

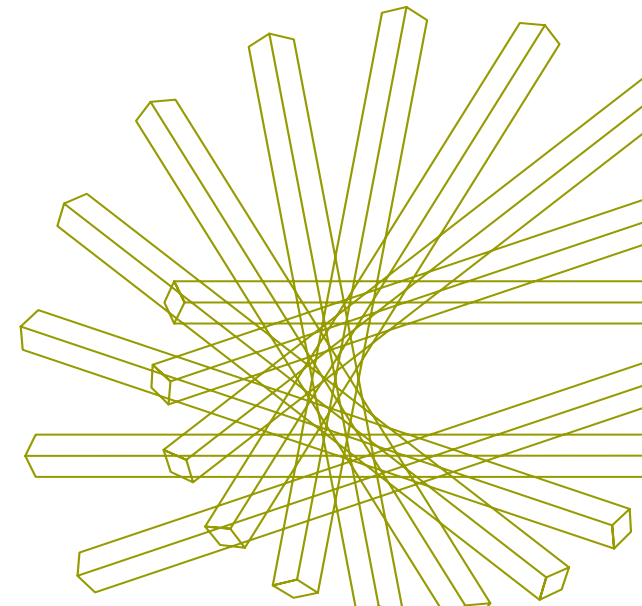


# Spanish Metro Line: Metro De Sevilla

*A Megaproject case study compiled by*

Ana Irimia-Dieiguez, Carmen Medina-López and Rafaela Alfalla-Luque

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# MEGAPROJECT Case Study

Case compiled by: Ana Irimia-Diequez, Carmen Medina-López and Rafaela Alfalla-Luque

Contact details: [anairimia@us.es](mailto:anairimia@us.es), [cmedina@us.es](mailto:cmedina@us.es), [alfalla@us.es](mailto:alfalla@us.es)

## Basic Project Information

|  |   |
|--|---|
| Project Title  | Spanish metro line : Metro de Sevilla   |
| Location   | Spain (Seville)   |
| Purpose  | Design, construction & operation of the first line of the metropolitan underground of Sevilla.  |
| Scope  | To improve the mobility in the metropolitan area of Seville. Line 1 connects the city of Seville with 3 cities: Mairena del Aljarafe, San Juan de Aznalfarache and Dos Hermanas [1]<br>To promote and facilitate the intermodality and the use of public transport [1]  |
| Total Project Value  | The final investment in infrastructure and facilities of Line 1 was set to 634.093.303 euros [1]  |
| Project Status(i.e.. initiation, planning, construction, operation, dismantling) | Operation. Date of opening: April 2, 2009 [1]<br>Future expansions: there are 3 more projected lines (2, 3 and 4) plus 2 extensions of line 1 [5]   |
| Contractual Framework (e.g. fixed price, cost-plus etc.)                         | Public Private Partnership (PPP)<br>Build Operate and Transfer (BOT)  |
| Relevant Physical Dimensions (e.g. height, width, volume, length)                | <p>-Length: 18.1 km, about 38 minutes. 56% underground; 31% on surface; 13% viaduct</p> <p>-Stations: 21 in operation (22 proyected)</p> <p>-Speed: Average speed: 30 km/h; Maximun speed: 70km/h</p> <p>-Trains: 21 (CAF. Urbos 2)</p> <p>-Power consumption: 20,3 million kw/h</p> <p>-Communication systems: TETRA; CCTV; interphones; indicator screens</p> <p>-Electrification: 750Vdc; 22 electric tranformer stations (20kv/400vac)</p> <p>-Double tunnel with tunnel boring machine: 4,484 meters (total length)</p> <p>-Concrete volume: 530,650 cubic meters -Reinforcing steel: 47,135 tons -Structural steel: 1,087 tons</p> <p>-Jet Grouting and micropilotes: 85,000 linear meters</p> <p>- 5 parkings (capacity: 1600 cars)</p> <p style="text-align: right;">[1, 7]</p> |

