa/2015/01/29/catalunya/1422539991_962672.html. [Accessed 14 Jul. 2017].

Therefore, this article aims to analyze one of the main factors in the proper functioning of the ring roads: their maintenance. Given that the existing scholarly literature² reveals that appropriate maintenance of public roads is crucial to avoiding possible accidents, ensuring that the Barcelona ring roads are appropriately maintained is vitally important to (1) lower their accident rate, (2) prevent possible traffic jams caused by poor maintenance, and (3) reduce the potential social costs of those traffic jams.

Specifically, this article seeks to evaluate the public-private contract that was signed by AMB and the Comarcal Council of the Barcelonès for the maintenance of the Barcelona ring roads and Gran Via Nord. We shall focus on the two most recent contracts: from 2011 and 2016.

Therefore, the purpose of this article is to identify the characteristics of this contract, which can be regarded as good practices in public-private partnerships, along with which aspects of the process could be improved, always bearing in mind the service they have provided citizens.

Sound use of public-private partnerships can be extremely beneficial for public institutions and consequently for society as a whole, given that they help to provide citizens with a necessary service without generating short-term fiscal tensions in the public sector. Nonetheless, this can only happen if the tender processes are carried out properly; an appropriate evaluation is essential for the development of good practices to be used in the future.

1.3. Scope and Characteristics of the Contract to Be Analyzed

Before performing an in-depth analysis of the tender process, it is important to outline the areas of action under the public-private partnership for the maintenance of the Barcelona ring roads.

Technical Scope – What Does the Contract Cover?

The purpose of this contract is to provide sound maintenance of Barcelona's ring roads. According to the award contract, the concept of "maintenance" of the ring roads is limited to:

- **Conductive operations:** Related to the jobs and services needed to support road management and maintenance tasks. Several subgroups can be identified:
 - Operations involving surveillance services, attending to incidents and accidents, occasional signage, maintenance of the highway elements in conditions that cannot cause problems under normal traffic conditions.
 - Winter highway administration operations.
 - GIS management operations, attention and control of centralized systems and programming, monitoring and control of execution.
- **Systematic, regulatory, and preventative operations:** All operations performed periodically that include the jobs needed to maintain the roads. They include:
 - Cleaning operations (ditches, roadways, signals, SOS posts, lighting, reflectors, etc.).
 - Mowing operations.
 - Operations involving installations, such as systematic obligatory checks in compliance with the regulations on safety and the sound state of the road.
- **Corrective operations:** Related to ordinary conservation tasks that result from a need or unforeseen circumstance, or from decisions made that necessitate their execution. Examples of situations to be corrected include earthworks, pavements, drainage of structures and brick work, signage and lighting, among others.

On a general scale, these tasks to be performed by the contractor remained the same in the contracts from both 2011 and 2016.

It is important to note that the cost of lighting was not included in these contracts, given that it is paid directly by AMB.

Geographic Scope – What Area Falls Within the Contract?

The territorial scope of maintenance includes Barcelona's Ronda de Dalt (C-32 and B-20) and Ronda Litoral (B-10) continuously from the Nus del Llobregat (kilometer 59+054 on the C-32) to El Morrot (kilometer 12+110 on the B-10), including the Nus de la Trinitat and the entrances to the C-58, the off-ramp of the exit leading to La Maquinista and Can Peixauet bridge, and the municipal stretch of Barcelona's Gran Via Nord (from the last traffic signal after Plaça de les Glòries to the boundary of the township of Sant Adrià de Besòs).

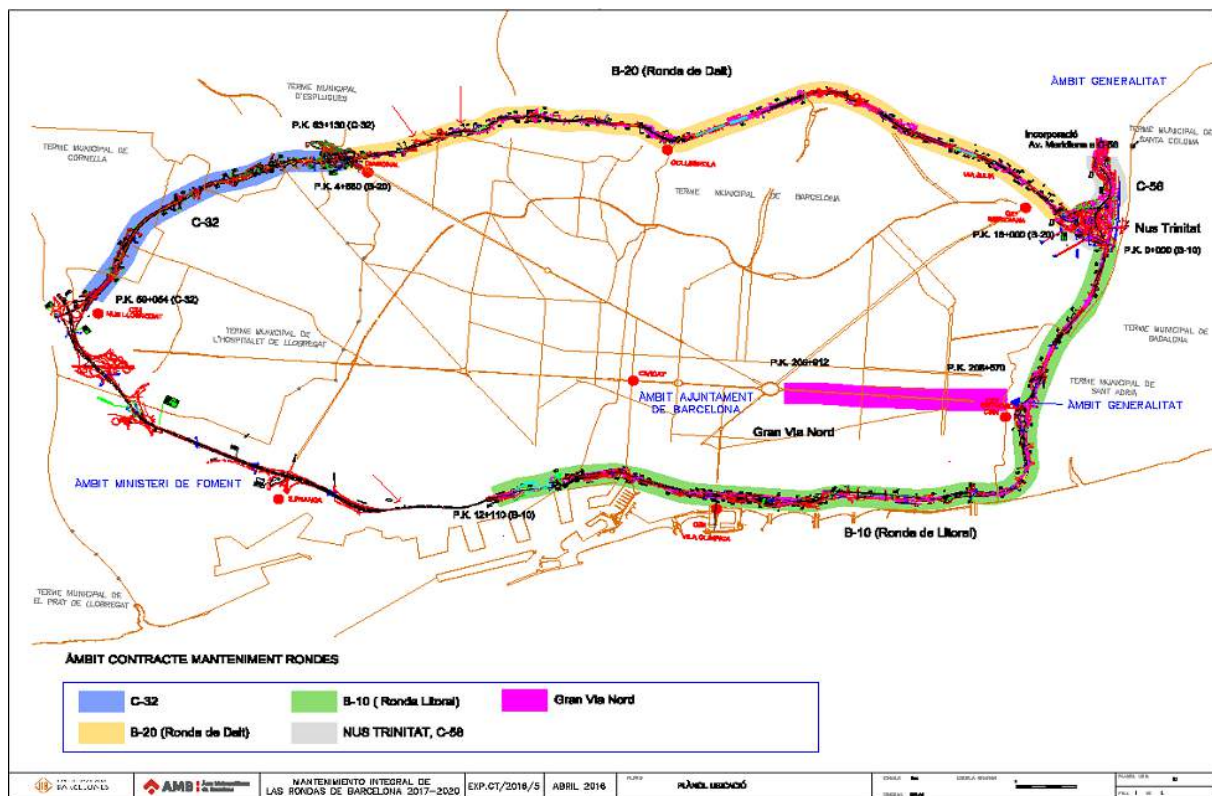
² See, for example:

Klein, R.H. et al. *Influence of Roadway Disturbances on Vehicle Handling*. Systems Technology Inc, Hawthorne, California, 1976.

Baker, J.S. *Traffic Accident Investigator's Manual*, 4th ed. Northwestern University, Evanston, 1975.

Quinn B.E., and S.E. Hildebrand. "Effect of Road Roughness on Vehicle Steering." In *Highway Research Record 471*, Highway Research Board, Washington, D.C., 1973.

Figure 6. Geographic area of the maintenance contract



Source: Information provided by AMB.

The distribution of kilometers per road is:

Road	Kilometers
B-20 (Ronda de Dalt Nord) + Nus Diagonal	11.42
C-32 (Ronda de Dalt Oest)	4.08
B-10 (Ronda Litoral)	12.11
Nus Trinitat + all off-ramps	13.56
Total ^a	41.17

^a Excludes the north stretch of Gran Via.

Institutional Scope – Who Is Contracting?

In both contracts, the institutional contractor was the Comarcal Council of the Barcelonès, which was responsible for publishing an announcement that the contract was going to be awarded and for evaluating the entire contracting process.

