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SUSTAINABLE MOBILITY

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ABSTRACT

The Strategic Infrastructure and Transport Plan (known by its Spanish acronym PEIT) as the strategic planning instrument passed by the Spanish Government in July, 2005 and with a 2020 horizon, amounts to an unequivocal commitment to sustainable mobility. Owing to their special nature, this Report describes four of the actions being carried out in Spain in this context, most of which are based on the experiences and initiatives the Government has been promoting for some years now.

As a result, the concern over cutting down the impacts of road transport on the environment is faithfully reflected in the current process of strategic environmental assessment contained in the new Sectoral Road Plan, currently at an advanced stage of drafting.

Furthermore, the concern over improving public transport has given rise to a resolute boost to the construction of bus lanes on the State-run Road Network in the vicinity of several Spanish cities.

In addition, the integration of these bus lanes into the urban fabric is benefiting, in the case of Madrid, from a new generation of underground transport interchanges facilitating accessibility to the metro and urban bus networks.

Finally, the determined boost given to the so-called “sea motorways” has provided an alternative to the sustained growth of road haulage in environmentally sensitive geographical areas such as the Pyrenees.

The Report ends by presenting the scheme known as "Madrid Calle-30", which transforms the existing M-30 urban ring road motorway into a "street" permeable to city traffic and recovers or creates park areas with the associated environmental enhancement that involves, constituting an example of sustainable development.

1. THE STRATEGIC ENVIRONMENTAL ASSESSMENT OF THE 2007-2012 SECTORAL ROAD PLAN

The PEIT Strategic Infrastructure and Transport Plan lays down the execution of a number of sectoral, intermodal or territorial concertation plans, each needing to be adapted to the requirements of the regulations applicable, including drawing up a Strategic Environmental Sustainability Report in accordance with Directive 2001/42/EC.

Where roads are concerned, the PEIT stipulates formulation of a Sectoral Road Plan for the 2007-2012 period, coordinated by the Directorate General of Roads of the Spanish Ministry of Development. The Plan is structured into three major action programmes, namely infrastructure creation, intermodality and periurban actions and operation and maintenance.

Pursuant to Directive 2001/42/EC and Act 9/2006, dated 28 April, transposing it to the Spanish legal system, the Strategic Environmental Assessment (SEA) of the said Plan is to include the following sequence of actions:

1) drafting of a preliminary environmental assessment report informing the environmental authorities (Spanish Ministry of the Environment) of the objectives, scope, content and possible environmental effects of the Plan;
2) carrying out of consultations by the Ministry of the Environment and definition of the scope and aspects that the Environmental Sustainability Report should cover;
3) drafting of the Environmental Sustainability Report, written up pursuant to the provisions of the relevant regulations and of the Ministry of the Environment report;
4) holding of consultations: this phase specifies public participation in the SEA by running a public information process and holding consultations between concerned government agencies and entities pursuant to the provisions of Act 9/2006;
5) finally, writing up of the Environmental Report which will analyse both the assessment process and the Environmental Sustainability Report and assess the result of the consultations and public information stage with a view to integrating the environmental aspects and forecasting the significant impacts of their application.

The stage of progress reached to date by the above-listed actions is described below.

1.1. Drawing up of the Preliminary Environmental Assessment Report

The Directorate General of Roads submitted the Preliminary Environmental Assessment Report (PEAR) to the Ministry of the Environment in September, 2005 so that the environmental authority, jointly with the promoter, could fix the content and scope of the Environmental Sustainability Report to be submitted to public information.

The PEAR drawn up specified the overall and specific objectives of the Plan (functional, economic, territorial and environmental) and the environmental assessment indicators to be used, intending these to be taken into account in the action programming and even ruling out some of the PEIT proposals.

The PEAR was also submitted to prior consultation by the agencies concerned so that the scope of the Environmental Sustainability Report could be defined more precisely. Amongst the most relevant conclusions of these consultations it is worth highlighting the following:

- including in the SEA zero scenarios (conservation only), intermediate scenarios (which would also incorporate intermodality as a solution to the problems of congestion and closing off of routes with over 50% already in service under execution or competitive tender), and Plan actions;
- including the geological domain and areas of importance to birds as environmental elements;
- augmenting the operation and maintenance programme by a programme of infrastructure integration and restoration of spaces;
- including a proposal for environmental recommendations to be respected in the Environmental Impact Assessment of projects;
- taking into account regulations such as the Protection of the Atmosphere Act, the Water Framework Directive or the Aarhus Convention;
- regarding the indicators to be used in the SEA, stipulating objective values and hierarching them, particularly taking into account the Eurostat indicators, assessing the number of impacts, their surface area and length, the severance effect and fragmentation involved;
- including the proposal for “scenic roads”, not by changing alignments but by integrating the existing ones;