# MEGAPROJECT Internal Stakeholder Identification

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

|          |   | Stakeholder Category | Case-Study  | Comments<br><small>(e.g. maturity, previous experiences of stakeholders, skills, influence on project)</small>   |
|----------|---|----------------------|---|--|
| Internal | Supply-Side   | Client               | Seville Metro Concessionaire Society of the Junta de Andalucía S.A. Hereinafter, Metro de Sevilla S.A. [1]  | New Company  |
|          |   | Financiers           | <p>Infrastructure Investment: 584 million € , including mobile equipment 634 million €, financed by:</p> <ul style="list-style-type: none"> <li>- Shareholders (21.7% of initial investment): public sector (25%), and several private companies such as Sacyr S.A., Dragados, GEA_21, and CAF. These shareholders also contribute with equity loans of 1% of the initial investment.</li> <li>- Regional Government subsidies: the initial subsidy amounted 33% of the total investment (except mobile equipment), although finally amounted to 47.94% of total investment.</li> <li>- European Investment Bank (E.I.B.) Loan: 260 million €.</li> </ul> |  |
|          |   | Sponsors             | Regional Government (Junta de Andalucía)  | <p>Promote the project and grants the concession to Metro de Sevilla S.A.</p> <p>If demand exceeds the level specified in the contract, any excess in profit reverts to the public sector.</p> |
|          |   | Client's Customers   | <p>Users (students, workers, tourists, professionals)</p> <p>In 2012: 44% of passengers travel for work and 20% were students</p>   | They pay a ticket which it is only a part of the cost. The remaining amount is obtained through an exploitation subsidy granted by the regional government                                     |
|          |   | Client's Owners      | <p>The concessionaire of the Metro Line 1 is a Limited Company created in 2003 for the construction and exploitation of this megaproject. The shareholders were the public sector (through a local-transport company TUSSAM) and a temporary multi-organization composed of several private companies. At the end of 2012, they are : Investment in Railway Concessions S.A. (belongs to Dragados Group), Sacyr S.A., GEA_21 and Development of Railway Concessions (belongs to Iridium group)</p>  |  |
|          | Other internal supply-side categories <small>(please specify)</small> | Category             | Case-Study  |  |

