

Dossier:

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Vasco da Gama bridge

1991 The Portuguese Government decided to construct a Second Crossing over the River Tagus. GATTEL (Gabinete para a Travessia do Tejo em Lisboa) was established, the purpose of which was to decide on the location of the Crossing, as well as to co-ordinate and control the procedures necessary to promote its construction and operation as a private concession.

1994 (April) LUSOPONTE, a consortium of Portuguese, British and French companies, won the international public tender for the concession to design, construct, finance and operate the new crossing.

1995 (February) Vasco da Gama Bridge Construction was begun.

1998 (29 March) - Vasco da Gama Bridge opened to Traffic

The location of the New Crossing was chosen in order to lighten traffic on the 25 Abril Bridge and to prevent heavy traffic, travelling from north to the south of the country, passing through the city of Lisbon.

This project, which was completed in a very tight schedule in order to allow for easy access to Expo'98, also included an expropriation and re-housing project, which for the first time in Portugal was undertaken by a private entity.

One of the ever-present concerns of this huge project was the preservation of its surrounding environment, resulting in a vast environmental programme. This programme was implemented from the very onset of construction and included, among other things, the Samouco Salt Pans located in the Special Protection Zone.

The construction of Vasco da Gama Bridge over the river Tagus by Lusoponte has now passed into the annals of the history of civil engineering as one of the largest and most successful projects of the 20th Century.

This Project gained international recognition when it was awarded first prize by the prestigious Ibero-Americana Institution of Architecture and Civil Engineering in the year 2000.

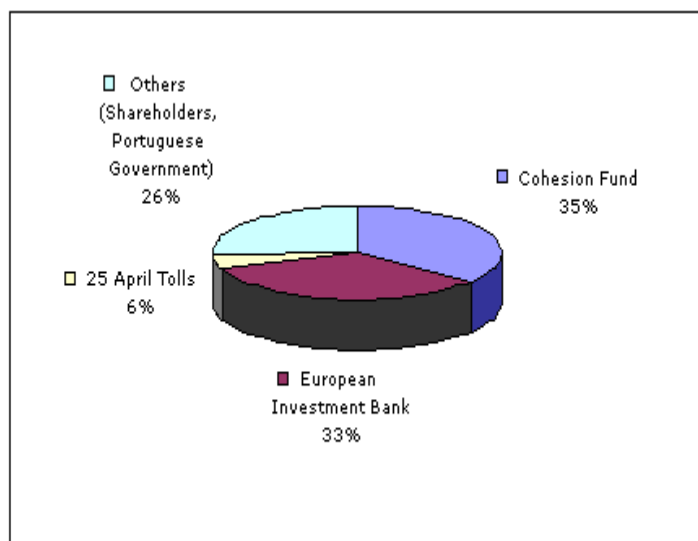
Funding

The Vasco da Gama Bridge funding project, with a total value of 897 million Euros, was mostly funded by the private sector under a "Build, Operate, Transfer" ("BOT") scheme.

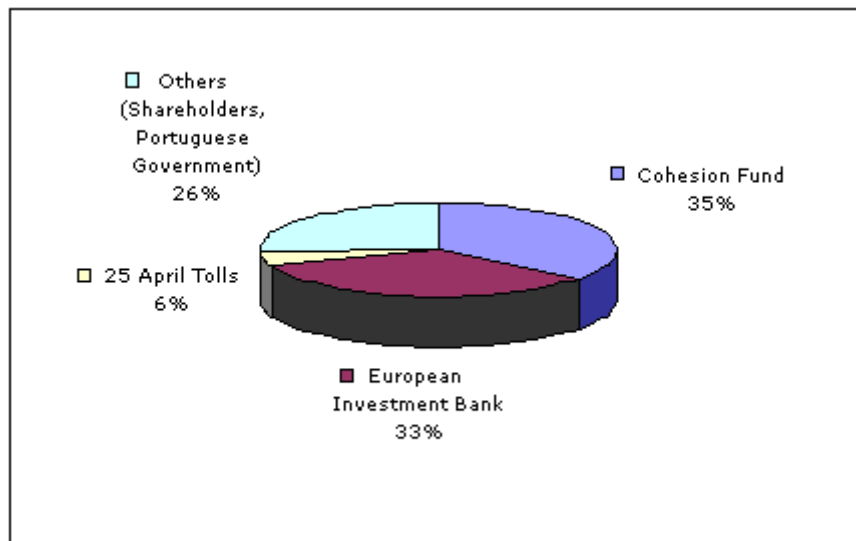
A BOT project is normally funded by a mixture of private equity, through shareholders, bank loans, and sometimes with the aid of grants. The shareholders carry the risks but receive a return on their investment and dividends during the concession period, while the government's subsequent reward is to obtain an infrastructure it could not, otherwise, have financed from its budget.