- assessing the greenhouse effect of gas emissions and its effect on compliance with the Kyoto Protocol - distinguishing between congestion and induction due to increased speed;
- quantifying and highlighting accident rate reduction;
- in impacts on the Natura 2000 Network, highlighting the specific rating of the spaces crossed and proposing specific design measures to reduce occupancy as also animal underpasses. Avoiding the presence of borrow materials and dumps within the network.

1.2. Work Done in Writing Up the Environmental Sustainability Report

Based on applicable regulations and having considered the consultations carried out in the previous stage, the Environmental Sustainability Report was drawn up. The tasks performed to date refer to:

(i) defining the scale of the work, the decision taken being to use a 1:200,000 scale in general;
(ii) defining the corridors to be assessed, based on existing information relative to the extent to which the planned actions are compatible with the territory's most important ratings;
(iii) defining the routes within the corridors with a view to equalising the area taken up by them, specified-width routes were then determined within these corridors (in principle, 50-m wide occupancy strips);
(iv) defining the alignments with a view to equalising the area taken up by the corridors, specified-width routes were then determined within these corridors (in principle, 50-m wide occupancy strips);
(v) defining the environmental factors listed below to be used as basis for building up the system of indicators that would serve to quantify the effects of the Plan:
    - physical and topographical environment: slope zoning,
    - biodiversity: including protected natural spaces, natural habitats and protected species of flora and fauna,
    - water sources: rivers, water masses and wetlands,
    - landscape,
    - land uses;
(vi) carrying out a Natura 2000 Network assessment, proceeding to set up a quantitative rating of the spaces potentially affected by the Plan's actions in zones or areas of differing environmental concern;
(vii) setting up the system of indicators with the following considered for the SEA:
    - length and surface area of the protected natural spaces crossed,
    - surface area of the natural or semi-natural habitats affected,
    - density of habitats of Community concern in the vicinity of the route,
    - territorial fragmentation index (plot size);
    - number of grid squares where endangered species are affected,
    - density of grid squares with endangered species in the vicinity of the route,
    - interception of water source elements, including rivers, wetland zones and water masses,
    - density of water masses close to alignments and routes,
    - number and length of the different types of landscape affected, highlighting landscapes of concern,
    - surface area of zones involving different land uses, pointing out areas involving intense agricultural or forest productivity;
(vii) GIS integration of the layers of information gathered or generated, the layers referring on the one hand to Natura 2000 Network spaces, priority habitats, zones important to

mammals, amphibians, reptiles and butterflies, livestock paths and species recovery plans and, on the other, to the possible routes of minimum and maximum environmental cost between whose limits the final impact resulting from the action will be found (the GIS being a virtually indispensable analytical tool for determining the degree of impact on the various environmental factors of the different alignments and routes involved, given that the majority of the impact indicators are based on calculating the surface areas taken up and the fact that the graphic data need to be combined with alphanumerical data);

(viii) environmental assessment of the impact derived from execution of the Plan, basically consisting of calculating the impact indicators for the different alignments or routes analysed. The results obtained need to allow the joint effects of occupancy and fragmentation derived from the Plan's actions to be assessed, permitting comparisons to be drawn between different alignments within a particular corridor and, where applicable, between different corridors. In relation to the main impacts, in addition to occupancy, fragmentation and typology, the functionality impact was also assessed. Along with the indirect impacts derived from the presence of the infrastructure (occupancy rate on the 50-m strip indicated above), the induced impacts rated on 100-m and 200-m strips in accordance with the criterion of the COST 341 Working Group were also assessed.

1.3. List of Tasks Pending

The tasks listed below remain pending for completion of the Environmental Sustainability Report.

- Quantification of the greenhouse effect emission of gases and other atmospheric pollutants, taking into account the contribution of the actions planned to the assessment that would result if they were not implemented. Future traffic induction produced by the new infrastructure provision will contribute to an increase in emissions, whereas the elimination of congestion and the transfer to less polluting modes or to public transport will reduce emissions.
- Territorial fragmentation. Design measures for animal underpasses and crossings and the recovery of historical routes and roads.
- The effects of the rest of the programmes - intermodality, upgrading work, bypasses and operation and maintenance.