# MEGAPROJECT Internal Stakeholder Identification

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

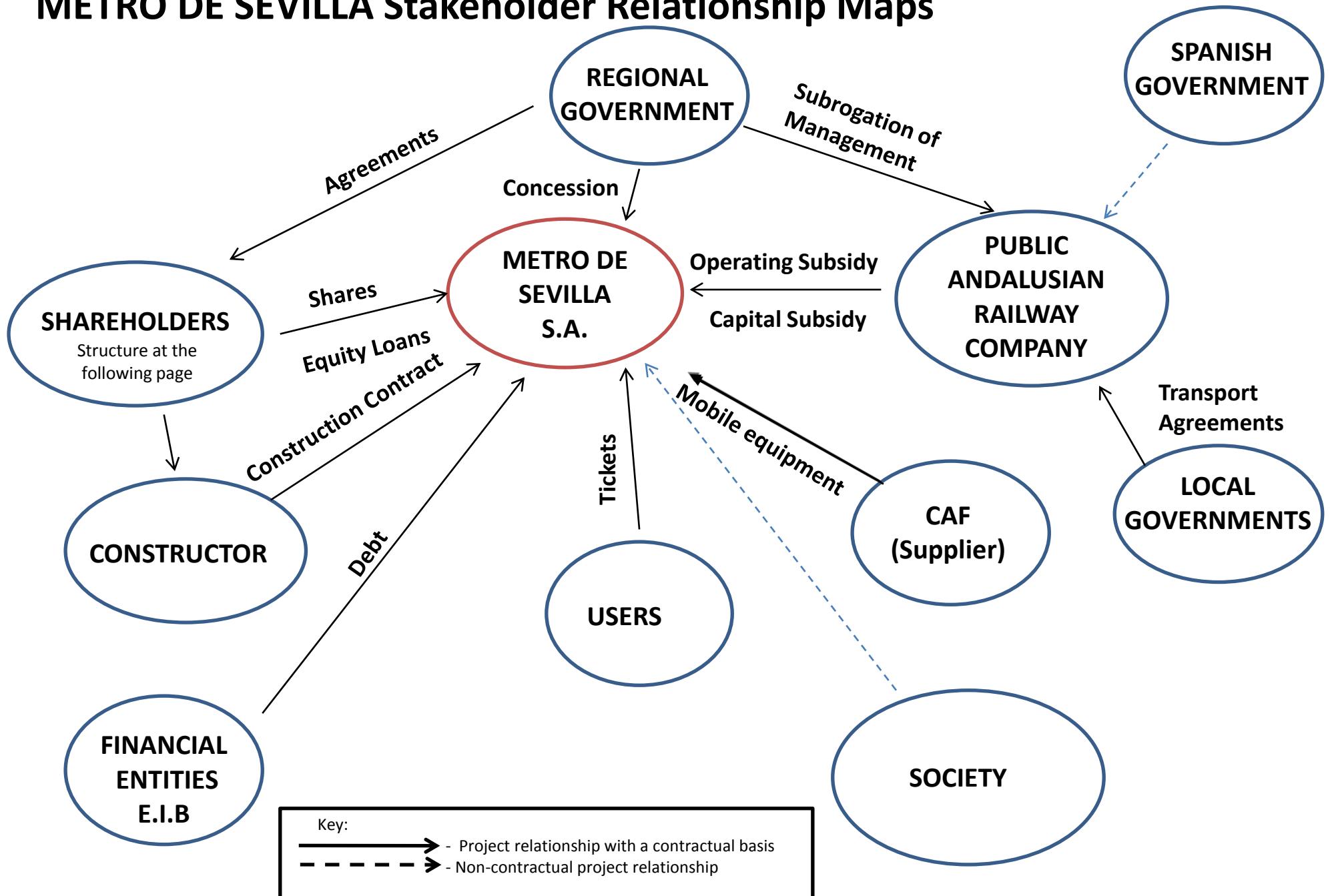
|          | Stakeholder Category | Case-Study  | Comments<br>(e.g. maturity, previous experiences of stakeholders, skills, influence on project)  |
|----------|----------------------|---|--|
| Internal | Demand-Side          | Principal Contractor                                    | Design: Regional Government (Junta de Andalucía) through a public company<br>The metro line was built by the concessionaire company (created in 2003).   |
|          |                      | First Tier Contractors                                  | The temporary multi-organization (composed of Sacyr S.A., Dragados Obras y Proyectos, S.A., GEA_21, Salvador Rus López Construcciones S.A.) was the constructor of the project.<br>The mobile equipment was provided by Construcciones Auxiliares de Ferrocarriles, S.A. (CAF) |
|          |                      | Second Tier Consultants                                 |  |
|          |                      | Professional Services Providers                         | Main services subcontracted during the operational phase are: maintenance of mobile equipment , cleaning, security and maintenance of facilities [1]   |
|          |                      | Other internal demand-side categories ( please specify) | Category   |
|          |                      |   |  |

