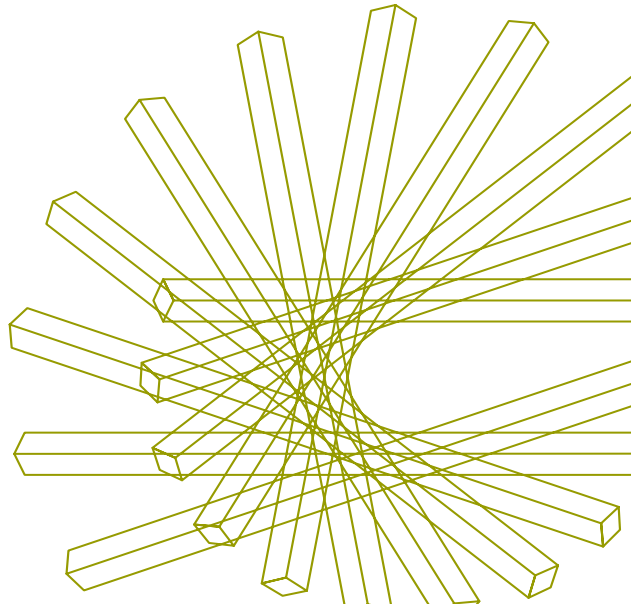
Megaproject

High-speed Rail: Seville - Madrid Line

A Megaproject case study compiled by

Rafaela Alfalla-Luque and Carmen Medina-López



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MEGAPROJECT Case Study

Case compiled by: Rafaela Alfalla-Luque and Carmen Medina-López
Contact details: alfalla@us.es, cmedina@us.es

Basic Project Information

Project Title	High-speed rail (HSR) in Spain. A case study: HSR Seville-Madrid line
Location	Spain
Purpose	To strengthen the connection between two main cities in Spain and to be a backbone for communications across the regions (Madrid, Castilla-La Mancha and Andalucía). To develop a safe, efficient and sustainable high speed railway system
Scope	To improve the connection between cities and regions. Integrated with Trans-European Transport Network (TEN-T)
Total Project Value	The Madrid-Seville HSR (AVE) was initially budgeted (1988) to 1,575 million euros, but in 1992 (start operations) had cost 2,704 million euros (a divergence of 71.7%). [1]
Project Status (i.e.. initiation, planning, construction, operation, dismantling)	Operation. The construction of HSR Seville-Madrid infrastructure was carried out between 1987 and 1993. The line starts operating in April 1992 [6]
Contractual Framework (e.g. fixed price, cost-plus etc.)	Public project.
Relevant Physical Dimensions (e.g. height, width, volume, length)	• Current Length: 477 km [51] Initial Length: 471 km • Track gauge: UIC (1,435 mm) • Maximum Speed: 300 km/h • 32 Viaducts. Total length of 8,355 meters. The two most important are the Ciudad Real viaduct (930 meters-the longest) and the Tajo and Guadálmez rivers viaduct (800 meters long and 78 meter-high piers). • 17 Tunnels. Total length of 16,030 meters. The longest: 2,540 meters. • Electrification: 1 x 25kV 50Hz AC • Signalling: ASFA200 and LZB. Planned installation of ERTMS • Telecommunications: Digital Train-Ground based on GSM-R • 5 passenger stations: Madrid Puerta de Atocha, Ciudad Real, Puertollano, Córdoba and Sevilla Santa Justa • Maximum inclination: Standard: 12.5 ‰; Absolute: 13.25 ‰ [3; 6]

High-speed train lines in Spain at 31/12/2014

http://www.adifaltavelocidad.es/es_ES/infraestructuras/lineas_de_alta_velocidad/lineas_de_alta_velocidad.shtml

Madrid-Sevilla HSR line:

MEGAPROJECT Internal Stakeholder Identification

(Stakeholders with a direct legally sanctioned relationship with the project)

