PROJECT OF THE FIXED LINK THROUGH THE STRAIT OF GIBRALTAR

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The Gibraltar Strait constitutes an area of great strategic interest due to its geographical location between Europe and Africa and as a crossroads between the Atlantic and the Mediterranean. A key passageway for sea routes.

Morocco and Spain, on the shores of the Strait, in an effort to consolidate their ties and to make the western Mediterranean a neuralgic corridor for exchanges between Europe and Africa, decided to study a railway tunnel across this stretch of sea. This tunnel will constitute, in addition to a symbol of unquestionable friendship between peoples, an essential link in a euro-mediterranean transport network for the integrated economic development of the entire region.

A definitely ambitious project, it is of great importance for the economic and social development of all the countries in the region and an opportunity for integrated growth in all the area. Its international dimension and synergies shall engender long lasting peace and stability. The flow of people, goods and services in both directions shall produce a qualitative acceleration of economic relations which will result in a new territorial organization and a widening in the transports networks on both sides of the Strait.

The countries in the region, seen prospectively, shall be in a central position, after the setting up of the new transports infrastructures, in the Western Mediterranean area.
The official launching of the studies for the Project of a fixed link through the Gibraltar Strait was jointly carried out by their Majesties Hassan II of Morocco and Juan Carlos I of Spain in June 1979. This Royal decision took shape on October 24, 1980, with the signing of an agreement between both countries, creating, on the one hand, a Spanish-Moroccan Joint Committee, the project’s governing body, and, additionally, two study State Agencies, the “Société Nationale d’Etudes du Detroit (SNED)” in Rabat and the “Sociedad Española de estudios para la Comunicación fija a través de Estrecho de Gibraltar S.A., (SECECSA)” in Madrid, in charge of carrying out the work schedules approved by the Joint Committee. Consolidation in project cooperation allowed for the development of pre-feasibility studies at a satisfactory rate, leading to a second Agreement on November 27, 1989. This agreement, strengthened the role of the Joint Committee and allowed the incorporation of third countries and international organisms to the development of the project.
Studies carried out to define the future link through the Gibraltar Strait have been undertaken in a wide range of fields (geological, oceanographic, seismic knowledge, engineering studies, ...). In 1996, these studies resulted in the choice of the excavated tunnel solution as the base solution. This option was adopted on the basis of the results of multi-criteria analysis of the many different alternatives studied (floating bridge, bridge on fixed supports, floating tunnel, tunnel laid on the sea bed and, in particular, a suspension bridge and an excavated tunnel under the sea bed).

The Project of the tunnel under the Gibraltar Strait, foreseen as a step by step process in time, shall include, initially, a single rail tunnel to be used in both directions, connected to a service gallery of smaller diameter. The gallery shall allow for the efficient solving of operation and maintenance problems arising from the tunnel and, above all, to ensure the safety of passengers and workers. It is the simplest and most economical solution from an engineering point of view. The construction techniques are available and have been used in other similar works.

The railway tunnel will carry both passenger and goods trains, as well as high-speed trains and also special trains, called shuttles, that will connect both terminal stations and that will be able to carry vehicles (cars and trucks) along with people.

To conclude:

- The project has an international scope. It will benefit a large region contributing to a lasting economic development.
- It opens new prospects in the scientific and technical fields, giving added value to construction and transport engineering.
- The construction technique is similar to the one used in the Channel Tunnel (Eurotunnel) and the Seikan tunnel (Japan). Although the unique characteristics of the Strait may require more specific and complex research for the development of the Project.
- It will be carried out progressively to answer to the evolution of traffic and to adapt the investment to the cost effectiveness of the Project.
FEATURES OF THE RAILWAY TUNNEL

Plan

1995: Adoption of the tunnel as the base solution for the following reasons:
- Proven construction techniques.
- Absence of interference with maritime traffic and risk of collisions.
- Compatibility with construction in phases, in accordance with future traffic requirements.

Longitudinal profile (tunnel)

Longitudinal profile:
- Length between terminals: 42 km.
- Total tunnel length: 38.7 km.
- Length of underwater tunnel: 27.7 km.
- Minimum earth cover at lowest point: 175 m.
- Slope: 30‰.

Cross-section

Final phase cross-section:
- Two one-way railway galleries, 7.5 m diameter.
- One pressurised service/security gallery, 4.8 m diameter, centered between both galleries and connected to them through transversal passageways at regular intervals (340m).
In order for this project to take shape many years of research and effort have been required. These have been carried out jointly in close cooperation between Morocco and Spain through both Agencies SNED and SECEGSA, headed by the Joint Committee, with the participation of national institutes of scientific and technical research and the expert evaluation of agencies of international standing.