The call for proposals for 2011 and 2016 differed in one respect. The 2011 contract was financed directly by the respective city councils of the municipalities within the territorial scope of the contract: the Barcelona City Council, the Sant Adrià de Besòs City Council, and the Santa Coloma de Gramenet City Council. It was also financed by the Generalitat de Catalunya.

Given that the maintenance of the ring roads legally depends on the Metropolitan Area of Barcelona, in 2016 the contract started to be financed by AMB. Nonetheless, the capital used to finance the contract still comes from the aforementioned city councils and the Generalitat de Catalunya.

We should also mention that through another public tender process, the Comarcal Council of the Barcelonès also hired an organization to serve as project and site manager, which took care of drawing up the project and defining all the technical and territorial aspects, as well as providing a point of reference for the materials needed during the validity of the contract.

Temporal Scope – During What Time Period?

The 2011 call for proposals provided for a two-year contract that could possibly be extended by an additional two years (that is, a total of four years). Given that AMB had to defray the costs of ring road maintenance in 2016, the contract period was extended by an additional year (2016) so that this institution could carry out all the legal procedures needed to formalize the contract with enough time. Therefore, the contractual period of the 2011 call for proposals began in 2012 and ended in 2016.

Unlike the previous contracts, the period of the 2016 contract (which begins in 2017) was lengthened to a minimum of four years with a possible extension by an additional two years. The reason for this extension of the contract is that AMB sought to break with political cycles in the awarding of contracts. Thus, with a four-year contract, the project will go through two governments, ensuring greater stability in the maintenance of the ring roads over time.

The methodology we shall use to evaluate this tender process will be the one used by the Specialist Centre on PPP in Smart and Sustainable Cities at IESE Business School. This methodology revolves around identifying the main factors that contribute to the creation of a sound public-private partnership and evaluating to what extent these factors are fulfilled in the tender process, as stipulated by bodies like the United Nations, the World Bank, and the European Commission. Therefore, the evaluation will take a primarily qualitative perspective, even though data will also be used to support certain arguments.

This article is divided into six sections. Section 3 describes the tender process and explains how the contracting process was organized and determined. Section 4 examines the internal features of the project, with a particular focus on the companies contracted, how the project was financed, and what aspects of governance and risk mitigation were chosen for this public tender. Section 5 describes the external features of the project, that is, the economic, political, and social situation surrounding the context of the contract. Section 6 evaluates the impacts of the project, especially the impacts that the contract had on the administration, the citizens, the environment, and the winning companies. Section 7 evaluates the methodologies of PPPs and identifies which United Nations development goals are fulfilled through the implementation of this project.

2. Tender Process

The tender processes of both calls for proposals were relatively similar and were divided into several phases: (1) Announcement of the process; (2) Evaluation of proposals; (3) Awarding of the project; (4) Start of operations; (5) Execution of the project; and (6) Completion of the operations.

The **announcement of the process** establishes the minimum conditions needed to be eligible for the tender, the main tasks to be performed, the maximum estimated cost of the project, and a description of the tender process. The announcement is published in different official journals,³ with a cost that is borne by the contracting company or companies.

The companies or joint ventures have to submit a series of documents that certify (1) their economic and financial solvency, (2) their technical and professional capacity, and (3) other general legal eligibility factors.

The minimum financial conditions stipulate that the bidder's annual turnover within the previous three years must be at least €5 million per year either individually or together for the different companies participating in a joint venture.

Once they have submitted the application, the bidders must provide a provisional guarantee in case they prematurely withdraw their bid before the contract is awarded; this guarantee was €150,000 in 2011 and €160,000 in 2016.

The **evaluation of the applications** is divided into several rounds of elimination, first eliminating the applicants that do not meet the minimum contracting conditions, and then evaluating each candidate using points-based criteria that distinguish between variables that are not automatically quantifiable (such as staffing and organizational factors) and automatically quantifiable variables (monetary bid). The maximum score that bids can earn is 100.

Specifically, the criterion used to evaluate the bids is divided into two parts: an evaluation of the technical bid (50 points) and an evaluation of the monetary bid (50 points). In the 2011 call for proposals, the technical bid included four factors: the suitability of the material means and human teams (15 points), the descriptive report of the work and the quality guarantee plan (15 points), improvements over the comprehensive maintenance project (10 points), and safety and

³ Official Journal of the European Union, Boletín Oficial del Estado, Diari Oficial de la Generalitat de Catalunya, and Boletí Oficial de la Província de Barcelona.

health measures that improve upon those proposed in the project's safety study (10 points). The points in the monetary bid are established based on the lowest bid received, as long as it is not recklessly low, which is assigned 50 points. All the values of the remaining bids are assigned by taking the lowest bid as the point of reference.

Once the bids have been evaluated by the Contracting Committee, the contracting body then ranks them in descending order by applying the aforementioned criteria. According to the result of this ranking, the contracting body identifies the bidder that has submitted the most advantageous bid.

The contract is awarded after the bidder pays the cost of the announcements and the definitive guarantee, which was 4% of the contract awarding budget in the 2011 and 5% in the 2016 call for proposals. Once the contract has been signed and formalized, the decision on the winning bidder is published in the official newsletters and journals.

When awarding the 2016 tender process, a total of 17 companies or joint ventures were part of the selection process. Of the 17 companies, only two were individual companies. The remaining 15 were joint ventures made up of several companies.

The three finalists were, ranked by scores:

Table 2. Top-ranking bids in the 2011 call for proposals

Company or joint venture	Economic bid	Points on monetary bid	Points on technical bid	Total score
Joint venture of Mantenimiento de Infraestructuras, SA + Indra Sistemas, SA	8,203,060.15	48.73	40.35	89.08
Joint venture of José Antonio Romero Polo, SA + Constructora de CALAF, SAU + ELECNOR, SAU	7,994,830.87	50.00	36.80	86.80
Joint venture of COMSA, SAU + EMTE SERVICE, SAU	8,610,141.84	46.43	38.55	84.98

Source: Information provided by AMB.

As seen in Table 2, even though the winning joint venture did not score the most points on its monetary bid, it scored higher on its technical bid, which helped it reach the highest total score. The joint venture of Mantenimiento de Infraestructuras, SA and Indra Sistemas, SA stood out for its score on the suitability of the human and material means, the descriptive report of the jobs, the quality guarantee plan, and the safety and health improvements proposed, where it earned one of the highest scores and the second highest among its competitors.

Subrogation of Personnel

Regarding the personnel, bearing in mind the provisions contained in the 5th Collective Bargaining Agreement of the Construction Industry (Article 27), the contractor is also obligated to subrogate the work contracts of the personnel affiliated with the maintenance service of the Barcelona ring roads in accordance with the list provided in the tender according to the provisions of Article 120 of the recast text of the Law on Public Sector Contracts.

3. Internal Characteristics of the Project

3.1. Members of the Winning Team

Indra Sistemas

Indra is a Spanish multinational that offers consultancy services on transportation, defense, energy, telecommunications, financial services, and public sector services. Headquartered in Spain, Indra is present in more than 140 companies and has a turnover of more than €2.6 billion per year.

Indra began operations in 1993 and since then has focused on offering systems and operations (including outsourcing and the application of maintenance) and business processes where technology is a differentiating, strategic factor.

Approximately one-third of the company's annual revenues come from international markets, primarily Europe and the United States, although Latin America is the geographic region where Indra has been operating the most intensely in recent years.

Matinsa

Matinsa is part of the FCC Group and is a leader in the Spanish infrastructure conservation market. Its activities encompass all spheres of conservation of large infrastructures (roads, railways, hydraulic works, and timber works), as well as services to improve energy efficiency.

In 2015, its turnover was over €66 million and it employed 1,115 people. It currently has more than 20 years of experience in the conservation sector and is known for offering its clients quality services and for investing in RDI projects in the infrastructure sector.