		Stakeholder Category	Case-Study		Comments (e.g. maturity, previous experiences of stakeholders, skills, influence on project)
Internal	Supply-Side	**Client**	In 1992 the client was **RENFE** Currently, the infrastructure belongs to **ADIF AV** and the the operationalization is managed by **RENFE OPERATOR**. [6]		
		Financiers	Has been encouraged and financially supported by the: [6] • European Regional Development Fund (ERDF): 267.3 million euros • European Investment Bank (EIB): 777,548,200 euros (loans) $[EIB\ website]$ • Spanish Government		
		Sponsors	Spanish Government		
		Client's Customers	Final customers: Tourists, professionals, passengers in general According to RENFE, the evolution of the passengers is: In 1992: 70% men; 63% between 25 and 44 years old; 62% had college degrees; 36% travel for work reasons. In 2012: 56% men; 60% between 25 and 44 years old; 77% had college degrees; 60% travel for work reasons.		
		Client's Owners	In January 2005 the Railway Sector Law extinguished **RENFE** company (Spanish National Railways Company, created in 1941). This company was divided into two companies: 1) **Renfe Operator,** that operates the trains, and 2) **ADIF**, that manages the infrastructure. In December 2013 ADIF was divided into two companies (*Real Decreto* 15/2013): 1) **ADIF AV,** responsible for the construction and administration of the HSR infrastructure and 2) **ADIF,** responsible for traditional train infrastructure. All of them are state-owned companies controlled by the Ministry of Development (*Ministerio de Fomento*).		
		Other internal supply-side categories (please specify)	**Category**	**Case-Study**	

MEGAPROJECT Internal Stakeholder Identification

(Stakeholders with a direct legally sanctioned relationship with the project)

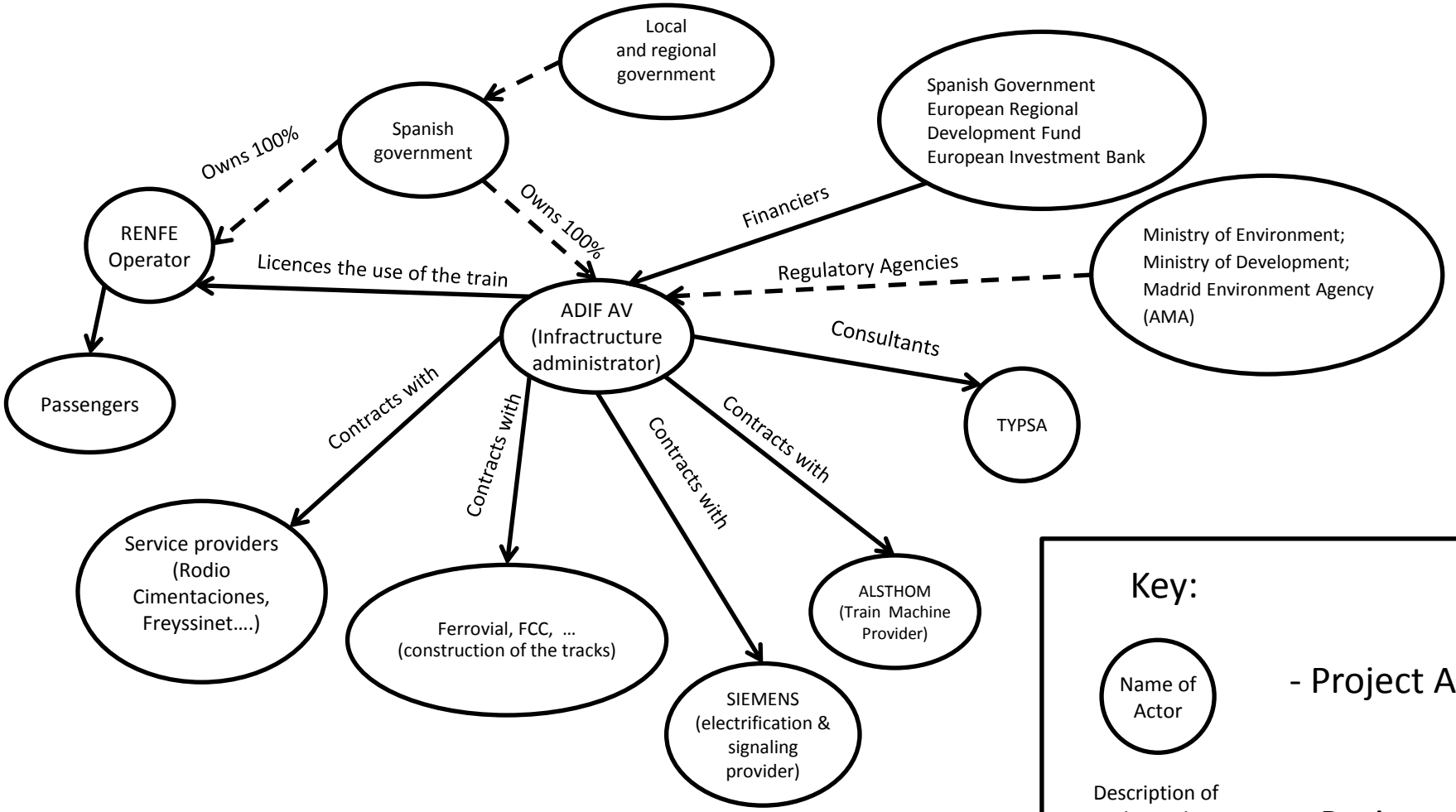
		Stakeholder Category	Case-Study		Comments (e.g. maturity, previous experiences of stakeholders, skills, influence on project)
Internal	Demand Side	Principal Contractor	• Siemens was awarded the signaling and electrification of the high-speed line [29, 19] • Alsthom Iberia (Maquinaria Terrestre y Marítima (MTM), Ateinsa and Meinfesa) builds the train machine [29] • Ferrovial, FCC, …(construction firms) build the track		
		First Tier Contractors			
		Consultants	TYPSA [41]		
		Professional Services Providers	Rodio Cimentaciones Especiales S.A. [9] Freyssinet (Maintenance of the viaducts during the operational phase) [40]		
		Other internal supply-side categories (please specify)	Category	Case-Study	