The SEA will be completed with the consultation and public information stage and subsequent writing up of the environmental report.

2. NEW INTERURBAN BUS LANES IN THE SPANISH STATE-RUN NETWORK

The Ministry of the Environment has commenced several studies and projects for the construction of bus lanes in the Spanish State-run network. A combination of different reasons drove the Spanish Ministry to take this decision, as listed below.

1) The existence of congested sections of the network in which public passenger transport, albeit with a small (2-3%) percentage of buses out of the total of vehicles, reached 30-50% of the total rush-hour mobility demand in passenger terms.

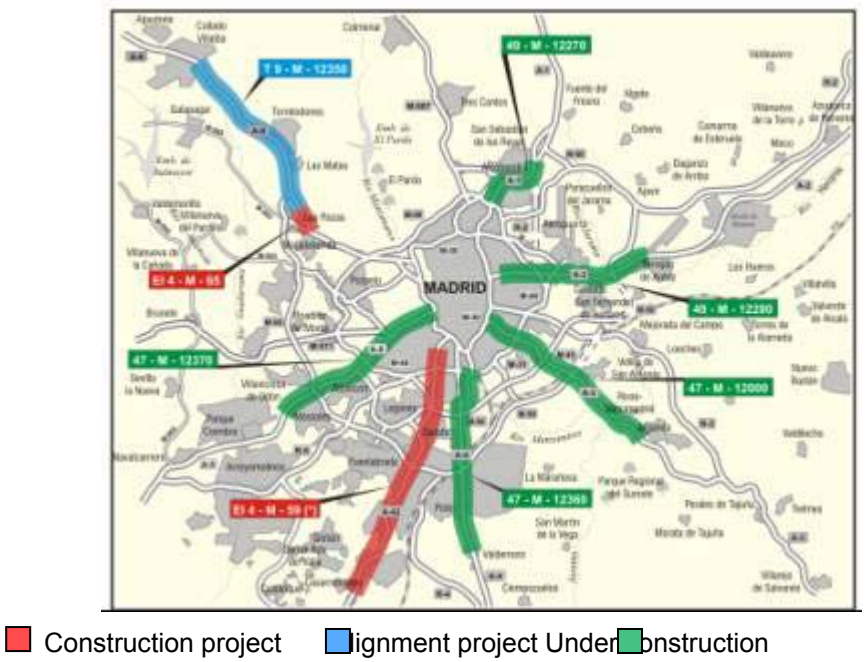

Figure 1 - Rush-hour passenger distribution in the bus-HOV lane on the Madrid-bound direction of the A-6 Expressway

2) The determination to improve public transport conditions and the need to cut down traffic pollution.

3) The excellent results obtained from the only bus-HOV lane (for public transport and vehicles with more than one occupant) currently in service in the State-run network, on the A-6 Expressway access route to Madrid from the North West. From its opening in 1994, this carriageway has recorded a rise in bus journeys that clearly exceeds the rise in journeys in private vehicles (Fig. 1).

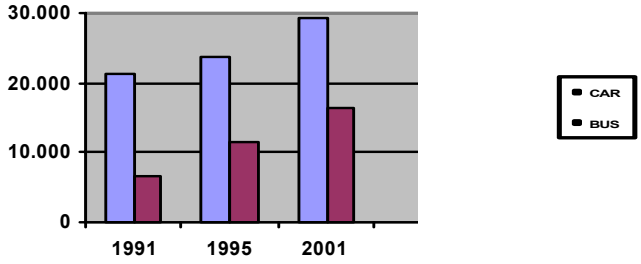

Figure 2 – New bus lanes in Madrid access routes

In the Madrid Region, the Spanish Ministry will build bus lanes on all the accesses it manages (seven in total, as shown in Fig. 2). On the A-6 Expressway, the existing bus-HOV lane will be extended as a bus lane. In all, some 128 million passengers will benefit each year from the construction of close to 120 km of bus lanes, involving an investment of 740 million euros. In addition to the seven Madrid radial motorways, the Ministry is also studying a further three sections in access routes to Malaga and Barcelona.