3.2. Joint Venture Created for the Project

The companies that won the project (Matinsa and Indra) created a joint venture, with Indra having a 30% share and Matinsa a 70% share. Within the maintenance contract, Indra is in charge of the maintenance systems of lighting, ventilation, energy, and SOS posts.

3.3. Financing and Method of Payment

The financing for the project was authorized to be charged to the Comarcal Council of the Barcelonès, to which were added the resources contributed by AMB, or in 2011 by the city councils of Barcelona, Sant Adrià del Besòs, and Santa Coloma de Gramenet and the Generalitat de Catalunya.

The quantity surveys and payments were made monthly based on the work that was executed, as cited in the conditions. Therefore, the project was and will be paid by monthly certifications to the contractor, equivalent in number to the months of the contract's duration.

The assessment of collection work for each of the certifications was done by applying per-unit contractual prices that were established before the contract was awarded. There is also a quantity survey established that estimates the number of units to be used for the duration of the project's application. All of these per-unit prices and quantity surveys are established by the contractors and evaluated by the Contracting Committee.

If the project and site manager believes that a modification of the number of units in the project is needed, he must secure an authorization from the Comarcal Council of the Barcelonès (or from the AMB starting in 2016) to initiate the corresponding proceedings. Nonetheless, variations can be introduced without the need for prior approval when they entail altering the number of units actually executed compared with those planned in the project measurements, as long as the price increase is not 10% higher than the initial contract price.⁴

The contractor, in turn, has no right to request reimbursement of any amount for tasks performed without the prior authorization from the project and site management team for changes larger than those stipulated.

As seen in Table 3, less was spent than was budgeted every year, so there was no need for the Comarcal Council of the Barcelonès to approve changes in the bill of quantities per the contract.

⁴ Boe.es. (2017). *BOE.es - Documento CE-D-2015-1115*. [online] Available at: <https://www.boe.es/buscar/doc.php?id=CE-D-2015-1115> [Accessed 14 Jul. 2017].

Table 3. Difference between amount budgeted and spent

Year	Budgeted	Total spent	Difference
2012	5,154,106.95	€4,840,790.56	€313,316.39
2013	5,257,189.09	€5,011,986.04	€245,203.05
2014	5,233,597.29*	€5,011,943.01	€221,654.28
2015	5,253,356.67*	€5,026,988.90	€226,367.77

* Adjusted for inflation in the province of Barcelona, considering the previous years, as stipulated by the list of particular administrative conditions.

Source: Information provided by AMB.

The reason why the budget is always larger than the spending is because it is always preferable to overbudget the cost of the contract in order to have enough funds if an extraordinary expenditure higher than those forecast is needed in the future. However, the price of the project was always set higher than the market price in order to encourage more companies to submit proposals to the tender and thus foster competition and innovation in the projects submitted.

We should note that despite the fact that the budget varies every year, the service provided is always the same. This variation is a consequence of estimated spending and the CPI.

3.4. Risks and Risk Mitigation

Just as in any project submitted to public tender, a risk evaluation is essential to the success of the service. The literature usually states that the risk should be transferred to the contractual party that is best able to bear it. The main risks identified in this project were:

Risk of completion of the service: As with any other public tender, there is a risk that private companies will not provide the services effectively. This can be a problem both for the reputation of public institutions and, ultimately, for citizens, as they will be unable to benefit from the service.

If the service is not completed within the stipulated period, the Comarcal Council of the Barcelonès could retain the provisional guarantee until these services are completed, within a guarantee period of one year.

Risk of provision of poor services: If the contracting company somehow causes damage or there is an appraisal of damages by the project and site manager, the Comarcal

Council of the Barcelonès could permanently retain the provisional guarantee and, in addition, the contractor would have to compensate the Comarcal Council of the Barcelonès for any damage caused.

Financial and solvency risk: Taken on by the public parties to the contract: that is, the city halls of the municipalities and the Generalitat de Catalunya in 2011 and AMB in 2016, as well as the Comarcal Council of the Barcelonès.

Inflation risk: The inflation risk is borne by the companies Indra and Matinsa, given that the contract stipulates that the table of prices agreed upon before the contract was awarded cannot be adjusted for the duration of the project. Therefore, if there is a price increase, the cost of this increase must be borne by the private party to the contract. Nevertheless, due to the short time frame of this contract, there is unlikely to be a significant risk of inflation for any of the parties involved.

Demand risk: If there is a significant increase in the number of accidents and the amount of reparations to be paid, all of the costs will be borne by the public sector, as any additional reparations or maintenance costs that were not set out in the contract are additional costs for public institutions.

If there is an increase in the demand for services not forecast by the agreed budget, the Comarcal Council of the Barcelonès and therefore the remaining public institutions must pay for the extra material needed to provide the service.

Political risk: Any complaint or problem stemming from the construction service or the actions of the companies shall be borne by the Comarcal Council of the Barcelonès and AMB as the parties ultimately responsible for the project.

Risk of damages: Given the possibility that the companies may cause damage to third parties during the period of operations, the winners of the tender are obligated to take out a liability policy for at least €3 million.

3.5. Technical Elements

All the technical elements of the project are outlined by the project and site management team, which draws up the project based on which the tender of the maintenance contract is established.

The operations that the winning companies must carry out are summarized in **Exhibit 1**, which also includes a table of the elements that are excluded from the contract, such as maintenance of the surveillance equipment, regulation and mobility of traffic, and the communications network owned by outside operators.

3.6. Governance

The main agents and institutions that were part of the project were:

- **The Comarcal Council of the Barcelonès:** The Comarcal Council of the Barcelonès (CCB) was created in 1988 and is in charge of administering the comarca [administrative division] of El Barcelonès and contributing to expanding the services and investments in the five municipalities that comprise it: Badalona, Barcelona, L'Hospitalet de Llobregat, Sant Adrià del Besòs, and Santa Coloma de Gramenet. The competences of the CCB include carrying out what is delegated or assigned to it by the different public administrations in Catalonia, including the Generalitat de Catalunya, the Diputació de Barcelona, the municipalities, and local organizations. It is also in charge of executing the general metropolitan planning systems and rehabilitating and managing the homes within the boundaries of the comarca.
- **The Metropolitan Area of Barcelona (AMB):** The AMB is the public administration for the metropolitan area of Barcelona, a large conurbation made up of a total of 36 municipalities. AMB's responsibilities are related to the territory, urban planning, mobility, housing, the environment, economic development, and social cohesion. Its main purpose is to provide public services within the metropolitan area by supporting the city councils.

AMB's governing bodies are assembled after the municipal elections, which are called every four years.

- **The project and site management led by SGS Tecnos, SA:** Assigned via a public tender process as well, the project and site management team (assigned to SGS Tecnos in this case) is tasked with creating the technical frameworks needed to carry out the project, as well as offering quality monitoring and control of the contractor's fulfilment of the contract.

SGS is a world leader in project inspection, verification, testing, and certification. With more than 85,000 employees, it operates all over the world with a network of more than 1,800 offices.

At the same time, a body was created to assist with the contracting during the selection process, called the *Contracting Committee*. Its purposes are those stipulated in Article 320 of the Law on Public Sector Contracts.⁵ The Contracting Committee acts as the entity that assists the contracting body, primarily by (1) safeguarding the legal formalities in the contracting, such as the requirements that the company or companies must meet during the contracting process, and (2) evaluating the bids and the proposed adjudication in the contracting body.