MEGAPROJECT External Stakeholder Identification

(Stakeholders with a direct interest in the project but with no legal contract)

		Stakeholder Category	Case-Study		Comments (e.g. maturity, previous experiences of stakeholders, skills, influence on project)
External	Public	**Regulatory Agencies**	Ministry of Development; Ministry of Environment; Madrid Environment Agency (AMA - *Agencia de Medio Ambiente de la Comunidad de Madrid*)		
		Local Government	Regional Governments of Andalucía, Castilla-La Mancha and Madrid. Municipal authorities/town councils of the cities with HSR stations		
		National Government	Spanish Government		
		Other external supply-side categories (please specify)	**Category**	**Case-study**	
			Tourism associations Industry & service associations		
	Private	**Local residents**	Local Associations		
		Local Landowners	Private landowners		
		Environmentalists	Greenpeace, WWF, European Environment Agency		
		Conservationists			
		Archaeologists			
		Other External Private stakeholders (please specify)	**Category**	**Case study**	
			Other transport operators		
			Universities and Technological Centres		
			Press & Media		
			Opinion makers: placement of news and opinion articles by companies interested in the project		
			Political Opinion		

MEGAPROJECT Stakeholder Relationship Maps



Key:

Name of Actor — - Project Actor

Description of relationship → - Project relationship with a contractual basis

Description of relationship - - - → - Non-contractual project relationship

Repeat this map for as many project phases as you require

MEGAPROJECT External Stakeholder Attitude Analysis

External Stakeholder	External Stakeholder's Attitude to this Project	External Stakeholder's Influence on project	Impact of Project on External Stakeholder	Phase of Project of Greatest Interest (initiation, planning, construction, operation, dismantling)
Tourism Associations	Highly Favourable. The HSR has a high impact on travel distribution and modal choice. [1]	General ability to lobby government	High. Contributes to achieving its overall aims	Operation
EU Commission	Highly Favourable. HSR is considered as a new form of European integration [2]	General ability to lobby government	Contributes to achieving its overall aims	Initiation, Planning, Construction & Operation
Others transport operators: air transport, conventional railways and road transport [2]	Worried about the effects	Limited	The introduction of the HSR reduced the demand of the Madrid-Seville flights a 50%, diminishing the load factor and flight frequency. The Seville airport suffered a 25% reduction because Madrid-Seville connections represented 50% of airport traffic [30]	Operation
Industry & services Associations	Highly Favourable . Commercial reasons [2]	Medium	High	Operation
Greenpeace, WWF, Environment agency (AMA)	Worried about the effects, but they recognised some energetic benefits	Ability to Lobby Government	Effect on the Manzares river - deterioration of the fauna of the area - noise barriers to mitigate the effects of the train next to residential areas [21] [25]. Archaeological prospection [24]	Initiation, Planning, Construction and Operation
Private landowners	Worried about the lost of the land	Limited	Lost of the land	Planning and Construction
Cities with HSR stations	Highly Favourable	Medium	High	Initiation, Planning, Construction and Operation

MEGAPROJECT Project Management

Project Organisation

Client Project Team Size & Structure	RENFE / ADIF AV / RENFE OPERATOR : state-owned companies
Contractor Project Team Size and Structure	Ferrovial, FCC, …
Sub-Contractor Project Team Involvement	Firms of engineering, construction, manufacturing systems and train machines

Project Tools and Techniques

No information avalaible

Please √ if present, x if absent , leave blank if unknown

Life-Cycle Costing Approaches ☐	Project Management Software ☐	Lessons Learnt Transfers ☐
Stakeholder Involvement ☐	Relationship Management Tools ☐	Team Building Tools ☐
Building Information Modelling (BIM) ☐	Project Knowledge Management Tools ☐	Competency framework ☐

Other Tools and Techniques or More Information

A cost benefit analysis was performed.
But the final decision to approve the project was a political decision.

Project Processes

Risk Management Processes	□ No Information avalaible
HR Management Processes	□ No Information avalaible
Procurement Management Processes	□ No Information avalaible
Integration Management Processes	Operational phase: Through the DaVinci technology platform, the Spanish model achieves all-round management of all the processes, systems and users on a single open-architecture platform which also offers the possibility of remote control and monitoring of lines managed by other control centres. This concept is applied in the Control and Regulation Centers (CRC), which include all the systems involved in railway traffic regulation, from signalling to passenger information, thus meeting the requirements of high-speed railways. [42]
Scope Management Processes	□ No Information avalaible
Time Management Processes	□ No Information avalaible
Cost Management Processes	□ No Information avalaible
Quality management Processes	□ No Information avalaible
Communications Management Processes	□ No Information avalaible