# MEGAPROJECT External Stakeholder Identification

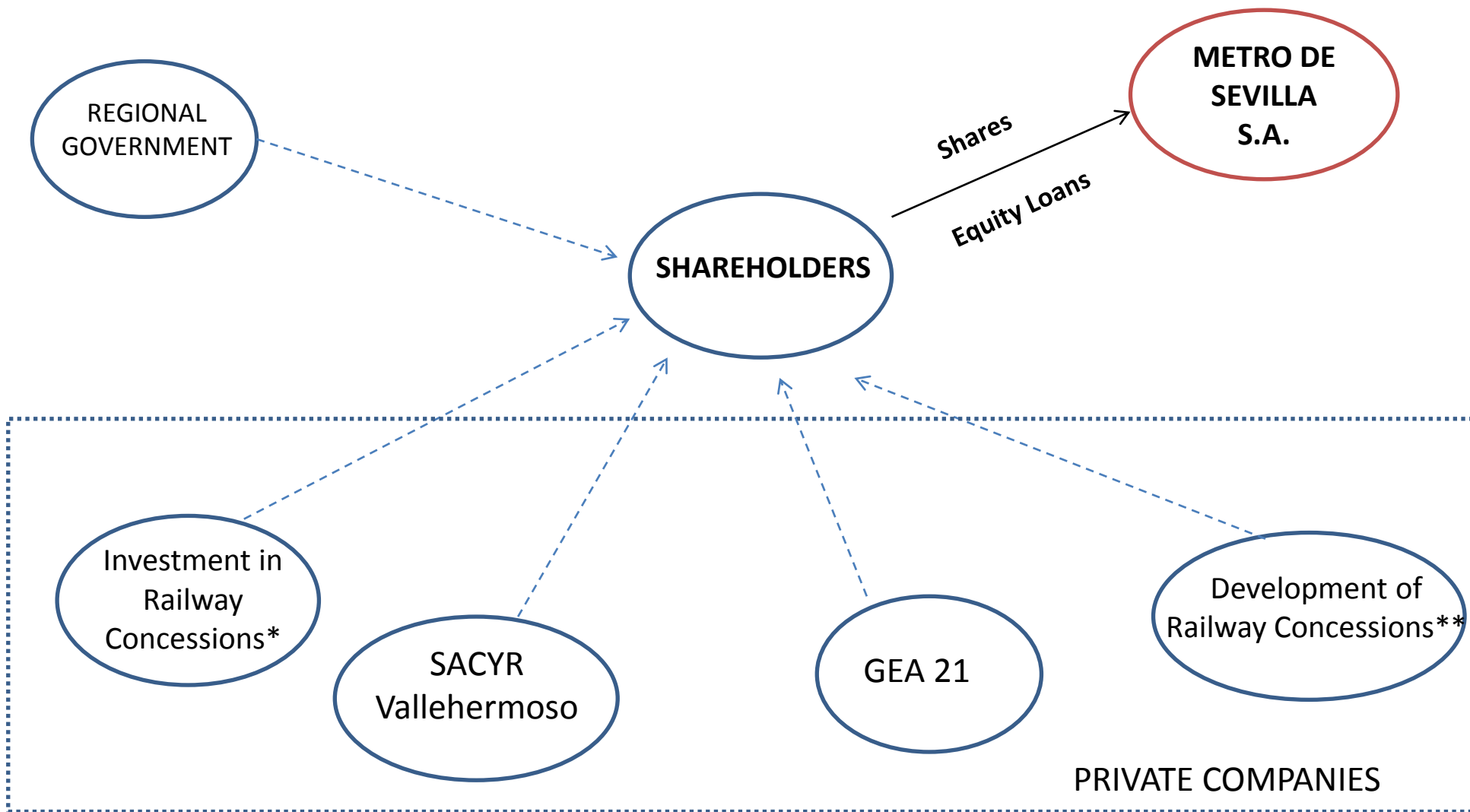
(Stakeholders with a direct interest in the project but with no legal contract)

|   |   | Stakeholder Category                                   | Case-Study   | Comments<br>(e.g. maturity, previous experiences of stakeholders, skills, influence on project) |  |
|---|---|--|--|---|--|
| External  | Public  | Regulatory Agencies                                    | The Andalusian Railway Public Company (Ente público de Gestión de Ferrocarriles Andaluces)   | Requires compliance with legal regulations  |  |
|   |   | Local Government                                       | Local Government of the cities of Sevilla, Mairena del Aljarafe, San Juan de Aznalfarache and Dos Hermanas   |   |  |
|   |   | National Government                                    | Spanish government   |   |  |
|   |   | Other external supply-side categories (please specify) | Category   | Case-study  |  |
|   | • Tourism board of Sevilla, Industry & service associations |  |  |   |  |
|   | Private   | Local residents  | <ul style="list-style-type: none"> <li>• Neighbourhoods. They were affected by noise and previous works</li> <li>• Citizens of the four involved cities</li> </ul> |   |  |
|   |   | Local Landowners                                       |  |   |  |
|   |   | Environmentalists                                      |  |   |  |
|   |   | Conservationists                                       |  |   |  |
|   |   | Archaeologists   |  |   |  |
|   |   | Other External Private stakeholders (please specify)   | Category   | Case study  |  |
|   |   |  | Other transport operators  |   |  |
|   |   |  | Press & Media  |   |  |
| Opinion makers: placement of news and opinion articles by companies interested in the project |   |  |  |   |  |
|   | Political Opinion   |  |  |   |  |