The Contracting Committee is made up of the president, who is the director of the Comarcal Council of the Barcelonès, and a series of members, including:

Table 4. Members of the Contracting Committee for the 2011 and 2016 calls for proposals

2011	2016
<ul style="list-style-type: none"> • Deputy director of the Comarcal Council of the Barcelonès 	<ul style="list-style-type: none"> • The manager of AMB
<ul style="list-style-type: none"> • The head of the Technical Services Office of the Comarcal Council of the Barcelonès 	<ul style="list-style-type: none"> • The general infrastructure coordinator for AMB
<ul style="list-style-type: none"> • The comptroller of the Comarcal Council of the Barcelonès 	<ul style="list-style-type: none"> • The head of the Territory Office of the Comarcal Council of the Barcelonès
<ul style="list-style-type: none"> • The head of economic services of the Comarcal Council of the Barcelonès 	<ul style="list-style-type: none"> • The secretary of the Comarcal Council of the Barcelonès
<ul style="list-style-type: none"> • The assistant technician for construction of the Comarcal Council of the Barcelonès 	<ul style="list-style-type: none"> • The comptroller of the Comarcal Council of the Barcelonès
<ul style="list-style-type: none"> • One representative from each city council, to be chosen by the city 	<ul style="list-style-type: none"> • The head of the Economic Management Service of the Comarcal Council of the Barcelonès
<ul style="list-style-type: none"> • One representative from the Department of Territory and Sustainability from the Generalitat de Catalunya, to be appointed by this department 	

Source: Information provided by AMB.

⁵ Spain. Royal Legislative Decree 3/2011 dated November 14, 2011, which approves the recast text of the Law on Public Sector Contracts. [Internet] *Boletín Oficial del Estado*, 16/11/2011, No. 276, pp. 135-136 [checked December 21, 2016]. Available at: <https://www.boe.es/buscar/pdf/2011/BOE-A-2011-17887-consolidado.pdf>. [Accessed July 2017].

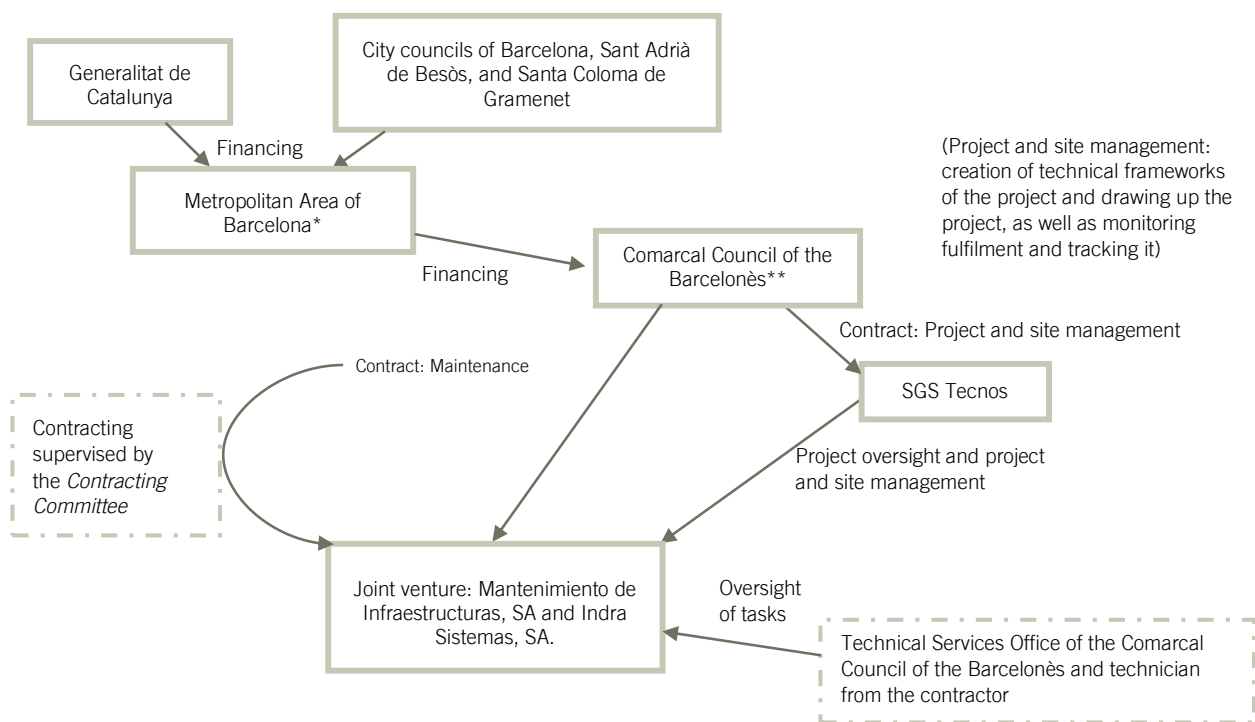
The oversight of the work is monitored not only by the project and site management team but also by the Office of Technical Services of the Comarcal Council of the Barcelonès (in 2011) and the technicians appointed by AMB (in 2016). At the same time, the contractor appoints a technician to be in charge of the service before the administration and third parties; this appointment must be approved by the Comarcal Council of the Barcelonès (or AMB in 2016).

Until 2016, AMB was not included in the contract. Despite this, since the law attributes it the responsibility for maintaining the ring roads, in the new call for proposals AMB had to be included as the institution

in charge of financing in the 2016 contract. Thus, the financing shifted from the city councils and the Generalitat to AMB, and later it would shift to the Comarcal Council of the Barcelonès. Nonetheless, the project and site management is wholly under the supervision of AMB.

The reason for including the Comarcal Council of the Barcelonès as a contracting institution for the maintenance contract is that AMB believes that taking advantage of the council's technical experience gained in previous years can help the tender proceed more smoothly.

Figura 7. Structure of the project governance



* In 2011, the city councils of Barcelona, Sant Adrià de Besòs and Santa Coloma de Gramenet and the Generalitat de Catalunya directly financed the Comarcal Council of the Barcelonès.

** The project and site management contract does not involve the Comarcal Council of the Barcelonès in the 2016 call for proposals.

Source: Information provided by AMB.

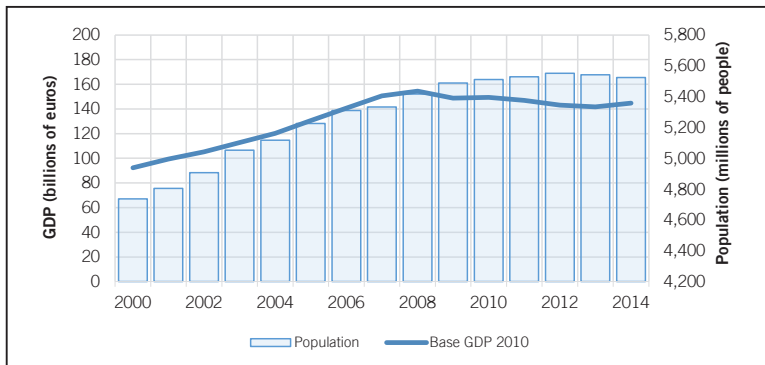
4. External Characteristics of the Project

4.1. Economic Conditions

The GDP of the province of Barcelona rose steadily until 2008 (Figure 8), with relatively stable inflation of around 3.5% (Figure 9). With the arrival of the

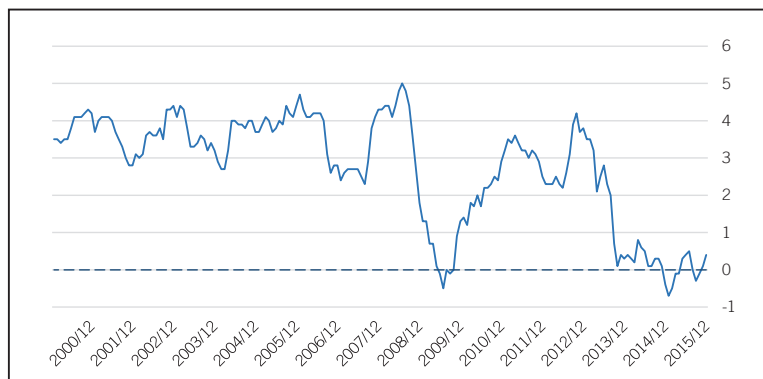
economic crisis, the GDP dropped around 2% in four years, the outcome of a downturn in the economic activity in the metropolitan area. Consequently, the financing of public projects by the administrations was also negatively affected, given that both the Generalitat de Catalunya and the Spanish government experienced a substantial increase in their debt (see Figure 10) and were thus forced to decrease spending in the autonomous community.