The specific solutions of creating bus lanes in central reserves or side carriageways are not identical in all the cases, they basically depend on the bus stops currently existing and on the solution adopted for complex spots (passes for engineering structures and ease of boarding, etc.). In any event, the construction of bus lanes is tackled from the perspective of integrating the existing lane, taking into account not only users of the road in question but also of adjoining roads. With this perspective, aspects such as increased capacity, execution or continuity of service lanes, restructuring of accesses, improvements to reduce noise pollution, etc. are integrated.

3. IMPROVING MODAL INTEGRATION IN THE INTERURBAN BUS INTERCHANGES IN MADRID

As a general rule, in order to preserve the functional nature of interurban bus lanes, it is essential to find a balance between the outlying location of their interchange hubs in the city - to avoid congesting the road system - and central situations - advisable for achieving a better urban dispersion of trips. In the case of Madrid, the compromising solution adopted since 1986 between these opposing necessities has been to build several outlying terminals as transport interchanges located on the outskirts of the city centre and connected to the different radial corridors they serve.

3.1. Evolutionary Process of Bus Interchanges

Since 1986, there has been a strong rise in demand for interurban buses as the regular public transport by road system operating between Madrid City and the towns in the Region. In 18 years, stages rose from 121.0 million to 276.2 million in 2004. At the present time, the percentage of journeys on interurban buses as compared to the other transport modes operating in the Region (metro, rail and urban bus), represents 13.4% of the total and 53.2% of the journeys made on public transport outside the city of Madrid.
It is not surprising therefore that the interchange concept has been evolving at the same time as passenger demand has been rising and that the intermodality idea has been gelling between users and operators.

As a result, actions on the first generation of interchanges in Madrid (1986-1993) were geared to conditioning surface space along the lines of the existing urban bus interchange facilities.

The second stage (1994-1997) saw the rise of a greater commitment to intermodality, building underground bus stations meaning they could be larger than surface facilities and also improving interchange with the metro network. The most representative example is the Moncloa Interchange, built in 1995, through which Line 6 of the metro runs and connects with the bus-HOV lane on the A-6 Expressway mentioned above. The year it was opened, the Moncloa Interchange served 26 interurban bus routes involving 1,603 daily dispatches. At the present time, it serves 49 interurban bus routes with over 4,000 daily dispatches, almost 125,000 passengers per day and 310 rush-hour dispatches between

8:00 and 10:00 am. The urban bus routes it serves transport 66,750 travellers per day at street level involving 3,586 daily dispatches. For its part, the Moncloa Metro Station is the busiest in the entire network, going from 44,000 passengers handled daily in 1995 to over 170,000 at the present time.

The opening of the Avenida de América Interchange in 2000 created a third generation of interchanges. This facility retains the underground station design but with more generous proportions than its counterparts. It also has an exclusive access tunnel, 400 m long in each direction, which runs directly into the bus bays, designed to cut down bus travelling time as the buses can avoid the traffic jams occasioned by incoming city centre routes. In addition, construction and operation of this interchange was made possible through private financing under the public concession system, meaning that the public authorities did not have to lay out any of the 24 million euros its construction cost in 1998. Results to date for this interchange, as with the Moncloa Interchange, are excellent from both the point of view of rising demand for public transport and reducing the number of buses travelling at street level.

3.2. The 2004-2007 Interchange Plan

With the aim of improving the modal integration of the interurban bus interchanges and enhancing the quality of service provided, the Madrid Regional Transport Consortium recently put out to public tender the works design, operation and maintenance of a further six major interchanges, namely Plaza Castilla, Conde de Casal, Plaza Elíptica, Príncipe Pío, Moncloa (extension scheme) and Chamartín (Fig. 3).