# METRO DE SEVILLA Stakeholder Relationship Maps



# METRO DE SEVILLA Stakeholder Relationship Maps at December, 2012



\* Dragados Group

\*\* Iridium Group

Key:

- > - Project relationship with a contractual basis
- - -> - Non-contractual project relationship

# 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) |
|---|---|--|--|--|
| Industry & services Associations  | * During construction phase there were a negative perception of the project<br>** In Operation phase: Highly Favourable | Low  | * Negative impact on some commercial areas affected by the construction.<br><br>** Positive for tourism and shopping   | * Construction<br><br>** Operation   |
| Customers (Users)   | Positive  | Through the use of public transport (metro) instead of their own car   | Better mobility in the metropolitan area   | Operation  |
| Society   | High awareness of environmental sustainability  | * Adaptations in the service were requested by the nearest neighbours (noise, ...).<br>** Requests for a broader service: timetable and frequency              |  | * Construction<br><br>** Operation   |
| The Andalusian Railway Public Company   | Highly Favourable   | Promoters  | Better transport service for the society   |  |
| Local Governments of the cities (Sevilla, Mairena del Aljarafe, San Juan de Aznalfarache and Dos Hermanas ) | Highly Favourable<br>Interest in reducing pollution and car traffic in their municipalities                             | They can influence the process through their relationships with the Regional Government. Looking after the interests of social groups affected by the service. | The project allows rapid and sustained communication between these municipalities and Seville city centre which is of great interest both socially and economically. |  |
| Spanish Government  | Highly Favourable   | Through legal regulations  | Better transport service for the society   |  |



# MEGAPROJECT Project Management

## Project Organisation

|  |  |
|--|--|
| Client Project Team Size & Structure       | There are 180 full time employees with high (20%) and medium (80%) qualification and an average age of 35 years in 2012 in Metro de Sevilla S.A.<br>General Management represents 2% of total employees, Operations Management (76%), Maintenance Management (16%), Economic and Financial Management (4%), and Human Resources Management (2%). [1] |
| Contractor Project Team Size and Structure | The client is the contractor   |
| Sub-Contractor Project Team Involvement    |  |

## Project Tools and Techniques

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

- |   |   |   |
|---|---|---|
| Life-Cycle Costing Approaches <input checked="" type="checkbox"/> | Project Management Software <input checked="" type="checkbox"/> | Lessons Learnt Transfers <input type="checkbox"/> |
| Stakeholder Involvement <input type="checkbox"/>                  | Relationship Management Tools <input type="checkbox"/>          | Team Building Tools <input type="checkbox"/>      |
| Building Information Modelling (BIM) <input type="checkbox"/>     | Project Knowledge Management Tools <input type="checkbox"/>     | Competency framework <input type="checkbox"/>     |

### Other Tools and Techniques or More Information

A tool for the continuous improvement of the maintenance process is employed (FRACAS)

The project incorporates the latest technology and security measures, some of them unique in the transportation of Spain.