The Vasco da Gama Bridge has been financed from the following resources:

- European Union Cohesion Fund: 319 million Euros (35%);



- European Investment Bank Loan: 299 million Euros;
- Toll revenues from the 25 Abril Bridge: 50 million Euros (6.0%);
- Others: (shareholders, government grants etc.): 229 million Euros (26%).



The term of the EIB loan was 20 years with no capital repayment over the first 120 months, guaranteed by the commercial banks for only 15 years. Of the project total cost, about 644 million Euros was for construction and the balance for maintenance costs of both crossings, payment of expropriated land, rehousing, and environmental projects.

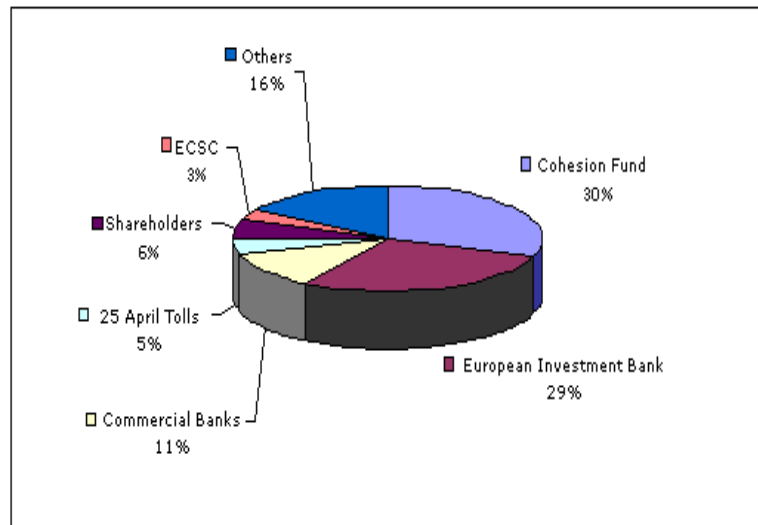
On 3rd July 2000, Lusoponte and the Portuguese State signed an Agreement, which included a draft of Global Financial Rebalance Agreement (Global FRA), which allowed, after the Global FRA approval by the Court of Accounts, that any disputes with the Portuguese State would be settled, the duration of the Concession would be established and extended until 24 March 2030, and the set up of a Global Financial Rebalance Agreement (Global FRA) would be drafted, thus defining the six-monthly payments to be made over a period of 19 years in order to make up for the changes in the toll rates on the 25 de Abril Bridge.

Refinancing

On the same date that the Agreement was signed the refinancing of Lusoponte was approved. In very brief terms, the main objectives that were to be accomplished with the Refinancing were:

To fit the financing costs of the project with the new risk profile and to the projected revenues, once the Vasco da Gama Bridge is concluded, taking into consideration the financing current market conditions, to acquire funds to pay additional construction costs and to anticipate a part of the debt payment.

In fact, the original funding was negotiated in 1994, when the interest rates reached the highest levels of the nineties. Furthermore, the referred funding was established with fixed interest rates, which became not attractive when compared to the recent long-term market rates. Lusoponte looked for, and achieved, a negotiation with the European Investment Bank (EIB) the conversion of the original loans to a sole long-term loan in Euros, and guaranteed by commercial banks for a 19 years term. The EIB loan is for 21 years, with a refund profile in agreement with the projected Lusoponte's "cash-flows", being the EIB guaranteed only by the project risk on the last two years. At the same date, a second 19-year loan of 120 million Euros was contracted, in order to finance construction additional costs as well as the Refinancing costs. The financing structure after Refinancing is as follows:

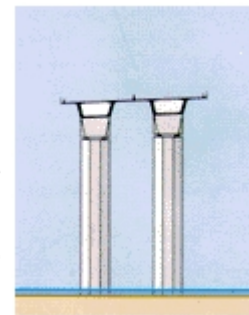


The facility was guaranteed by Société Générale, BNP Paribas, Caixa Geral de Depósitos, Banco Comercial Português and BCP Investimento S.A. A secondary syndication for this facility, involving 14 banks, took place in November 2000.