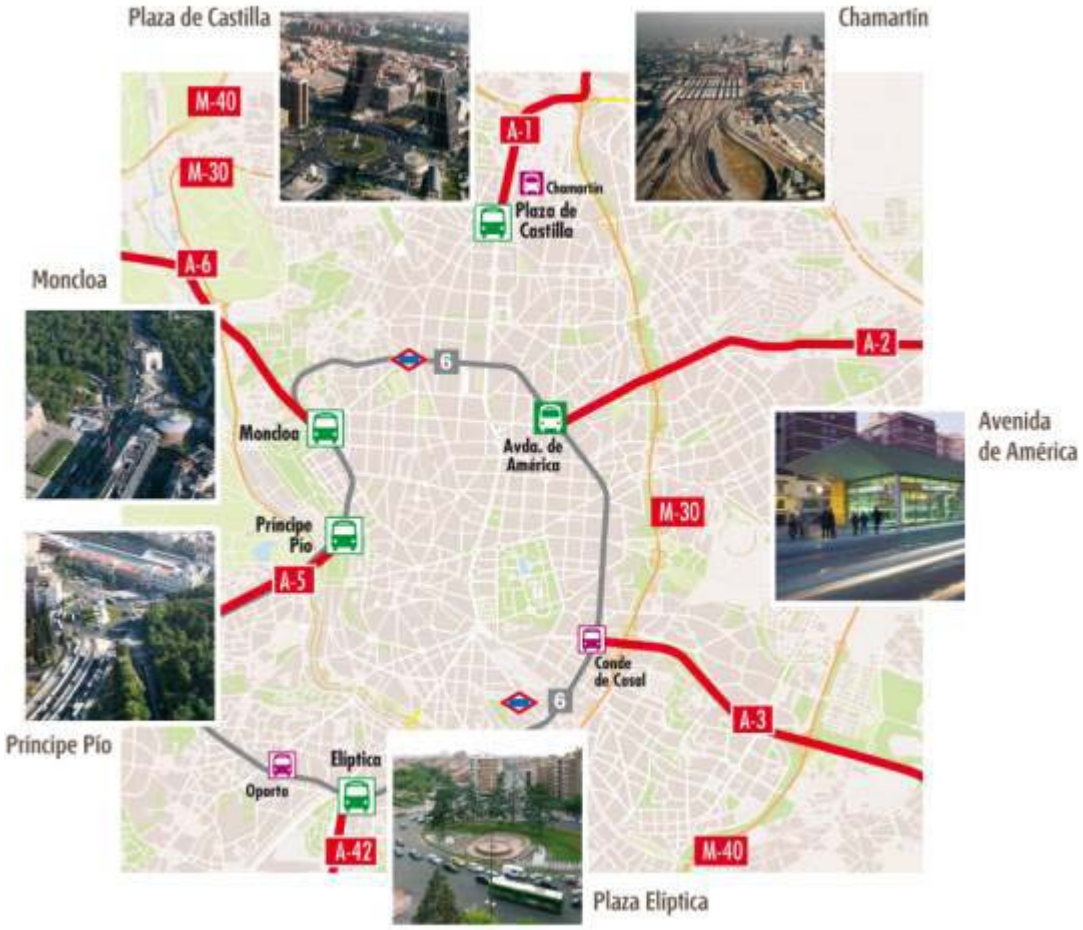

Figure 3 – Location of the six new interurban bus interchanges in Madrid

These new large-scale intermodal transport centres take as reference the third-generation type of interchanges and the financing scheme applied to the Avenida de América Interchange. However, there has been a change in the approach to the earlier generations of interchanges in terms of design, changing from an eminently prescriptive approach to a definition based on the concept of the provision desired. Architectural concepts pay special attention to spatial clarity, physical separation between persons and vehicles, organisation of uses, safety and security, the materials employed, information and furniture. The basic criteria adopted for the design of the facilities are interior air quality, lighting level, enhanced security and integrated maintenance with real-time accessibility.

The Plaza Elíptica Interchange is arranged on three levels, the first two serving interurban buses and the last for the connection to the metro by means of a general service area. The action includes construction of a direct access tunnel using one of the bus lanes the Ministry is going to build. The cost f the operation will be 36 million euros.

The Príncipe Pío Interchange is arranged in two levels. The first one provides connection to the metro and one of the bus accesses while the second provides the access to the tunnel connection to the A-5 Extremadura Expressway. The approximate cost of the construction is 50 million euros.

The extension work on the Moncloa Interchange includes lowering the tunnel on one metro line, extending the current bus-HOV lane with a view to being able to dispose of sufficient width to allow buses to overtake, and providing an access from the bus-HOV lane to the future interchange. The cost of the operation will be approximately 100 million euros.

Action on the Plaza Castilla Interchange, involving a cost of 102 million euros, is intended to improve the interchange facility for the more than 150,000 users of interurban and urban buses with the three metro lines converging on it. To this end, a new, three-level underground interchange will be built for the interurban bus routes.