This infrastructure is a bet from the Junta de Andalucía for a modern transport system by virtue of their service quality, high technology, modernity and environmental sustainability. [7]

# Project Processes

|                                     |   |
|-------------------------------------|---|
| Risk Management Processes           | <p><i>Metro de Sevilla has included measures to minimize construction and operations risks in order to ensure the safety of both workers and citizens. In the preliminary phase, and within the geotechnical tests were conducted 48 surveys of drilling, hydrological studies and field trials to check the status of nearby buildings, 222 buildings were inspected, which were assigned different levels of sensitivity given the type of structure and foundation, the distance to the trace of the work and state of repair and maintenance.</i></p> <p><i>Environmental risks are covered with several measures for example minimizing noises.</i></p> <p><i>Demand risk is covered by the regional Government with a minimum and a maximum volume of sales.</i></p> <p><i>Interest risk is covered by swaps.</i></p> |
| HR Management Processes             | <input type="checkbox"/> No Information available   |
| Procurement Management Processes    | <input type="checkbox"/> No Information available   |
| Integration Management Processes    | <p>A tool for the continuous improvement of the maintenance process is employed (FRACAS)</p>  |
| Scope Management Processes          | <input type="checkbox"/> No Information available   |
| Time Management Processes           | <input type="checkbox"/> No Information available   |
| Cost Management Processes           | <p>Energetic efficiency measures such as illumination with leds in some stations, automatic switch-off system, and so on.</p>   |
| Quality management Processes        | <p>Certificate UNE-EN ISO 14001:2004 for the whole activity of the company.</p> <p>Internal audits for Norm UNE-EN-ISO 9001:2008, and Norm UNE-EN ISO 14.001:2004</p>   |
| Communications Management Processes | <p><i>The web page of Metro de Sevilla is elaborated in accordance to the content of Web 1.0 of the Web Accessibility Initiative (WAI 1.0) from the World Wide Web Consortium, in its level Double A. Furthermore, the web satisfies the requirements of the Norm UNE 139803:2004, level Double A.</i></p>  |

# MEGAPROJECT Project Performance

## Aspects of Performance Concerned with Doing the Project Right

|                                     | Original Targets and changes to targets  | Actual Achievements Against Targets  |
|-------------------------------------|--|--|
| Performance relating to <b>time</b> | <p>The first project of Metro de Sevilla was conceived in 1974 although the project was cancelled in 1983 for fear of causing damage to historic buildings.</p> <p>In 1999 the project is reactivated, and the planning or design phase last until 2003, when the concession contract is given to the company Metro de Sevilla.</p> <p>It was expected that the works were completed in 2006, but the first partial opening was on April 2, 2009. This delay of 3 years was due to:</p> <ol style="list-style-type: none"> <li>The existence of property protected by the government such as Muslim archaeological remains.</li> <li>The construction of the tunnels was interrupted and delayed due to the river (Guadalquivir) that crosses the city and has lots of small streams. [2]</li> </ol> | <ul style="list-style-type: none"> <li>• Concession Date: May 20, 2003.</li> <li>• Signing of Concession Agreement: June 24, 2003.</li> <li>• Start of operation phase: April 2, 2009.</li> <li>• Duration of Concession: 35 years.</li> <li>• End of Concession contract: June 25, 2038</li> </ul> <p>The whole line is operating since November 23, 2009, after three partial openings:</p> <ol style="list-style-type: none"> <li>April 2, 2009 (16 km. between the stations of City Expo and Condequinto except Puerta de Jerez Station),</li> <li>September 16, 2009 (Puerta de Jerez station), and</li> <li>November 23, 2009 (2 km and the last three stations: Montequinto, Europe and Olivar de Quintos)</li> </ol> |