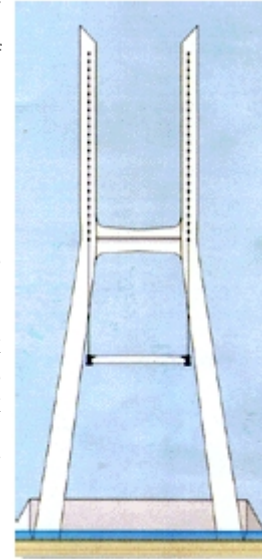
Design and construction

Lusoponte's shareholders set up a consortium in a "joint venture": Novaponte, ACE, headed by Campeon Bernard SGE, which was responsible for the design and construction of the Bridge and for its access branches. The construction of the bridge was divided into seven sections:

- **Sacavém and EN10 Variant Interchanges:** Two interchanges on the northside of the Tagus link with the A1 motorway to the north, the CRIL and the EN 10 Variant, which provide access to Lisbon and the Expo 98 site. This section was managed by H. Hagen, Bento Pedrosa Construções and Teixeira Duarte.
- **North Viaduct:** A 488m long viaduct which spans the main railway line and several local access roads, with a variable deck width to accommodate the slip roads. This section was managed by Teixeira Duarte.
- **Expo Viaduct:** A 672 m long viaduct comprising pre-cast concrete segments and placed in a inner way on each side of the piers. The works were managed by Campeon Bernard SGE.
- **Main Bridge:** The Main Bridge is a spectacular concrete structure as the deck it is stayed to main pylons. Its central span is of 420 m and the side spans of 203 m. The central pylons are 150 m high and the deck gives a clearance of 47 m above water level on the navigation channel called North Channel. The deck is a mix-structure composed with concrete slabs laying on steel crossbeams casted on two side concrete beams where the stays are linked to the pylons. The H-shaped north and south pylons, stand on foundations designed to withstand impact from a 30.000 tonne ship travelling with a speed cruise of 12 knots. Each foundation of these pylons are casted on 44 precast piles with 2,2 m diameter which are bored up to 90 m. The Main Bridge works were managed by Campeon Bernard SGE.



- **Central Viaduct:** The construction of the 6,351m Central Viaduct was carried out using double pre-cast units with 78 m long weighing 2,200 tonnes placed on 81 piers. The foundation of each pair of piers are cast on 8 driven piles, with 1.7 m diameter reaching sometimes 65 m deep on the river bed. The deck is less than 14m above water level for most of its length but rises to 30 m over two navigation channels, the Barcas Channel and the Samora Channel with spans of 130 m to accommodate medium sized vessels. The piers located on these two channels were also designed to withstand ship impact. Five of the deck sections have wider edges to provide for emergency vehicle parking. A huge pre-casting yard at Seixal, 22 kms downstream from the bridge, was used to manufacture concrete pre-cast units for this viaduct. The deck sections were made in eight pieces, stitched into 78 m long beams and then it was applied the use of pre-stressed cables. The deck beams were then transported to the site on the giant crane vessel Rambiz. The yard worked to a schedule, producing one beam every two days. This section was managed by Kvaerner Construction International (former Trafalgar House Construction Special Projects) and by Bento Pedroso Construções.



- **South Viaduct:** The South Viaduct with 3.825 metres long consists in a twin deck with 45 metres spans, which were, cast in situ using twin launching girders. The 85 groups of 4 piers of this Viaduct are cast partially on land and partially on marine driven piles. This Viaduct land section crosses the Samouco Salt Pans an environment area for birds. This Viaduct was constructed on a temporary embankment, which was removed after the works conclusion. The construction was carried out by Somague.
- **South Access:** The 3,9 km South Access links the Vasco da Gama Bridge with the South Interchange mainly through agricultural land. The most closed local links are Setubal (A12 motorway) and with Alcochete and Montijo (Coima Ring). The Toll Plaza is located about halfway along this stretch south/north bound and incorporates 12 booths with cash or automatic systems means of payment. On both sides of the crossing the driver can find a fully service area, close to the South Viaduct. The construction which involved 655.000 m3 of earthworks was carried out by Mota & Companhia.