Figure 8. Population and GDP of the province of Barcelona



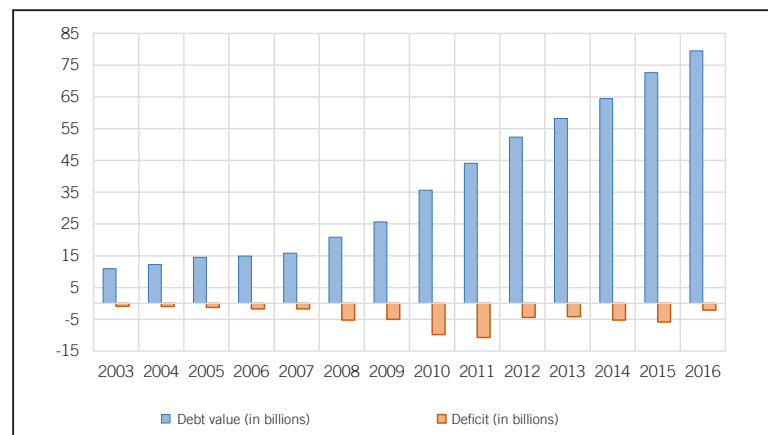
Source: Prepared by the authors based on Statistical Institute of Catalonia (Idescat), [Accessed July 2017].

Figure 9. Evolution of the CPI in the province of Barcelona



Source: Prepared by the authors based on data from INE, Estadística territorial, 2017, <http://www.ine.es/FichasWeb/RegProvincias.do?codMapa=9>, and Indices nacionales: general y de grupos ECOICOP, <http://www.ine.es/jaxiT3/Tabla.htm?t=22344&L=0>, [Accessed July 2017].

Figure 10. Evolution of the deficit and debt in the autonomous community of Catalonia (2003-2016)



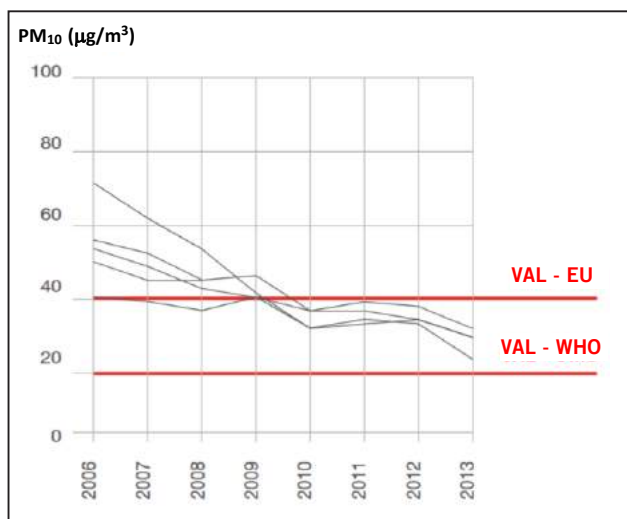
Source: Prepared by the authors based on data from Autoridad Independiente de Responsabilidad Fiscal. Airef Data Lab (2017). Available at: <https://public.tableau.com/profile/autoridad.independiente.de.responsabilidad.fiscal#!/> [Accessed July 2017].

4.2. Legal and Legislative Conditions

The legal scope of the contract is contained in the Law on Public Sector Contracts.⁶ According to this law, the categorization of this contract, as stipulated in Article 10, is a services contract. However, this contract is subject to harmonized regulation, as stated in Article 13 of this law, given that the estimated value of the contract is higher than €209,000.

Harmonized regulation is a legal sphere imposed by EU law that establishes the guarantees and necessary conditions at the time a public tender process is engaged. One of the most noteworthy guarantees is the obligation to publish the call for proposals of the selection process in the Official Journal of the European Union (OJEU), in addition to the announcement published in the Boletín Oficial del Estado, yet it also contains a general prohibition on establishing conditions in tender processes that put up unjustified obstacles for certain companies to be able to compete. For example, regarding the technical specifications, they must refer, if applicable, to technical specifications contained in national norms that incorporate European norms, to European technical suitability documents, to common technical specifications, to international norms, to other technical systems of reference developed by European standardization bodies, etc. All of this notwithstanding the mandatory instructions and technical regulations of the state, as long as they are compatible with EU law.

Figure 11. Evolution of the maximum record of PM10 in the air



Source: <http://lameva.barcelona.cat/querespaires/es>. [Accessed July 2017].

⁶ Spain. Royal Legislative Decree 3/2011 dated November 14, 2011, which approves the recast text of the Law on Public Sector Contracts. [Internet] Boletín Oficial del Estado, 16/11/2011, No. 276, [checked December 21, 2016]. Available at: <https://www.boe.es/buscar/pdf/2011/BOE-A-2011-17887-consolidado.pdf>.

Although this is not an exclusive exemption of contracts that are subject to harmonized regulation, it is worth noting – given the goal of ensuring that the processes are open to European competition – that non-Spanish companies from other EU member states do not need classification to participate in a contracting proceeding in which classification is required for nationals.

4.3. Political Conditions

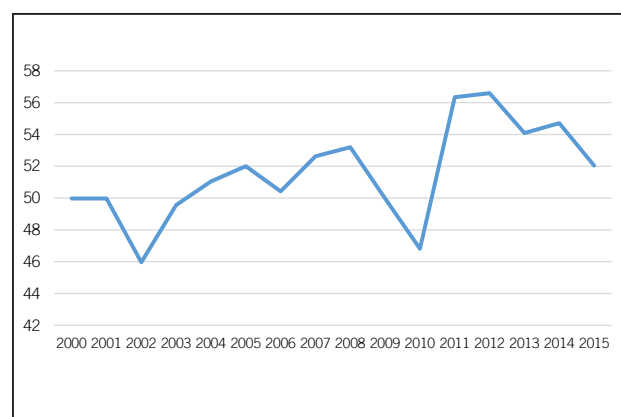
In recent years, the political climate in Catalonia has been characterized by a focus on the independence movement, which has sparked serious political tensions between the Catalan government and the Spanish state.

The Catalan Parliament is currently made up of a simple majority of a new electoral party called “Junts pel Sí” (Together for a Yes-Vote), whose goal is to make a unilateral declaration of Catalonia’s independence. Even though it could be argued that Catalonia’s potential independence could affect the economic and political stability and create a great deal of uncertainty in the private sector, it is unlikely to affect the maintenance contract of the ring roads.

4.4. Environmental Conditions

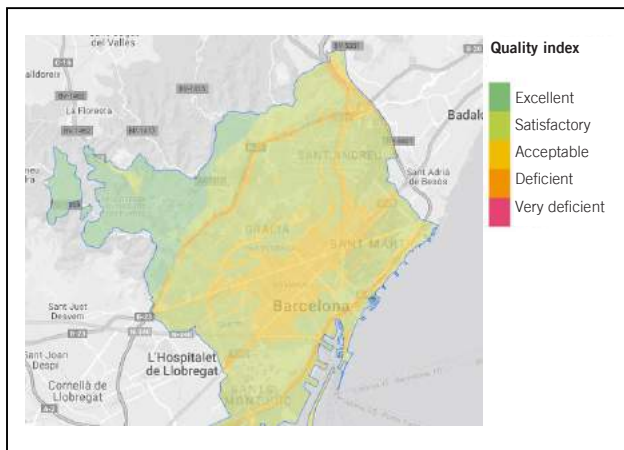
The air quality in the Barcelona metropolitan area has improved significantly in recent years. The air quality index measured by Idescat (Figure 12) shows that air quality has improved 23% since 2002. However, the ring roads are clearly a place where pollution concentrates because of the large amount of traffic that travels on them (see Figure 13).

