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**STRATEGIC MATTER D – MANAGEMENT OF
ROAD ASSETS:**

**“MANAGEMENT OF ROAD ASSETS IN THE
CONTEXT OF SUSTAINABLE DEVELOPMENT AND
THE ADAPTATION TO CLIMATE CHANGE”**

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SUMMARY

The National Roads Network, with 25,936 km of roads, makes up 15% of the total length of the roads network in Spain and supports more than half the total traffic that circulates on Spanish roads and more than 60% of the heavy traffic. For the maintenance and use of these road assets, direct management techniques could be used, such as Integral Conservation by means of contracts with private companies and the direct undertaking of renovation and improvement works of infrastructures. Alternatively, indirect methods could be used by means of concessions. This report details the motorway concessions together with the new concessions in operation in order to bring the old arterial motorways of the country, the first generation motorways, up to the quality standards of the newly constructed roads. The report ends by detailing the different actions being taken in order to improve sustainability in the Spanish road network, whether these are measures considered in the general state legislation or in specific regulations within the field of road networks.

1. INTRODUCTION

The 1978 Spanish Constitution in reference to roads establishes that the “public works of general interest or whose undertaking affects more than one Autonomous Community” are the State’s responsibility and that the “roads whose itinerary is developed comprehensively within the Autonomous Community” are the responsibility of the Autonomous Community itself.

These responsibilities have been developed in the State and Autonomous Community road laws in such a way that the roads included in a general interest itinerary (border passes, accesses to ports or airports) or roads whose function in the transport system affects more than one Autonomous Community correspond to these laws, with the rest of the network belonging to the other Communities.

The previous distribution of responsibilities takes into account that in Spain there are 21 Road “laws” for the management of the road assets: the Law 25/1988, July 29th, of Roads (applied to State roads), the 17 road laws of each one of the Autonomous Communities and three provincial regulations of the Basque regions (Álava, Biscay and Guipúzcoa).

The National Roads Network may make up 15% of the total length of roads existing in Spain, in kilometres (25,936 km), but the traffic circulating on these roads makes up 52% of the total that circulates on Spanish roads. This is the reason why we are going to concentrate on the management of the road assets of the aforementioned Network.



2. MANAGEMENT TYPES

In the maintenance and use of the National Roads Network there are three co-existing management types:

- Indirect: Toll motorways concessions (2,493 km).
- Indirect: First generation motorways concessions (994 km).
- Direct: Comprehensive conservation and works (22,449 km).



2.1. Toll motorways concessions

This road assets management system in Spain already has almost fifty years experience and is in full force, having recovered its previous importance in the past 15 years.

The first toll motorways in Spain were allocated on the basis of the legal system established in specific Decrees-Laws for each one of the motorways (1965-1971). Previously, in 1972, the still valid Law 8/1972, of May 10th, of Construction, Maintenance and Use of Concessionary Motorways was approved and shortly after the General Clauses Document was approved by Decree 215/1973, of January 25th which continues to represent the current legal code in the matter.

The toll motorways in service in the National Roads Network are 2,493 km long, having grown significantly in recent years (in 1999 they were 1,844.6 km long).

In the aforementioned concessions, construction, maintenance and use of the toll motorways corresponds to the concessionary, with the Administration having the highest inspection and control facilities of all the Concessionary Associations amongst which are found: approval of the private clause documents, establishment of charges, readjustments of the economic-financial plan, control of compulsory purchase actions, approval of projects, control of use of the service, checking of traffic intensity, approval of contracts of use of the services areas, etc. The surveillance, inspection and economic-financial control of said concessionary associations correspond to the Government Representative on the concessionary associations of national toll motorways.

2.2. First generation motorways concessions

Within the actions that were carried out according to the General Roads Plan 1984/1991, are the so-called “first generation motorways” that basically correspond to the 6 arterial roads from Madrid and for those roads in general that used the road that existed until then as one of the carriageways of the motorway.

The time that has passed since then, in which the new regulations which have appeared do not admit some of the characteristics with which these motorways were designed, has made the quality of these infrastructures incomparable with the new sections of motorway opened to traffic in the last fifteen years.