# MEGAPROJECT Project Performance

## Aspects of Performance Concerned with Doing the Project Right

|  | Original Targets and changes to targets  | Actual Achievements Against Targets  |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |
|--|--|--|--------|------------|-------|-----------|------|------------|------|------------|--------|------------|------|------------|------|------------|-------|------------|
| <p>Performance relating to <b>cost</b></p>                   | <p>Planned budget: 461,224,754 euros [3]</p> <p>The implementation of the Metro line 1 of Seville has a total investment of more than 658 million euros, 196 million more than originally planned due to, among other things, changes in routes and stations. The final investment in infrastructure and facilities of the Metro Line 1 amounted to 658,020,037 euros Seville, representing a deviation of 42.67% compared to</p>              | <p>The final investment in infrastructure and facilities of the Metro Line 1 amounted to 634,093,303 euros.<br/>According to the planned budgeted the deviation has been of 37.48%. This gap is due to:</p> <ul style="list-style-type: none"> <li>• Improvements agreements with other administrations and institutions (parking areas, ...).</li> <li>• Changes introduced by the project management in order to increase security.</li> <li>• The redesign and constructive solution in the area between the University Pablo de Olavide and Montequinto, which has seen an increase in investment of 64.5 million euros.</li> <li>• The change of location of the Puerta de Jerez station which increased budget by EUR 11.8 million. [3]</li> </ul>   |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |
| <p>Performance related to achieving <b>specification</b></p> | <ul style="list-style-type: none"> <li>• Annual travelers estimated (first five years): 14 million.</li> <li>• Population served approximately: 230,000 habitants of four municipalities who live near the stations.</li> <li>• This metro line is included in a bigger project with 3 more lines and 2 extensions of line 1. Due to budgetary constraints it has been postponed</li> <li>• 22 stations projected, 21 in operation.</li> </ul> | <ul style="list-style-type: none"> <li>• 21 stations in operation</li> <li>• Only Line 1 of Metro de Sevilla has been constructed and is in operation.</li> <li>• Passengers per year (source:<a href="http://www.ine.es/">http://www.ine.es/</a>)</li> </ul> <table border="1" data-bbox="1199 862 1556 1079"> <thead> <tr> <th>Period</th> <th>Passengers</th> </tr> </thead> <tbody> <tr> <td>2009*</td> <td>7,109,000</td> </tr> <tr> <td>2011</td> <td>15,048,000</td> </tr> <tr> <td>2013</td> <td>13,887,000</td> </tr> </tbody> </table> <table border="1" data-bbox="1597 862 1953 1079"> <thead> <tr> <th>Period</th> <th>Passengers</th> </tr> </thead> <tbody> <tr> <td>2010</td> <td>13,863,000</td> </tr> <tr> <td>2012</td> <td>14,033,000</td> </tr> <tr> <td>2014*</td> <td>14,281,000</td> </tr> </tbody> </table> <p>* 2009 data is from April to December; 2014 data is from January to September.</p> | Period | Passengers | 2009* | 7,109,000 | 2011 | 15,048,000 | 2013 | 13,887,000 | Period | Passengers | 2010 | 13,863,000 | 2012 | 14,033,000 | 2014* | 14,281,000 |
| Period   | Passengers   |  |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |
| 2009*  | 7,109,000  |  |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |
| 2011   | 15,048,000   |  |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |
| 2013   | 13,887,000   |  |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |
| Period   | Passengers   |  |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |
| 2010   | 13,863,000   |  |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |
| 2012   | 14,033,000   |  |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |
| 2014*  | 14,281,000   |  |        |            |       |           |      |            |      |            |        |            |      |            |      |            |       |            |

# 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   |
|--|---|---|
| <ul style="list-style-type: none"> <li>• Local Governments</li> <li>• Society</li> </ul> | <ul style="list-style-type: none"> <li>• They wanted a safe, fast and clean way of transport in the city and the metropolitan area.</li> <li>• They expected a new source of employment.</li> </ul> | <ul style="list-style-type: none"> <li>• The metropolitan transport system has been improved.</li> <li>• The private car traffic from the cities with metro to Seville and the traffic jams at the entrances to Sevilla has been reduced.</li> <li>• The use of the Metro offers savings of CO2 emissions which is almost half that issued by private vehicles.</li> <li>• The annual power consumption in 2012 was 1.4kwh per passenger</li> <li>• In the operation phase they have been created 180 direct jobs and about 200 indirect jobs.</li> </ul> <p style="text-align: right;">[1]</p> |
| <ul style="list-style-type: none"> <li>• EIB</li> <li>• European Union</li> </ul>        | Improvement of the transport system.  | The Metro de Sevilla is widely used and it is considered a safe and eco-friendly means of transport.  |