Figure 12. Evolution of the air index in Barcelona



Source: Prepared by the authors based on data from Idescat. Available at: <https://www.idescat.cat/pub/?id=aec&n=236>. [Accessed July 2017].

Figure 13. Map of the air quality index



Source: <http://ajuntament.barcelona.cat/qualitataire/ca/>. [Accessed July 2017].

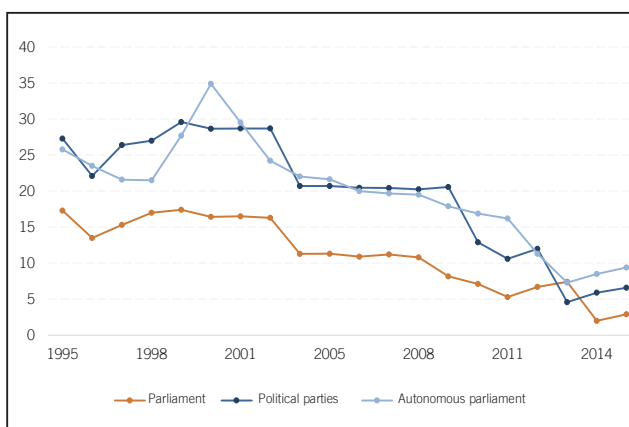
5. Impacts of the Project

5.1. Administration

The administration is positively affected by this tender, since it is able to carry out a project that requires extensive technical and logistical knowledge at a lower cost than projected (Table 3), while also ensuring that all conditions are met within the established time frame.

In terms of society, offering citizens good services, such as the conditions of the ring roads, generates trust in public institutions – something that has declined in recent years (Figure 14).

Figure 14. Evolution of trust in institutions (Spain)



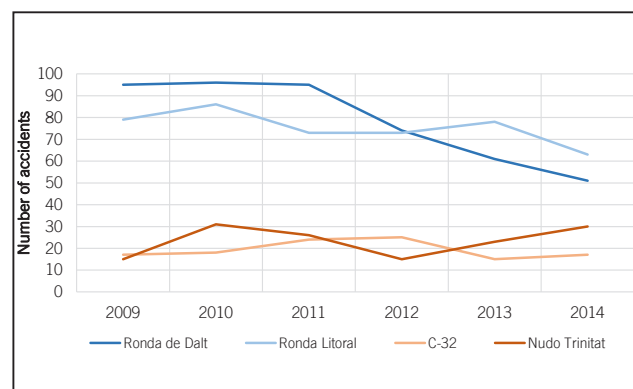
Source: Prepared by the authors based on data from CIS. Available at: http://www.cis.es/cis/openm/ES/1_encuestas/estudios/ver.jsp?estudio=14338. [Accessed July 2017].

5.2. Residents

The residents benefited from the project given that the maintenance of the ring roads was effectively carried out. Even though it is difficult to specifically quantify the effect it has had, in recent years there has been a downswing in the accident rate on the ring roads (Figure 15), which may somehow be attributable to factors such as the implementation of the points-based driving license, in addition to their proper maintenance. Since 2009, the number of accidents dropped by around 45% on the Ronda de Dalt and 20% on the Ronda Litoral. However, the rates on the stretches of the C-32 and Nus de la Trinitat remained relatively stable.

In this sense, the residents have been positively affected by avoiding possible risks of the loss of human lives and personal damages.

Figure 15. Evolution of the number of accidents per year on the ring roads



Source: SGS (2015) - Estudi d'accidentabilitat a les Rondes de Barcelona - Període 2009 - 2014.

5.3. Environment

As noted above, the air quality in Barcelona has improved in recent years (Figures 11 and 12). Although this may have been caused by a host of factors, including improvements in public transportation services and the incorporation of alternatives to the private vehicle in the urban grid, this trend may also be caused by a lower accident rate (Figure 14), which consequently leads to a lower volume of congestion compared with the situation when there was no proper maintenance of these public roads.

5.4. Winning Companies

The winning companies, in turn, saw the chance to carry out a key project in Barcelona's urban installations. This not only allows these companies to gain experience in projects of this type, but it also means that their names will be tantamount to companies capable of successfully engaging in public-private partnerships.

6. Assessment of the Project

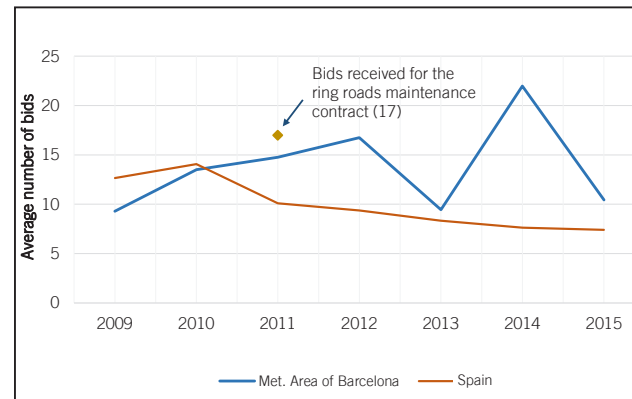
6.1. PPP Methodology

This PPP is the outcome of a contract between some of the metropolitan institutions in Barcelona and a private consortium formed to provide maintenance work on Barcelona's ring road. The ring road was built for the Olympic Games in 1992; it was one of the historical public works projects that characterized the city's urban transformation during that period. Since then, the new ring roads have done a great deal to improve vehicle circulation in the city. Therefore, the contract for maintenance road is a brownfield contract. There have already been two two-year contracts (2007 and 2011), and there is a new four-year project (renewable for two more years) starting in 2017.

The conditions related to the project are summarized in Table 5. The maintenance of the ring roads is an interesting case to analyze in the evaluation of public-private contracts because it is an example of a good tender process. The most favorable characteristics for this contract include:

- An open, competitive public bidding process that promotes competition in the private sector and consequently encourages greater economic efficiency in the end result. According to Tenders Electronic Daily, a database on public contracting around Europe, the number of bids received for the 2011 contract (17) is higher than the average number of bids received in Barcelona and Spain during that year (Figure 16), indicating that the contract was effectively announced. Both contracts, the one from 2007 and 2011, were the object of serious competition, with 14 and 17 firms participating in the tender processes. This is probably tied to the fact that the length of the contract is short, and therefore the risk is limited.
- An evaluation of the bids through the creation of contracting bodies which include all the units of governance in the project, such as the Contracting Committee.

Figure 16. Evolution of average number of bids in public-private contracts



Source: Prepared by the authors based on data from Tenders Electronic Daily (2017). Available at: <https://data.europa.eu/euodp/en/data/dataset/ted-csv>. [Accessed July 2017].

- An evaluation of the quality of the service through an **independent** external company and a technical representative of the public administration. As an independent company, this guarantees that there is no bias when evaluating the quality of the service provided.
- There are incentives for innovation by the companies in the selection process, which promotes a better service in each call for proposals. Indeed, of the 100 maximum points that can be assigned to each company in the selection process, 20 are related to proposing improvements to the service not initially considered in the project, which requires companies to consider how they can offer citizens a better service.
- A stable legal framework on public contracting, which guarantees and organizes all the parties' compliance during the contracting process.
- An equitable transfer of the risks that may arise during the process, ensuring that all the parties make a proper assessment of the costs and services to be delivered (albeit with possible improvements).
- The existence of some risk mitigation mechanisms such as guarantees and insurance, which encourage compliance with all the conditions provided for in the contract. The company must provide a definitive guarantee of 5% that ensures delivery of the services stipulated in the contract. Likewise, the company is required to take out a liability policy to cover possible damages caused to third parties.