These years of research have allowed, in spite of the Gibraltar Strait’s characteristic aggressive marine and atmospheric environment and a geology which, at best, can be said to be chaotic, to understand the complexities of the site from a geological, oceanographic, seismic and meteorological point of view. They have also permitted the definition of the geological formations in the area by means of deep drilling on land and test galleries at real scale under the sea on the shore near Tangiers (Morocco) and on land near Tarifa (Spain).

Initial geophysical marine research, combined with shallow drilling with coring, confirmed the geological continuity of both coasts along the bottom of the sea, raising much hope in a quick development of the project. But the discovery, after various deep drilling campaigns, of two very deep channels in the middle of the Strait, filled with quaternary material not favourable for the construction of the project, have made the task even more complex. This has led to additional research by deep sea drilling, to obtain geological and geotechnical data necessary for the updating of the tunnel scheme studied in 1996.

A new work schedule has been drawn up for the 2007-2009 period. It takes the new data into account and the results shall provide a better estimate of the cost, the environmental impact, the socio-economic repercussions on the area as well as the legal impact linked to its construction and use.

At the end of this work schedule, a global, multi-criteria report will be submitted to the governments of the two countries involved in the project and to the European Union. An official petition for institutional support was presented by the Moroccan and Spanish ministers in charge of transports during the presentation of the project to the European Commissioner for Transport on June 8, 2007.

The evaluation report will allow the updating of technical features of the tunnel (longitudinal profile, underwater overburden, cross-section...), construction costs, the phases of construction and the evaluation of socio-economic elements. It will also include a tentative financial scheme. The horizon for commissioning the project will be determined on the basis of the financial and economic results of studies currently underway.
GEOLOGIC STUDIES [Spain]

Tarifa Gallery

Geological cross-section

GEOLOGIC STUDIES [Morocco]

The Malabata experimental shaft

Geological cross-section of the formations found
OCEANOGRAPHIC CAMPAIGNS

42 oceanographic campaigns were carried out, using the most sophisticated technology and technique.

- Over 10,000 km of geophysical profiles with seismic reflection.
- Over 5,000 km of side-scan sonar profiles.
- About 2,000 samples recovered from the sea-bottom.
- About 50 short boreholes with a maximum penetration of 5 m.
- About 3,000 m deep boreholes drilled.

Land and Sea drilling carried out

Base profile and deep variants

Paleo-channels (vertical scale enhanced 5 times)
At the level of economic development, the Gibraltar Strait constitutes, today, a frontier marked by different economic levels. This gap must, however, vanish with effort and time due to the vigorous and voluntarist policies pursued, in close cooperation with the European agencies, for the development of the whole North African region. The future of the area as a whole is promising. It offers a number of advantages: capital, labour force and technology, energy and natural resources. In addition, its privileged geographical situation is near the consumer centres and it can attract international investment for a very wide range of products.

In the near future this area, with its large growth potential, could, thanks to its multiple advantages and basic infrastructures, constitute a dynamic axis in global economy, capable of being a rival to the traditional sites in the Far East. In fact, both coasts in the Gibraltar Strait, only 28 km apart and once the future fixed link is in operation, will have their travel time reduced to thirty minutes, the same as any urban or suburban trip. Additionally, the technological advances in high-speed trains, with an unprecedented growth in Spain and Morocco, shall issue in a new, faster system of transportation, which forebodes an extraordinary potential for exchanges between the coasts in the long term and which is still not understood today.
5 Setting a New System of Transportation

In its international economic context, the project is, in fact, of interest to a wide area of intercontinental Europe and Africa. Its objective is not only to make movement of goods and people through the Strait more fluid. It aims, in fact, beyond being the missing link, to establish a new international system of transportation Europe-Africa and around the Mediterranean.

This new system of transportation implies therefore a railway tunnel through the Gibraltar Strait and the highway and high-speed train networks along the corridor which link South-West Europe with the Maghreb. It is totally integrated in the development of transport in the Western Mediterranean and it will become a space of true partnership between the European Union and the Maghreb.

This corridor is essentially composed of the Trans-European axis that connects South-West Europe to Switzerland and its extension, trough the Gibraltar Strait, to the land networks that connect the three Maghreb countries; Morocco, Algeria and Tunisia. Adopted by the Euro-Mediterranean High-Level Committee, this corridor has been the subject of a communication from the European Commission, of January 31, 2007, to strengthen cooperation in the transport field with neighbouring countries and among themselves, through the development of the main infrastructure projects on an international basis and of a harmonization of the legislation to apply to the transportation systems throughout those axes.

The countries in the area work for the development of the large overland transportation axes which are undergoing a full expansion. South-west Europe is served by the Trans-European axis in the direction of the Gibraltar Strait, through its many branches and modes of transport, whether along the Atlantic, through Bordeaux and Madrid, or along the Mediterranean, through Barcelona and Marseille with branches to Rome and Geneva.