The Chamartín Interchange is planned as part of a major redesigning scheme under way in the vicinity of the Chamartín mainline rail station by several authorities. The Ministry of Development plans to extend the existing station to provide it with a new station for Spain's high-speed rail service, the AVE, that will be operating with the North of the country plus a new suburban commuter rail service connecting to Madrid-Barajas Airport. The regional government is building a new metro station to serve four metro lines. For its part, the bus station will serve the flow of long-distance coach services operating with the North of Spain.

4. DEVELOPMENT STRATEGY FOR THE "SEA MOTORWAYS" IN SPAIN

The annual volume of road haulage between the Iberian Peninsula and the rest of Europe across the Pyrenees is currently approaching the 100 million tons mark in both directions. It has recorded an average growth since 1986 (the year Spain joined the EEC) of 8% p.a., meaning that it doubles itself every ten years. The current levels of congestion and the saturation forecast for the near future affects the general principle of sustainable mobility and triggers the need to rebalance the transport system by promoting both rail and short sea shipping modes and to develop the so-called "sea motorways".

The sea motorway concept appears as a priority action in the latest review of the Trans-European Networks (TENs), passed by co-decision of the European Parliament and the Council of Europe in April, 2004. Since that time and after a relevant consultation

period, the European Commission has drawn up a vade mecum containing a series of criteria for the launch of sea motorways eligible for receiving public aid through the Tender Procedure in Member States.

4.1. Progress in the Western Mediterranean Area

In the Western Mediterranean, and more specifically between Spain and Italy, a series of sea services has been gradually appearing at growing frequencies of service and involving several Spanish ports (Barcelona, Valencia and Tarragona, etc.) and several Italian ports (Genoa, Leghorn, Salerno and Civitavecchia, etc.). The modern trend points to creation of a network of services between different points on the Mediterranean in which frequency of service is implicit in the actual network. This network of services fundamentally draws HGVs travelling by road between Italy and Spain and vice versa, across the French Côte d'Azur, either as (autonomous) complete trucks or as semi-trailers sharing consignments by Spanish and Italian firms of a certain entity.

This type of demand is nevertheless being slowed down by a longstanding inertia in the habit of road usage and by the misgivings set off by submitting to maritime/port operation and processing.

Set against the reaction time of the demand, the strategy for developing services that the promoters of short distance sea shipping are adopting consists of marking pace with the supply in order to minimise risks and optimise the capacity of their ro-ro vessels at all times. It began by taking advantage of the existing vehicle traffic and reserving hold space in the car carriers to draw freight on a gradual basis until the point came round to devoting vessels exclusively to vehicular haulage (preferably in semi-trailers) with a departure frequency that was not very high (Mondays, Wednesdays and Fridays for example).

Having gone through a business maturing process, the Ports of Barcelona and Valencia are already running more than one daily service to several ports of destination in Italy and are benefiting from a relatively high growth in traffic.

In order to continue to strengthen this progress and to launch the sea motorways in this geographical area, the Italian Minister for Infrastructure and Transport and the Spanish Minister of Development signed an agreement in December, 2004 by which they committed themselves to creating a Mixed Group to propose a Government Agreement for defining the respective powers of each country and the necessary financial commitments for launching sea motorways between both countries.

4.2. Situation in the Atlantic Area

Spain's Atlantic coast has not reached such an advanced stage as the Western Mediterranean. While the Mediterranean handles approximately 15 million tons of truck traffic between Spain and Italy and vice versa, a significant volume of which could be drawn owing to the fact that the haulage covers a run that is clearly longer than the sea section, especially the farther South of both the Iberian Peninsula and Italy it goes, the Atlantic side has a very different geographical configuration both for the sea arc and its possible port hinterlands.

Public aid is needed to promote development of sea motorways capable of revitalising short distance sea shipping, to which end a number of agreements have been signed between the French Ministry of Transport and the Spanish Ministry of Development, aimed

at drawing up the competitive call for tender for launching sea motorways between both countries.

In relation to these calls for tender, Spain generally defends the terms listed below.