However, the following are the characteristics to be improved:

- There is not much bundling, since the contract is primarily a maintenance contract. One exception is the integration of tasks among a variety of municipalities in order to achieve economies of scale.
- There is also little transfer of risk for the operating company. Perhaps other bundling options (the combination of construction and maintenance/operation) can be explored in the future, and with some transfer of risk, such as the risk associated with the management of the lighting on the ring roads, through a fixed contract that transfers to the company the risk of possible differences between real costs and the costs stipulated in the fixed contract. Since it does not include a value-for-money analysis, it is impossible to assess to what extent an alternative method of supplying the services would be more effective (such as a 100% public project).
- The annual contract does not encourage companies to contract more economically efficient materials, such as LED lighting or more durable materials that require fewer repairs in the long term. In this case, if the costs of lighting (which is currently paid by the Comarcal Council of the Barcelonès) were transferred to the company, or if economic incentives were included in the contract for the purchase of more efficient materials, the quality of the service could be improved at a lower cost for the administration.
- The system of governance is reasonably good inasmuch as it depends on the democratic institutions which, generally speaking, function smoothly in the Barcelona metropolitan area. An independent company supervises the quality of the service. This provides some degree of separation of powers, although the quality of this supervision also depends on the contract between the public authorities and this supervisory company, the number of bidders for the contract, etc.

Over time, the ring roads have become increasingly congested, thus contributing to associated externalities such as pollution and traffic jams.

It seems like a relatively short-term contract, which does not have the characteristics of standard PPP contracts in terms of length and bundling; nevertheless it can contribute reasonably to improving maintenance efficiency because the tender process was quite competitive.

However, the project does not address the issue of the negative externalities currently associated with Barcelona's ring roads, such as congestion and pollution. This is a major political problem that will require all the strengths of a fully effective regional government; this seems unlikely in the context of political paralysis that has surrounded Catalonia since 2012.

Comparison with other similar contracts

Compared with other international contracts, such as the M50 motorway in Dublin or the construction of the Aconcagua highway in Chile, we can see that the maintenance contract of the Barcelona ring roads has a much lower transfer of risks from the administration to the company. In the case of Dublin, for example, the administration transfers all the operational and maintenance risks to the contracting company during the entire length of the contract. Although it is true that the Dublin contract is different and lasts a longer time, the greater transfer of risks to the contracting company has a positive effect since:

- It ensures that the company can have a long-term strategy and avoids decisions determined by the short length of the contract.
- The amount of payments is constant, and therefore the public institution does not need to assign extraordinary amounts during years with a great deal of maintenance work.

In the case of the Aconcagua highway, the administration stipulated very high fines in the contract if the contractual maintenance conditions were not fulfilled. In the contract of the ring roads, however, the penalization of the company for failure to comply with the contract is relatively low, only 5% of the awarded budget.

Therefore, the maintenance of the ring roads would benefit from a better design of the risks transferred to the contractor and better incentives to avoid short-term behavior on the part of the companies. Likewise, higher penalties for the company for noncompliance with the tasks assigned in the contract could be considered as well.

Table 5. Summary of the conditions related to the selection and development of the project to maintain the ring roads

MAINTENANCE OF THE BARCELONA RING ROADS		
PPP METHODOLOGY	EXISTING	DETAILS
1. Procurement contracting and selection		
1.1. Value-for-money analysis or cost-benefit analysis	No	
1.2. Real competition for the contract	Yes	17 bidders
1.3. Contract evaluation committee	Yes	Evaluation of contractual process: Contracting Committee
2. Contractual issues & incentives		
2.1. Bundling	Not applicable	Not applicable because it is exclusively a service contract
2.2. Verification of quality	Yes	Contracting project and site management to an outside, independent company, along with a technical manager from the administration
2.3. Externalities	Yes	Positives
2.4. Length		2 years + 2 years (2011) and 4 years + 2 years (2016)
3. Risk, finance & payments		
3.1. Construction and operations	Transferred	To the joint venture
3.2. Risk of the demand	Not transferred	Need for more material than planned will be paid by the administration
3.3. Macroeconomic risk and public policies	Partly transferred	Inflation shall be covered by the joint venture
3.4. Payment mechanism	Monthly certifications	
3.5. Joint venture	Yes	Mantenimiento de Infraestructuras, Sociedad Anónima, and Indra Sistemas, Sociedad Anónima
4. Governance		
4.1. Transparency	Relative	Citizens cannot access the documentation to easily evaluate the process
4.2. Participative decision-making process	No	Residents of the metropolitan area do not have any decision-making power in the selection process
4.3. Internal/external monitoring	Yes	Contracting project and site management to an outside, independent company, along with a technical manager from the administration
4.4. Legal framework	Yes	
4.5. Distribution of jobs	Contracting	Comarcal Council of the Barcelonès with the Contracting Committee
	Monitoring compliance	Project and site management and CCB
	Renegotiation	With the approval of the CCB and the project and site management
	Regulation	Contracting Committee
	Operation & quality	Project and site management and CCB technician (and AMB in 2016)
5. Process of operations		
5.1. Excess costs	Yes	
5.2. Deadline	Not observed	
6. Potential Benefits		
6.1. Price certainty	Not applicable	
6.2. Transfer of responsibilities to the private sector	No	
6.3. Incentives for innovation	Yes	One of the conditions on points is innovation
6.4. Savings in public payments	Yes	Table 2
6.5. Life-cycle approach	Not applicable	
6.6. Incentive to deliver services on time	Yes	Not finishing within the time frame leads to retention of the guarantee

Source: Prepared by the authors.

Academic evaluation

This PPP is the outcome of a contract between some of the metropolitan institutions in Barcelona and a private consortium formed to provide maintenance work on Barcelona's ring road. The ring road was built for the Olympic Games in 1992; it was one of the historical public works projects that characterized the city's urban transformation during that period. Since then, the new ring roads have done a great deal to improve vehicle circulation in the city. Therefore, this is a brownfield contract. There have already been two two-year contracts (2007 and 2011), and there is a new four-year project (renewable for two more years) starting in 2017.

Over time, the ring roads have become increasingly congested, thus contributing to associated externalities such as pollution and traffic jams.

One positive aspect of these contracts is that they were the object of serious competition, with 14 and 17 bids participating in the tender processes for the first two periods. This is probably tied to the fact that the length of the contract is short, and therefore the risk is limited.

In this case, there is not much bundling, since the contract is primarily a maintenance contract. One exception is the integration of tasks among a variety of municipalities in order to achieve economies of scale. There is also little transfer of risk for the operating company. Perhaps other bundling options (the combination of construction and maintenance/operation) can be explored in the future, and with some transfer of risk, such as the risk associated with the management of the lighting on the ring roads, through a fixed contract that transfers to the company the risk of possible differences between real costs and the costs stipulated in the fixed contract.

The system of governance is reasonably good inasmuch as it depends on the democratic institutions which, generally speaking, function smoothly in the Barcelona metropolitan area. An independent company supervises the quality of the service. This provides some degree of separation of powers, although the quality of this supervision also depends on the contract between the public authorities and this supervisory company, the number of bidders for the contract, etc.

It seems like a relatively short-term contract, which does not have the characteristics of standard PPP contracts in terms of length and bundling; nevertheless it can contribute reasonably to improving maintenance efficiency because the tender process was quite competitive.

However, the project does not address the issue of the negative externalities currently associated with Barcelona's ring roads, such as congestion and pollution. This is a major political problem that will require all the strengths of a fully effective regional government; this seems unlikely in the context of political paralysis that has surrounded Catalonia since 2012.

6.2. United Nations Sustainable Development Goals

The maintenance of the Barcelona ring roads was also evaluated in keeping with the United Nations Sustainable Development Goals. The conclusions are summarized in Table 6.

Of all the goals, the one that stands out the most is the project's impact on industry, innovation, and infrastructure (goal 9). This goal refers to all projects that seek to invest in improving transportation infrastructures with the goal of increasing the productivity of the economy and encouraging the improvement of other sustainable development goals such as the environment or citizen health. Given that this project seeks to develop reliable, sustainable, resilient, and high-quality infrastructures, this document deems that the maintenance project of the ring roads has a high impact on goal 9: industry, innovation, and infrastructure.