MEGAPROJECT Project Performance

Aspects of Performance Concerned with Doing the Project Right

<table>
<tr><th></th><th>Original Targets and changes to targets</th><th>Actual Achievements Against Targets</th></tr>
<tr><td>Performance relating to time</td><td>Estimated construction duration: 2 years</td><td>Real construction duration: 5 years (divergence 3 years)
The construction was carried out between 1987 and 1993. Starts operations: April 1992 [2]</td></tr>
<tr><td>Performance relating to cost</td><td>Planned budget (1988): 1,575 million euros [1]</td><td>In 1992 (start of operation of the line) had cost 2,704 million euros (a divergence of 71.7%). [1]</td></tr>
<tr><td>Performance related to achieving specification</td><td>Expected number of passengers in 1997: 4,3 million (constantly increasing since 1992) [37]
Renfe had expected the first net benefits in 1998, but finally it had the first net benefit in June 1997 (217 million pesetas in June 1997) [37]</td><td>Passengers per year [13; 37]:
From April to December 1992 there were 1.3 million HSR passangers
<table>
<tr><th>Period</th><th>Passangers</th></tr>
<tr><td>1993</td><td>2,338,000</td></tr>
<tr><td>1994</td><td>3,5 million</td></tr>
<tr><td>1995</td><td>3,8 million</td></tr>
<tr><td>1996</td><td>4 million</td></tr>
<tr><td>1999</td><td>3,804,000</td></tr>
<tr><td>2000</td><td>4,202,000</td></tr>
<tr><td>2001</td><td>4,613,000</td></tr>
<tr><td>2005</td><td>3,397,000</td></tr>
</table>
<table>
<tr><th>Period</th><th>Passangers</th></tr>
<tr><td>2006</td><td>3,677,000</td></tr>
<tr><td>2007</td><td>3,571,000</td></tr>
<tr><td>2008</td><td>3,407,730</td></tr>
<tr><td>2009</td><td>3,061,000</td></tr>
<tr><td>2011</td><td>2,797,240</td></tr>
<tr><td>2012</td><td>2,574,000</td></tr>
<tr><td>2013</td><td>2,791,000</td></tr>
<tr><td></td><td></td></tr>
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</td></tr>
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Aspects of Performance Concerned with Doing the Right Project

Stakeholder or Stakeholder Grouping	Original Aims of Project Involvement and Changes to these Aims	Achievement of these Aims
Tourism associations Industry & Services Associations	To increase the passenger traffic	• Time savings [30] • The benefit caused by the introduction of the HSR from the point of view of the regional equilibrium is obvious, taking into account the peripheral situation of Seville and Andalusia with respect to the centres of decisions and production of the Spanish and European economy [31] • The HSR stations play a major attraction for population located more than an hour drive [14]
City of Madrid	Madrid mobility enhancements	• The mobility for residents and host population has increased with the consequent economic impact [15] • Impact urban environment of the station, increased activity, decreased congestion traffic [15]
City of Seville	Seville mobility enhancements To improve economics performance	• HSR has decreased the air traffic in Seville (63%). • Madrid has become a dynamic element of the outsourced economy. • It has been responsible for reshaping the city, decreasing the plight of urban bottlenecks and allowing to recover degraded areas and creating new areas of expansion [15] • The HSR has turned the community of Madrid in the second national tourism market to Seville. The increased accessibility of Seville has benefited the development of a greater number of conferences in Seville. [36]

MEGAPROJECT Project Environment

Legal and Regulatory Environment

Legal and Regulatory Project Environment (regionally, nationally and Europe wide)	• The European System of Accounts SEC-95 • Spanish public contracts law 24/2011 • *Real Decreto* 12/2011 develops the legislation of public contracts
Specific Legal and Regulatory events impacting on the project	• The Infrastructure and Transport Plan of the Spanish Government • Law of Railway sector 39/2003 (17 November)