- Calls for tender must be made *without predetermining ports*, at least on the Spanish part.
  The reasons why it defends non-definition of ports from the public side is because of the fact that transport demand is spread out along the Mainland geography and that Spain's existing free and loyal competition must be maintained in the port system known as "ports of general interest", all of which have sufficient capacity to cater for this type of traffic and, furthermore, the majority of which are Class A category in the Trans-European Networks.
- Aid for sea motorways should count on help from *European funds* (TENs and Marco Polo aid) and from *State funds*. In both cases, the aid should be considered as “start up” aid to achieve sufficient initial conditions to allow the sea-land chain to reach a price/quality ratio allowing it to compete with road only haulage. In no case should the aid serve to cover inefficiency at any point in the sea-land chain.
  The Spanish reasoning consists of defending the need to take into account the different kinds of aid possible, given that Spain is carrying out a substantial effort in cutting down port costs, for instance. As a result, many Spanish ports are applying a 40% reduction in rates for vessels and ro-ro goods traffic, thereby succeeding in making the cost of passing a unit of freight (semi-trailer mode) through a Spanish port considerably lower than the French port rate.
  In relation to Spanish State aid, within the relevant European regulations, plans are currently under study to allocate a specified amount within the framework of the Strategic Infrastructure and Transport Plan (PEIT), through a Sectoral Sea Transport and Port Plan which refers to sea motorways as a key issue for Spain.
- Setting up a series of *quality criteria* is considered to be highly relevant, defined through a set of measurable indicators serving as basis for defining sea motorways and the subsequent monitoring of their enforcement during the service period.
  The Spanish position has been stressing that quality criteria must cover the different sections of the transport chain and their indicators must be subjected as far as possible to a set of thresholds indicating the minimum quality demandable in each of them individually. The selection process would assess the degree of improvement over each threshold.

  A quality criteria proposal was under study in Spain and reached an internal consensus with the Spanish sea/port sector and was recently submitted to the European Commission at its request.

5. “MADRID CALLE-30”, A SCHEME FOR IMPROVING SUSTAINABILITY: THE REDESIGN OF AN URBAN MOTORWAY

5.1 Background

Madrid's M-30 urban motorway was conceived and executed by the then Ministry of Public Works in the 1960s and mid 1970s but the ring road was not closed off to the North owing to problems of local surroundings. It had high-level technical characteristics and its main purpose was to serve as a ring road so that through traffic could avoid passing through the centre of the capital city, an extremely important issue in view of the radial nature of the Spanish road network.

This road gradually became obsolete with the passage of time as its high rush-hour saturation rates forced many motorists to use interior streets, snarling up the city centre. The urban development of the city centre converted the M-30 into a barrier to traffic flow inside and outside the urban areas it ran through and produced high levels of noise and atmospheric pollution in the surrounding districts.

At the same time, the Ministry now known as the Ministry of Development began to build the M-40 and M-50 outlying beltways which, farther away from the urban centre, decongested it of through traffic.

5.2 The “Madrid Calle-30” Scheme

In 2004, the State ceded title to the M-30 ring road to the Madrid City Council, which immediately set in motion a scheme known as “Madrid Calle-30” which it had previously been working on.

The aims of this scheme are *to* v*ertebrate the city*, reducing the severance effect of the M-30, *to reduce the accident rate*, cutting down accidents by some 50%, *to lower pollution*, as a result of the greater traffic fluidity and construction of numerous tunnels, *to create over 50 hectares of green zones*, chiefly on the sections rerouted underground, *to recuperate the River Manzanares*, making it more accessible to the public since the fact that the M-30 runs along its banks meant it was inaccessible, and finally *to foster mobility* in the city involving a saving in the region of 708 million journey hours over the next 30 years, which represents a saving of 3,915 million euros at the current rate.

All of these aims make a substantial contribution to sustainable development in the city of Madrid. This scheme has been costed at 3,677.37 million 2004 euros and its estimated total completion date is 2008. Its execution has been divided into four sectors designated according to the four cardinal points. The brief description of the actions below have been given the same number in brackets as appear in the figure.