# MEGAPROJECT Project Environment

## Legal and Regulatory Environment

|  |  |
|--|--|
| <p>Legal and Regulatory Project Environment (regionally, nationally and Europe wide)</p> | <ol style="list-style-type: none"><li>1. European normative<ul style="list-style-type: none"><li>• The European System of Accounts SEC-95</li></ul></li><li>2. National government<ul style="list-style-type: none"><li>• Spanish public contracts law 24/2011</li><li>• Royal Decree-Law 12/2011 develops the legislation of public contracts.</li><li>• Estrategic Plan for Infrastructure and Transport</li></ul></li><li>3. Regional government (JUNTA DE ANDALUCÍA)<ul style="list-style-type: none"><li>• Decree-Law 5/2010, 27 of July, urgent measures for restructuring the public sector</li><li>• Infrastructure Plan for Transport Sustainability in Andalusia 2007-2013</li></ul></li></ol> |
| <p>Specific Legal and Regulatory events impacting on the project</p>                     | <p>Local Governments</p> <ul style="list-style-type: none"><li>• Agreements between the Government of Andalusia and Councils affected by July 14, 2002 [4]</li></ul>   |

# MEGAPROJECT Project Environment

## Political Environment

|  |   |
|--|---|
| Political Project Environment                      | The Concession Contract is regulated by an specific document called Pliegos de Cláusulas Administrativas Particulares (PCAP). |
| Specific Political Events impacting on the project |   |

## Economic Environment

|   |  |
|---|--|
| Economic Project Environment                      | <p>The crisis started in Spain in 2007 during the construction phase.</p> <p>When the Metro started to operate (2009) it became an important instrument for revitalizing retail commerce in historical city districts since it improved the access to the city centre from peripheral neighborhoods. In addition, two big shopping centres are close to metro stations. During the crisis, the metro is widely used because this means of transport is cheaper than a private car.</p> |
| Specific Economic Events impacting on the project |  |

# MEGAPROJECT Project Key Events and Activities Timeline

TIME

1974 to 1983 | ... | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008

**1974:** first project of Metro de Sevilla.  
**1983:** after the start of the works the project was cancelled for fear of causing damages to historic buildings and bad expected return.

**December 15, 1999:** The Council of Seville and the Regional Government (Junta de Andalucía) signed an agreement for the construction of the metro.

**May 21, 2002:** The Junta de Andalucía adopts the Plan of Seville Metro Network and the Declaration of interest in Line 1

**January 14, 2004:** Start of works

**August, 2005:** Construction of north tunnel.

**December, 2008:** Delay of the works by collapse of land (six meters deep)

**May 20, 2003:** Junta de Andalucía awarded the concession for the construction and operation of Line 1 to Metro de Sevilla SA

**June 24, 2003:** Signing of Concession Agreement

2009 | 2010 | 2011 | 2012 | 2013 | 2014 | ... | 2038

**November 23, 2009:** The whole line is operating with 17 trains .

There were three partial openings:

- (a) **April 2, 2009** (16 km. between the stations of City Expo and Condequinto except Puerta de Jerez Station),
- (b) **September 16, 2009** (Puerta de Jerez station), and
- (c) **November 23, 2009** (2 km and the last three station)

**June 25, 2038:** End of Concession contract (35 years)

**2012:** Purchase of 4 new trains



# DATA SOURCES

- [1] Financial statements of the company Metro de Sevilla S.A. (2012).
- [2] Cruz-Aunón, A. (2012) El proyecto del metro de Sevilla, línea 1. EOI <http://www.eoi.es/blogs/adolfinaacruz-aunon/2012/01/18/el-proyecto-del-metro-de-sevilla-linea-1/>
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- [7] Junta de Andalucía Corporate website about Metro de Sevilla:  
<http://www.juntadeandalucia.es/html/especiales/especialmetro-sevilla>