Once the need was recognized to upgrade these motorways, as far as possible, to the present standards, it was decided that this adaptation should be carried out by means of concession contracts. Bids were made for these contracts (10 at present) between the months of May and August 2007 and consist of a total of 994 km. The application legislation of these contracts is the Adapted Text of the Public Administrations Contracts Law, approved by the Royal Legislative Decree 2/2000, of June 16th.

The activities included in these contracts can be grouped into the following areas:

- **Area 1.** Initial construction work and improvements. The aim is to adapt the motorway, as far as possible, to the standards established in the current regulations and includes various types of actions: route improvements, adaptation of junctions, lengthening of lanes with speed changes, elimination of direct accesses, construction of service areas etc. The improvement actions include any necessary exceptional maintenance work.
- **Area 2.** Repositioning and large repair works. Includes actions that are necessary during the concession period in the different elements of the road in order to maintain its functioning and quality of service.
- **Area 3.** Ordinary maintenance of the motorway.

The period of these concessions is 19 years. During the first years Area 1 works should be carried out. Subsequently and during the rest of the concession, the ordinary and exceptional maintenance work should be carried out (areas 2 and 3) in order to provide a service with the quality established in the guideline of clauses which is governed by the contract and controlled by means of 41 indicators.

The payment by the Administration (shadow toll) depends on the number and type of vehicles using the road, taking into account the quality of the service provided (measured by means of a series of indicators) and, during the first years of the contract, in accordance with the percentage of the initial construction work and repairs (area 1) that have been put into service.

The main novelty of this type of concessions compared to toll motorways is that the quality control and availability of the services provided by the concessionary is carried out by means of indicators. These indicators serve to objectively evaluate the conditions of different elements of the road network and the quality of the service.

From the first day of the contract, the fulfilment of the service quality indicators which regulate the highway administration is required. The rest of the indicators, so-called state

indicators due to their relation to the state of the element, only have to be fulfilled from the end of the initial construction and repair works.

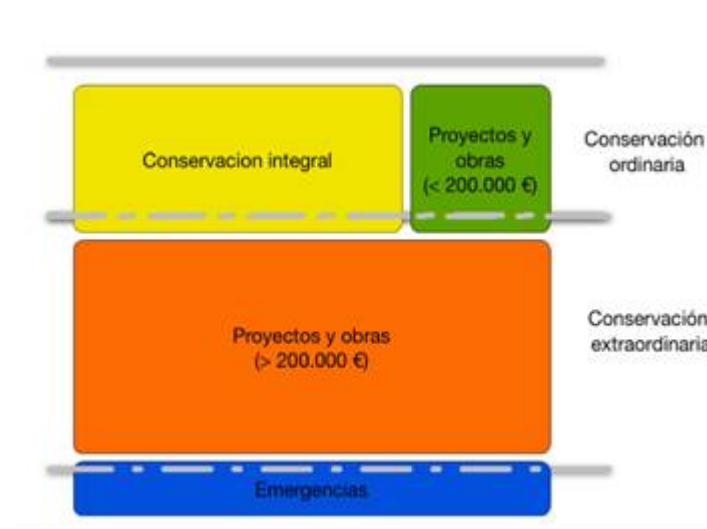
Each indicator has fixed thresholds that should be fulfilled during the contract and maximum action deadlines in order to act on the element in case of exceeding the fixed established threshold. In the guideline of private administrative clauses a series of penalties is established for the non-fulfilment of the thresholds and of the response times.

The values of the different indicators therefore allow the total correction factor to be calculated, which is a co-efficient applied to the basic yearly fee and which can penalize the concessionary income substantially.

2.3. Comprehensive maintenance and road works

The rest of the National Road Network whose conservation is not carried out by means of toll motorway concessions or first generation motorways is managed by means of:

- Comprehensive maintenance contracts.
- Road works execution contracts.



Comprehensive maintenance

Comprehensive Maintenance consists of contracting private companies for highway administration, ordinary conservation, low cost road safety actions and a small part of exceptional maintenance work as well as the execution of inventories and inspections of elements of the road and the preparation of reports about road safety, the road surfaces, the factory works, the drainage etc....that allows for the diagnosis of road elements and adequate planning of preventative actions that are considered necessary, some of which will require the writing of the corresponding projects, which will subsequently be put out to tender and the execution of the corresponding works.

For each one of the 160 sectors into which this part of the network has been divided, with an average length of 150 km if it is conventional and 70 km if it is motorway, one of these contracts is available for those which minimum staff and machinery are required on which the bidders offer.