Design and construction

The design work was carried out by a consortium of four companies: **Kvaerner Technology** Ltd.; EEG - Europe Etudes Gecti; **COBA** - Consultores para Obras, Barragens e Planeamento; and **PROPONTE** - Projectos de Pontes e Estruturas Especiais.

Each member of the consortium was responsible for a different section of the crossing and their work was co-ordinated by a design management team consisting of representatives from each company.

The designs were checked by an independent consulting consortium, "Tejo Ponte Control", consisting A2P Consult, Estudos e Projectos Lda, Hyder Consulting Ltd., Provia Consultores de Engenharia Lda., and Tudor Engineering Company.

Environment

Lusoponte's environment protection programme was carried out on a scale never before seen in Europe. The monitoring and surveillance work by the Environmental Monitoring Study Centre 8CEMA9 is done in conjunction with external consultants who are eminent in their respective fields. The various fields continuously studied by these experts include water and air quality, flora and fauna, bird life, marine life, archaeology, and noise levels.

The Vasco da Gama bridge runs through 400 hectares of the partially abandoned Samouco Salt Pans, an important breeding ground for a number of protected species such as the Black Winged



Stilt (*Himantopus himantopus*), the Little Tern (*Sterna aibifrons*) and the Kentish Plover (*Charadrius alexandrinus*).

As part of its commitment to minimize the environment impact of the project the Portuguese Government agreed with the European Union to establish the area as a nature reserve and Lusoponte has implemented a comprehensive recovery programme which includes the restoration of 43 sluice gates, several buildings and scores of dykes as well as the general cleaning of the pans and other debris.

A 15th century chapel, the Capela da Nossa Senhora da Conceição, located between Alcochete and Samouco about 200m from the bridge, has also been restored to its former glory. During the refurbishment important ceramic tiles and archaeological artefacts were uncovered including a brass medal embossed with image of a saint dating from around the 17th century. Also revealed was a 17th century decorative fresco painting in the arch of a Gothic window which had lain concealed by walls built in a 19th century modification to the interior of the building.

Archaeological excavations near the South Access of the bridge led to the discovery of a Middle Palaeolithic site considered to be of exceptional interest and the unearthing of numerous artefacts and implements.

The measures to minimize noise levels and air pollution include landscaped acoustic barriers and there is provision silt rainwater running off from the South Viaduct at the Samouco Salt pans area.

The environment design aspect created widespread interest and this has been met by an informative newsletter published by CEMA, which is sent to schools, universities, municipalities, and other interested organisations.

In respect of socio-economic issues, Lusoponte carried out a careful management program regarding expropriations and rehousing. This program, a task usually carried out only by government agencies, was for the first time carried out by a private company. This program led significant improvements in live conditions of more than 1000 habitants.

Nearly 300 Portuguese families, living in shanties, with no minimum healthy conditions, were rehoused in apartments built by LUSOPONTE, at the new Quinta do Carmo resort, or indemnities were paid. Luosoponte also provided, at a cost of 350.000 euros, a bright new spacious day centre for the elderly to replace the former centre at Moscavide, a poorly equipped and cramped building which had to be demolished. The new facilities include a library, meeting room, bar, canteen, medical clinic and laundry.

A new primary school with modern classrooms, gymnasium and leisure facilities was also built at Portela to replace one demolished on the boundary of the Praça José Queirós access and another school in Moscavide was completely refurbished.

Construction statistics

Overall length of crossing	17.185 m
Overall length of structures	12.345 m
Length of Sacavém access	945 m
Length of North Viaduct	488m (11 spans)
Length of Expo Viaduct	672m (12 spans)
Length of Main Bridge	826 m
Length of main span	420 m
Height of piers on the main span	148 m
Navigation clearance	47 m
Length of Central Viaduct	6.531m (80 spans)
Length of South Viaduct	3.825m (84 spans)
Length of Montijo access	3.895 m
Caissons units	81
Total volume of concrete required	730.000 m3
Weight of reinforced steel	100.000 tonne
Total of precast deck beams units	150
Total volume of earthworks	1.400.000 m3
Total surface area	400.000 m2
Staff employed at peak	3.300
Construction period	February 1995 – March 1998

2. Tolls in 2008, for passenger vehicles:

€1.30 in "April 25th" bridge

€2.25 in "Vasco da Gama" bridge

3. Internet references:

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- http://en.wikipedia.org/wiki/Vasco_da_Gama_Bridge
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