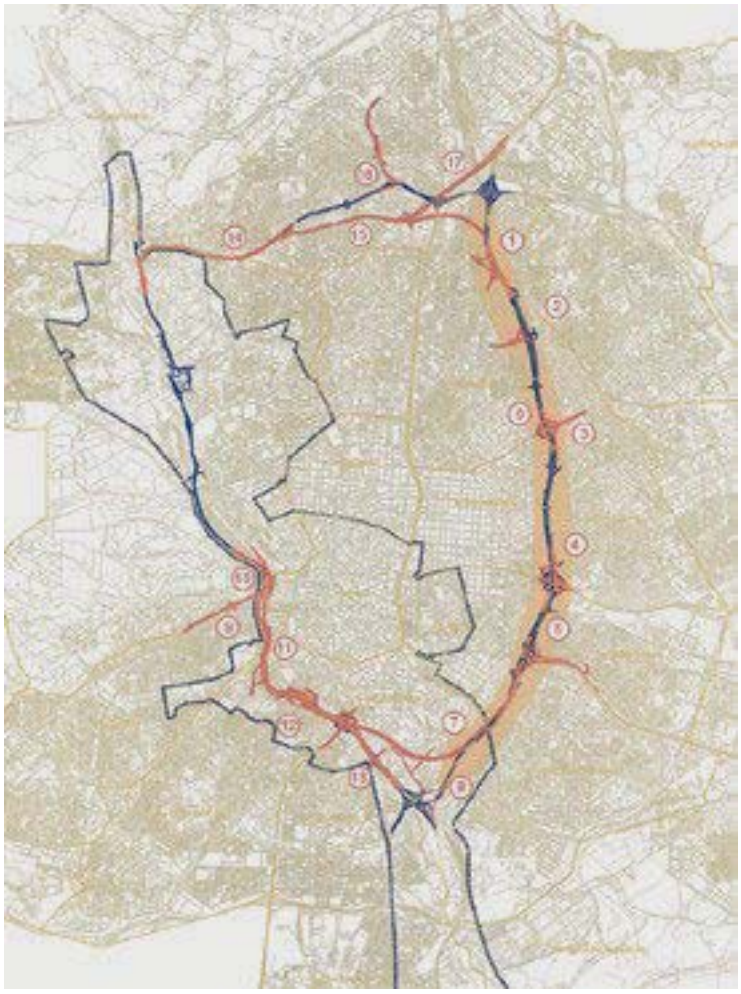

Figure 4. Ground plan of Madrid and the M-30 ring road

5.3 East Sector

The actions in this sector are aimed at improving communication between the main and side carriageways and remodelling the accesses in order to facilitate traffic movement. It covers the work listed below.

Remodelling of the La Paloma Interchange (1) to avoid the earlier weaving pattern. Remodelling of the exit of the Costa Rica grade-separated interchange (2) with Plaza de José Mª Soler and building a tunnel communicating that street to the M-30 and to Calle de Arturo Soria. Avenida de América Interchange (3) in which the movements between the A-2 Expressway and the M-30 have been replaced by direct connections. The O'Donnell Interchange (4) where two direct slip roads have been introduced, facilitating the movement of traffic coming off the M-23 Expressway. A slip road has also been created from Avenida del Marqués de Corbera in the direction of the M-30 South, which avoids a long detour. Grade-separated interchange between the M-30 and the A-3 Expressway (5) where two tunnels have been built to link these roads directly, thereby avoiding having to drive through Plaza del Conde de Casal and use the Puente de la Lira Bridge, now converted for pedestrian use only. Execution of connections between the Manoteras and South Interchanges (6) by restructuring the service roads.

5.4 South Sector

This action is aimed at providing an efficient distribution of the traffic that used to congest the Southern Interchange by two major engineering works.

Figure 5. Costa Rica interchange

The Southern Bypass (7), between the interchange with the A-3 Expressway and Paseo de Santa María de la Cabeza. This section is practically totally underground, comprising two tunnels running deep below two important park areas. Connection of Calle Embajadores with the M-40 Ring Road (8) where a tunnel directly links the district and the Southern Bus Station to the A-4 Expressway and the M-40 Ring Road, avoiding the M-30.

5.5 West Sector

This action contains the greatest environmental commitment of the M-30 Redesign Plan. It comprises four sections of undergrounding works for the old street-level M-30 alignment along the River Manzanares (10), (11), (13) and (14) and a fifth section (9) in the junction of the Avenida de Portugal with the M-30, extending as far as the entrance into the Exhibition Sites.

Figure 6. La Paloma interchange

These tunnels are built using diaphragm walls linked by an upper and lower slab. The works include the regeneration and clearing up of the river and its banks, leaving it accessible to the public.

5.6 North Sector

The aim of remodelling this section comprises the solution to the mobility problems in the area by construction of the Northern Bypass (15), a genuine closing off to the North of the M-30 ring road. This will recover the urban function of the Avenida de la Ilustración, which currently serves to close off the M-30 to the North.

It also includes the M-30 service road in the North-West zone (14) and extends to three lanes its junction with the western section of the M-30, making it possible to restructure local traffic. New connection of Avenida de la Ilustración with the M-607 Expressway (16). The last work is the connection of the Northern Bypass with the A-1 Expressway (17).