The works included in the comprehensive maintenance contracts are grouped as follows:

Group I. The activities included in this group are the following:

- Tunnel control service and communications service
- Surveillance services. Attention to accidents and incidents.
- Winter highway administration services.
- Systematic maintenance of installations of energy, electricity, light, ventilation supplies and tunnel control, variable signalling and traffic lights, communications, pumping and similar.
- Establishment of Inventories and Recognitions of state.
- Information agenda of the state and functioning of the road.
- Exploitation support actions, studies of accident rates and road safety reports

These seven activities, all of them aimed at ensuring that the highway administration is undertaken in the best possible conditions, are paid monthly as a cost overrun.

All of the Group I operations have priority over the rest of the contract, fixing maximum execution deadlines for those of highway administration maintenance; in this way, the accidents and incidents will be attended less than an hour after finding out about them and the rest less than 48 hours after. The incidents should be signposted as soon as they are discovered.

Group II. The activities included in this group are programmable and are paid as works by means of their corresponding prices and measurements.

Punctual repairs of the road surfaces, banks, drainage, mowing, cleaning, etc. are included in this group.

Group III. This involves a small percentage of the contract (7-10%) and works for any new needs that may arise, as well as supplementing the insufficient quantities of collections in Group II and of some of the materials in group I. It can also be used for possible actions in the rest of the provincial network.

Lastly, a quantity for the construction or conservation of the installations defined in the Guidelines is also included.

This structure of the contract resolves the possible rigidity of the teams, as it is only necessary to measure those dedicated to carrying out the Group I activities.

For the development of the activities of Group II it is advisable to have a minimum team which, as well as carrying out these operations, supports group I in the case of important incidents and reassures the Contract Director that these are carried out on time. This team also contributes contrasted experience so that the works to be carried out are done in adequate security conditions.

From the Management of each Contract a quarterly report is sent to the Traffic Department in which the following is included:

- Rating of the execution of the 10 most important activities for the maintenance of the highway administration.
- Information about accidents, possible incidents in tunnels and sections that are cut off or need chains in winter.
- The most important consumption of materials of Group I up to 80% of the total budgeted for the group.
- The most relevant actions of Road Safety, of improvement of the asphalt or road surface, improvement of drainage, banks, factory work, etc...., with their corresponding costs and rating its execution, in a way that its total cost is less than 60% of that budgeted for Group II.
- The most important actions carried out under Group III's responsibility in the rest of the sections of the province, including its descriptions and costs and rating them.

In addition, twice yearly it will be completed with the following:

- State examinations of the elements of road that have been carried out and their results.
- Values obtained from the following State indicators:
 - Road Safety: Values of Dangerousness and Mortality Indexes and High Accident Concentration Sections
 - Superficial deterioration of the road surface
 - Road Signs
 - Vertical Signalling
 - Beacons
 - Rigid and flexible barriers
 - Deep longitudinal drainage
 - Transversal drainage

A report should also be made about more significant questions that have prevented better levels of service from being achieved.

It may be confirmed that an effort is made to influence the most important actions, as much as in carrying them out well as dealing with the necessary resources.

The values that consider this contract model to be desirable for the different indicators are not under contract, but are simply recommended objectives.

In order to attend to the winter highway administration of the network, 1,095 snowploughs and 35 dynamic ploughs are available, a total of 1,130. In terms of the distribution of de-icing products, there are 308 machines available with a capacity for 150,136 tons and 404 silos with a capacity for 35,260 tons.

Road works

The management of the road assets requires, as well as the comprehensive maintenance contracts, the execution of road works for the structural and/or superficial renovation of the road surfaces, the reparation of structures, the renovation or installation of the container systems, the improvement of routes, lighting of new sections of roads, repainting of road markings etc.

This type of contracts requires the previous writing of a project, its supervision (if the cost is more than 350,000.00 €) and its approval (except those with a budget of less than 50,000.00 €) and the publicity of the corresponding call to tender (except for those in budgets less than 200,000.00 €).

Works with a cost of less than 200,000.00 € require a deadline of less than 18 months from when the need for the work is detected to when the work is carried out.

3. SUSTAINABILITY IN THE NATIONAL ROADS NETWORK

In recent years actions are being taken from different fields aimed at improving the sustainability of the Spanish road network. Some of these actions are examined below.