Likewise, as mentioned earlier in the article, sound maintenance of the ring roads could have a major impact on the accident rates and traffic flow in Barcelona, which could in turn have a direct impact on the other goals. Even though there is no direct evaluation of the impact that the maintenance of the ring roads specifically has on their traffic flow, there is a great deal of scientific evidence on the positive effects of proper maintenance of public roads on accident rates. Therefore, the authors believe that it is valid to argue that sound maintenance will lower the accident rate of the ring roads, and consequently their congestion.

A lower level of traffic congestion will mean that users waste less time per trip, which entails considerable savings for the entire urban economy. As stated by the RACC, the cost of traffic jams on the ring roads in 2007 was €120 million per year. Proper maintenance service will help decrease this cost with a lower accident rate. Therefore, the authors believe that the impact of the maintenance of the ring roads with respect to goals 8 and 11, called "Decent work and economic growth" and "Sustainable cities and communities," respectively, will be high.

Table 6. Fulfilment of the United Nations Sustainable Development Goals

SUSTAINABLE DEVELOPMENT GOALS	MAINTENANCE OF THE BARCELONA RING ROADS	
	HIGH IMPACT	MODERATE IMPACT
1. No poverty		
2. Zero hunger		
3. Good health & well-being	✓	
4. Quality education		
5. Gender equality		
6. Clean water & sanitation		
7. Affordable & clean energy		
8. Decent work & economic growth	✓	
9. Industry, innovation & infrastructure	✓	
10. Reduced inequalities		
11. Sustainable cities & communities	✓	
12. Responsible consumption & production		
13. Climate action	✓	
14. Life below water		
15. Life on land		✓
16. Peace, justice & strong institutions		
17. Partnership for the goals		✓

Source: Prepared by the authors.

Furthermore, the authors also believe that this project will have a high impact on the good health and well-being of citizens (goal 3) and on the city's environment (goal 13), since lower congestion means a direct decrease in the city's air pollution. In a more moderate impact, it is also plausible that an improvement in the urban environment could have a relatively positive effect on the species and ecosystems in the Barcelona metropolitan area and its surroundings (goal 15).

In terms of governance, this project is a successful public-private partnership in which the private sector (companies) and different public institutions (CCB, AMB, city councils, and the Generalitat) were able to join forces to implement a public service project. The maintenance of the ring roads is also deemed to have a moderate impact on goal 17, serving as an example of good governance for other institutions interested in a similar PPP.

6.3. City Strategy

This study concerns two contracts (2011 and 2016) for the maintenance of Barcelona's ring roads. Some of the observations about possible improvements in the urban area have an impact on issues already dealt with earlier:

- The contracts set out no attempt to integrate this tender explicitly with its contribution to the city model and thus relate it to the strategic plan. It seems that there is an attempt to do so since environmental, mobility and safety objectives are mentioned, but in the end the tender and the contract call for actions to be carried rather than for final objectives to be met.
- In principle it might seem that it is a purely operational service contract, in which measurable quality criteria need to be specified and the lowest-cost provider sought. However, in the end, it was the best technical bid that won, even though it was not the cheapest. This indicates that there is room for innovation in bids beyond the financial aspect.
- The tendering system does not take advantage of trying to attract more innovative bids by using a more open system such as Citimart.com, which has already helped the city of Barcelona meet other challenges. The contract does not make clear how much freedom there is when defining the tasks to be performed (technical proposal) and how they should be carried out. Instead, it would be possible to define only the results required and to allow the concessionaire to achieve them in the way it deems most efficient.
- here is no "smart" integration in the project, such as installing sensors or other quality control and service parameters. Such integration might improve service monitoring and promote higher quality.

Table 7. Cities in Motion

SMART CITY EVALUATION	MAINTENANCE OF THE BARCELONA RING ROADS	
	HIGH IMPACT	MODERATE IMPACT
1. Human capital		
2. Social cohesion		✓
3. Economy	✓	
4. Public management	✓	
5. Governance	✓	
6. Mobility and transportation	✓	
7. Environment	✓	
8. Urban planning	✓	
9. International impact		
10. Technology		

Source: Prepared by the authors.

7. Conclusions

The maintenance project of the Barcelona ring roads is a good example of a service delivered via a public-private partnership. The main positive elements of this partnership include: (1) the existence of a competitive tender open to the public that operates under an established legal framework; (2) an evaluation of the quality of the results and the services provided by an **independent** company, which guarantees that the evaluation is not biased; (3) the existence of incentives for innovation and improvements in the service in the selection process; (4) the creation of risk mitigation mechanisms such as guarantees; (5) the creation of contracting bodies that include all the members of the project; and (6) a partial transfer of risks, such as inflation, to the private company.

Nonetheless, this article argues that the maintenance project of the ring roads could benefit from a better contract design in the following ways:

- By providing incentives for innovation and the procurement of more efficient and higher-quality materials.
- By providing incentives for the company to purchase and design a lighting system that guarantees lower energy consumption and lower spending for the administration, in this case the Comarcal Council of the Barcelonès.
- By transferring more risks to the private company, such as the risk of demand or operations.
- By increasing the penalties for failing to deliver the service.

Indeed, greater innovation in the lighting system would help this project have significant impacts on other United Nations goals, such as goal 7, affordable and clean energy.

We should also note that this project would benefit from a cost-benefit analysis, or a value-for-money analysis, since this would help the government and public institutions identify the improvements needed in this contract in order to offer better service at a lower cost.

Exhibit 1

Table A1. Activities excluded from the maintenance contract

EXCLUSIONS	ACTIVITIES	SPECIFICATION
	Maintenance of the surveillance, regulation, and traffic flow installations	Closed-circuit TV cameras (CCTV) and accident detection systems
		Automated access closure systems (barriers)
		Traffic lights
		Flow meters (gauges)
		Variable message panels (VMPs)
		Radar
	Maintenance of the service tunnels running in the area parallel to the ring roads	—
	The maintenance of communications networks of external operators using the ring roads' own conduits and structures	—
	Maintenance of the lighting system	The system

Exhibit 1. (Continued)

Table A2. Activities included within the maintenance contract

GROUP	DEFINITION	SUBGROUPS
CONDUCTIVE OPERATIONS	Corresponding to the jobs and services needed to improve the highway administration and surveillance, and maintaining the elements comprising the road in a state that ensures the normal service and safety conditions befitting the characteristics of each of the stretches contained in the contract	Operations involving the surveillance system, attention to incidents and accidents, occasional signage, and maintenance of road elements in a state that cannot cause problems under normal driving conditions
		Winter highway administration operations
		Running and managing the maintenance and operations center
		GIS management operations, attention and control of centralized systems and programming, monitoring and control of execution
PREVENTATIVE, REGULATORY AND SYSTEMATIC OPERATIONS	Any operations that must be performed systematically or following a given frequency. They are governed by the regulations in force or by the planning	Regulatory checks
		Periodic and preventative checks
		Cleaning operations
CORRECTIVE OPERATIONS	Operations not classified in either of the other groups that stem from a sudden need caused by unforeseen circumstances, or from decisions made that necessitate their execution but that do not have a predetermined frequency	Unforeseen highway administration operations and conservation of road elements that could cause problems under normal driving and safety conditions
		Cleaning operations and occasional checks as needed because of external factors
		Occasional improvement operations

Most notably:

- Surveillance and assistance with highway administration
- Soil conservation and rehabilitation
- Draining, monitoring sewers and beacons at specific points
- Planting, cleaning, and slopes
- Road cleaning
- Brick work
- Maintenance and replacement of vertical and horizontal signage
- Safety barriers and beacons
- Winter highway administration
- Installations
- **Lighting and electrical energy**
- Water supply and fire extinguishing network
- Any other action related to the maintenance of elements with similar features

Source: Information provided by AMB.

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