Political Environment

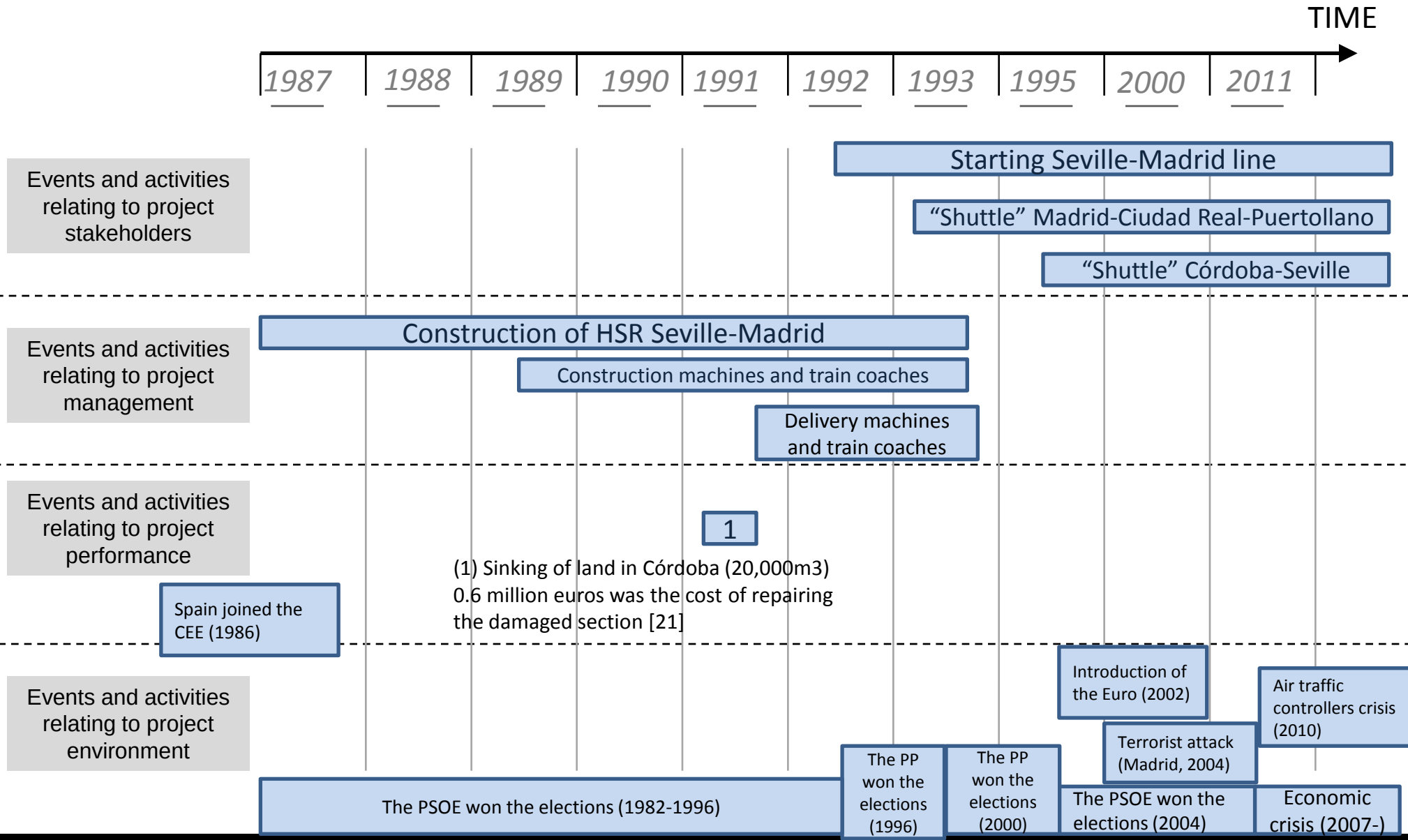
Political Project Environment	• Urban planning measures: regulations and incentives to reduce the possible barrier effects of the rail system; the new areas developed allow the location of new economic activities and create positive synergies. • Management measures: the implementation of mobility policies to foster the coherent coordination of internal and external passenger flows. [16] • Interest in removing regional imbalances and improving communications in the country. • Given its importance, soon became a terrorist target. Some terrorist attacks have been suffered (one of the most important was the attack of 11-M) [32]
Specific Political Events impacting on the project	• 1992 Universal Exposition in Seville

MEGAPROJECT Project Environment

Economic Environment

Economic Project Environment	In the early 1990's developed countries were affected by an economic and financial crisis causing inflation. The effects of this crisis took longer to arrive in Spain, given the huge public spending that was done between 1990 and 1992 to prepare the country for major events like the 1992 Universal Exposition in Seville (including the transport infrastructure Madrid-Seville HSR) and the 1992 Olympic Games in Barcelona. HSR creates a new type of mobility in relation to business and university studies, specially in those urban centers that are located midway on the headwaters of the corridor cities - as is the case of Córdoba, Ciudad Real and Puertollano. The business travels increase as a direct result of the new markets open up by the HSR [33]
Specific Economic Events impacting on the project	1992 Universal Exposition in Seville

MEGAPROJECT Project Key Events and Activities Timeline



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