3.1. By means of the general legislation

The general legislation has introduced measures in recent years aimed at making the actions carried out on the roads more sustainable, with the following measures standing out:

Waste materials

The constant increase in the generation of waste materials from the construction of infrastructures and new buildings, as well as the demolition of old buildings poses an environmental problem due to its volume and difficult treatment.

For this reason, the government considered it necessary to dictate basic regulations, specific for waste materials from construction and demolition (Royal Decree 105/2008 by which the Production and Management of Construction and Demolition Waste Materials are Managed), which establishes the minimum requirements for its production and management, with the aim of promoting its protection, reuse, recycling, evaluation and adequate treatment of the materials to be discarded.

This Royal Decree establishes, amongst other obligations, that of including in the works project, a management study of the waste products of construction and demolition that will be produced, and that should include, amongst other aspects, an estimation of its quantity, the generic prevention measures that will be adopted, the predicted destination for the waste materials, as well as an evaluation of the costs of their management. This should form part of the project budget.

Of the previous obligations the waste material products and holders from construction and demolition in minor construction and home repairs are excluded, as they are taken into

account under the urban waste law and will be subject to the requisites that the local bodies establish in their respective municipal bylaws.

The Royal Decree prohibits the deposit of previously untreated materials and demands the establishment of fee systems that discourage the deposit of recyclable materials in dumps or the deposit of others in which previous treatment has been limited to a mere classification.

The Royal Decree also establishes the minimum criteria for distinguishing when the use of inert waste materials in restoration, conditioning or filling works may be considered an appreciation operation or not in the rubbish dump.

Energy efficiency

Efficiency and energy saving constitutes priority objectives for any economy, and may be achieved without affecting the dynamism of its activity, as they improve their competitiveness of its productive processes and reduce the greenhouse effect gas emissions as well as the energy bill. The irrational use of the energy and light contamination has a negative impact on the environment, and so, in light of the lack of natural resources, it is imperative to avoid this situation as far as possible.

In 2008 the Government considered it advisable and necessary to approach the problem of energy efficiency in outside electric lighting installations in general for the whole of Spain, approving with this aim in mind, the Royal Decree 1890/2008, of November 14th, in which the Energy Efficiency Regulations in Outside Lighting Installations were approved.

Rubbish dumps

The existence of unsupervised rubbish dumps and the obligations imposed by the European community regulations were the reasons why the Government regulated the elimination of waste materials by depositing in a dump by Royal Decree.

Three categories of dumps are established, and the acceptable types of waste are defined in each of these categories, the establishment of a series of technical requirements necessary from the installations, the obligation to manage the dumps after its closure and a new structure and the imputation of the costs of waste dumping.

In this way the technical criteria for its design, construction, use, closure and maintenance are specified. It also deals with the adaptation of the already existing dumps to the requirements of the aforementioned Royal Decree and the environmental impacts to consider in the new situation.

3.2. By means of the specific road regulations

The Traffic Department regulations have introduced measures aimed at making the actions carried out in the network it manages more sustainable. The following actions stand out:

Recycling

The Spanish road surfaces renovation regulations (Rule 6.3-IC "Road Surfaces Renovation") establishes that "for environmental reasons and reusing existing materials in

asphalts and road surfaces, recycling techniques should be taken into account in the solutions analysis in actions whose renovation surface is more than 70,000 m².

The conditions in which it is possible to undertake the following types of recycling are perfectly regulated in the current regulations (Order 8/2001 on Recycling of Road Surfaces):

- On-site recycling with bituminous coated emulsion.
- On-site recycling with road surfacing cement.
- Off-site hot recycling of bituminous layers.

The aforementioned regulations establish that the material recovered may be used in layers that are lower than the road surface, that is, in the middle or on the bottom, in proportions of less than 10% (which in practice only needs a low quantity of adaptations).

It can be concluded, from personal and European experience, with reference to hot recycling (in continuous or discontinuous plant) and even though this technique still has evolutionary potential, that it is becoming clearer that given that in the majority of the cases the milled materials will be recyclable (using recycling techniques) on the road, these recycled materials may be classified in the following scales: high rates (higher than 50% of the new mix, which is in the experimental phase), high (from 30 to 50%), intermediate (from 15% to 30%) or low (less than 10-15%).