This axis is already in operation in highways and expressways and the connection of the Spanish and French high-speed rail networks is under construction.

In the South, the level of development of transport infrastructures is not like in the North, but the countries in the region are carrying out an intensive effort to place themselves at the same level. These efforts are specifically; the Maghreb Unity Highway, connecting the five capitals of the Maghreb countries and in the Trans-Maghrebian Train, linking Morocco, Algeria and Tunisia.

In this framework, the Moroccan highway network is in an advanced state of construction, 784 km are already operational since March 2007 and the 1,500 km programmed are to be finished by 2010, along the axes structuring the country mainly from North to South and from East to West. This network is completed by the Mediterranean branch under construction, which will connect Tangiers to the Moroccan-Algerian border.

At the same time, in the domain of railways, Morocco has drawn up a Guideline Scheme for High-Speed Lines (SDLGV) of 1,500 km to be constructed in phases and to be finished by 2030 allowing a good and clear vision of the development of the future national network and its integration into the planning of the Maghreb-Europe railway networks. A protocol agreement has just been signed with France for a high-
TRAFFIC FORECAST

- Setting up of a maritime traffic observatory in the Strait and a flight one for Morocco-Europe.
- Traffic that could be "drawn" by the tunnel in 2025:
  - 9 Millions of passengers.
  - 8 Millions of tons of goods.

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Evolution of exchanges through the Gibraltar Strait
speed train connection between Tangiers and Casablanca by 2013. Upon completion, the high speed train network shall consist of two axes: the Tangiers-Agadir and the Rabat-Oujda to the Algerian border lines.

Algeria on its part, in the framework of roads and highways infrastructure development, has drawn up a National Highway and Road Master Plan dealing mainly with the 1,097 km long East-West highway, under construction, to be completed by 2010 and the high plains corridor.

Tunisia also foresees pursuing its highway program, and its network shall reach a length of 360 km around the end of 2007.

The 8,383 km Trans-Maghreb railway (5,587 km of which are of European width), is undergoing important rail renovation works to improve capacity and the modernisation of communications and signals systems.

The Regional Transport Action Plan, (PART), programmed between 2007-2013 and adopted by the EuroMed Transport Forum in Brussels, may 29 and 30, 2007, comprises a series of actions in the different transport modes, connected with infrastructure planning and the reform of regulations concerning transport services and priority projects, including an annex listing these projects, among which the tunnel under the Gibraltar Strait and the Trans-Maghreb networks can be found.
Interest by the International Community

The United Nations Economic Council (ECOSOC) produces, since 1981, a biannual evaluation report on the investigation works and studies done on the project. The Fixed Link through the Gibraltar Strait is the only international project that has a systematic follow-up by the ECOSOC. The latest report, done in 2007, gave a very positive evaluation of the progress in the studies and was the object of a resolution adopted by the ECOSOC, emphasising the beneficial repercussions expected of the project.
Step by step the logic of a Euro-Maghreb network is pervading, owing to the multimodal Trans-European South-West axis in Europe and the efforts made by the three countries: Morocco, Algiers and Tunisia in its extension, through the future tunnel, and the Maghreb highways and railway.

When complete, Europe and the Maghreb shall be able to further develop their exchanges using a complete network of communication routes. From nodal points located along these axes on the South coast, access to Egypt and Asia, to the East, will be possible, as well as access to sub-Saharan Africa from the networks originating in North Africa.

The Mahgreb railway network connecting the three countries offers the advantage of having the European width. Promising development prospects for a high-speed train forebode the integration with the European network, with direct connections Paris-Madrid-Rabat-Algiers-Tunisia, once the current works in progress, for the Madrid-Barcelona-French border and on the Mahgreb side, are finished, along with the construction of the railway tunnel through the Gibraltar Strait.

This situation must answer the imperative requirement to create a Euro-Mediterranean free trade zone which will stimulate the Maghreb countries to improve their transport infrastructures and, in addition, to modernise their enterprises acting on the sector by training and qualifying the personnel, by the progressive liberalisation of the transports sector and by the harmonising of administrative and customs laws for a greater fluidity in the exchanges.

The international community has witnessed the development and, later on, the construction of two important underwater tunnels: Seikan, connecting two islands in Japan and the Eurotunnel, under the English Channel, connecting Britain to the rest of Europe. The future tunnel under the Gibraltar Strait proposes the linking of two continents, Europe and Africa. It will contribute to lasting peace and a harmonious development in this part of the world known to be one of the origins of civilization.
Société Nationale d’Études du Détroit

Sociedad Española de Estudios para la Comunicación Fija a través del Estrecho de Gibraltar