Use of rubber from out-of-use tyres

The Traffic Department praises the use of asphalt with the use of rubber coming from out-of-use tyre. The conditions to be met by this asphalt are established in the following legal orders:

- Legal Order 21/2007 on the Use and Specifications to be met by Bitumen Binders and Mixes that use Rubber from Out-Of-Use Tyres.
- Legal Order 21 Bis/2009 on Improved Asphalts and High Viscosity with Rubber from Out-Of-Use Tyres and Criteria to take into account for its in-situ Manufacturing and Storage.

The asphalts which include rubber from out-of-use-tyres have a double advantaged solution:

- From an environmental point of view, it allows the majority of discarded tyres in Spain to be recycled.
- From a technical point of view, they modify binding properties of bituminous mixtures included in them, obtaining longer lasting road surfaces and reducing the costs of conservation and maintenance of the roads.

Restrictions on lighting

In June 2010, and in accordance with that established in the aforementioned Royal Decree of energy efficiency, the Traffic Department approved the Service Note on Actions to be carried out for the Demarcation of Roads in order to reduce the Consumption of Energy in Lighting Installations. In this note the periods and places of sections that should provide

artificial lighting are significantly restricted in accordance with parameters such as the average daily traffic, timetable intensity or the existence of high accident concentration sections. It is estimated that the application of this will achieve a reduction in cost of 16%.

Use of marginal grounds

The effort made by the Traffic Department in making the most of the marginal grounds that up until recently were considered inadequate according to the regulations and therefore was taken to the dump should be pointed out.

The present regulations allow its use in the centre of embankments, by fulfilling certain conditions that guarantee its adequate operation in the long term.

3.3. Access limitation. Another measure of sustainability of the roads

The need to have a sustainable National Road Network available, in which the security as well as capacity of the roads to meet the demand of circulation in the best service conditions possible is guaranteed has determined that since various decades ago, access limitation is a non-negotiable objective in order to preserve the quality of the network.

If this weren't the case, the network would be degraded by multiple new accesses that would inevitably be opened by the spread in neighbouring roads of all kinds of urban, industrial and commercial developments.

In accordance with the aforementioned, access to the National Road Network should be granted only in previously established places as the function of the network is to facilitate the long distance traffic and not to give access to adjoining roads.

The only way of achieving good accessibility to everyone is, starting from a global vision, to respect the function and characteristics of each class of road so that each road functioning at the best of their technical possibilities, may be integrated in a mesh in which the different functions complement and strengthen each other.

The principal of limiting accesses aims to achieve this. As well as that already mentioned in relation with the access to adjoining properties, it is completed with the need for the number of junctions to be kept to the minimum compatible with the adequate connection of the long distance network with the distribution road network, given that each junction is a point of potential problems for traffic fluidity and general traffic safety.

3.4. Other measures in the study phase

There are other measures which aim to improve the sustainability of our roads in the study phase. The following stand out:

Warm mixtures

With the signing of the Kyoto Protocol on climate change, Spain is obligated to contribute to the international objective of reducing the emissions of the six gases that cause global warming, amongst them CO₂ in the period 2008-2012.

To this end, Spain should act in all the productive sectors by modifying behaviour patterns and introducing new technologies and materials that reduce emissions.

In the road construction sector actions are being developed that are supported in the use of low temperature bituminous mixtures, which reduce emissions during manufacturing and when the mixtures are being made. This lower temperature means a saving of energy associated with the decrease in the consumption of fuel in the mixing plant and, on the other hand, an improvement in the work conditions of the operators as they will be exposed to less thermal radiation.

Spain is introducing this technical innovation in their road works. The technical regulations are being written for this which includes the data obtained in various experimental sections that have been developed by the Traffic Department.

Cold microbinding

The use of this technique by the Traffic Department in renovation projects of existing road surfaces is owed to their allowances for improving the superficial characteristics of the roads and especially the resistance to sliding and macrotexture.

As this is a cold technique and with small thicknesses, it is perfectly adequate for the specified conditions for a sustainable road surface, as it reduces the gas emissions and consumes less materials.

Efficiency in the use of de-icing products

The Traffic Department is studying how to improve the efficiency in the use of de-icing products in winter road works, for which they are carrying out tests in order to know what quantity is required in accordance with the weather conditions and the road surface.