Reviewing Mitigation Hierarchy Implementation

LISBON METRO’S RED LINE (ORIENTE – AEROPORTO)

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Presentation Outline

- Introduction
- Project
- Study/Research Goals
- Study/Research Methods
- Results
- Conclusions
- Recommendations
- Acknowledgements
Lisbon Metro’s Red Line (Oriente – Aeroporto)

- Geographical Location
  - Europe, Portugal
  - 2 Districts: Lisboa & Loures
  - 3 Parishes: Parque das Nações, Moscavide & Olivais
Lisbon Metro’s Red Line (Oriente – Aeroporto)

- Development Project Context

- GOALS
  - From the Metro to the world
  - Connect Lisbon’s International Airport to the city’s CBD through the Metro network
  - Improve mobility and sustainability in Lisbon
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Development Project Context

UNDERGROUND INFRASTRUCTURE

- 3.3 km of tunnel
- 3 stations - Moscavide, Encarnação & Aeroporto
- 5 ventilation shafts

INVESTMENT

- 202 M€, with a 140 M€ contribution from European Cohesion Funds
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• Development Project Context

IMPORTANT STEPS:

- Ministerial Decision: 1999
- First studies: 2002
- With EU funds
- Environmental Impact Assessment (EIA) according to Portuguese legislation
- Environmental Impact Assessment Statement – positive, but with constraints: 2005
- Construction phase: 2007 to 2012
Lisbon Metro’s Red Line (Oriente – Aeroporto)

- Development Project Context
  - Opening date: 17 July 2012
  - Operation phase: almost 3 years...
• Project’s Environmental Context

Environmental Impact Studies (EIS)

- PRELIMINARY STUDY 2004
- DETAILED DESIGN 2005

Main conclusions:

*The balance between the inconvenience to the population during the construction phase and the benefits during the operation phase, as well as between the reduced time frame of construction and the extended time frame of operation, strongly supported the implementation of Lisbon Metro’s Red Line.*
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Project’s Environmental Context

Environmental Impact Assessment (EIA)

- This project was considered very delicate due to its integration in Lisbon’s urban area.

*Densely populated urban area*
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Project’s Environmental Context

Environmental Impact Assessment (EIA)

 Under the Portuguese law this project was submitted to a lengthy and demanding procedure by the Ministry of Environment, just to guarantee its approval.

- EIA Started
- Public Participation
- Environmental Impact Assessment Statement

DETAILLED DESIGN

- June 2005
- 24 August - 27 September 2005
- December 2005

2005

6 months until project approval
Lisbon Metro’s Red Line (Oriente – Aeroporto)

- Project’s Environmental Context

Requirements of the Environmental Impact Assessment Statement

- New solutions on detailed design
  - lowering of the tunnel to a depth of 30 meters to make it as deep as possible in relation to the houses on the surface
  - new project approval – October 2006

- Mitigation measures

- Environmental monitoring

- Report to the National Authority for Environmental Impact Assessment
• Study/Research Goals

1st STEP
  • To describe how Environmental Follow-up was developed at construction and operation phases in the last decade

2nd STEP
  • To compare the EIS’ predictions to reality

3rd STEP
  • To identify the lessons learned
ENVIRONMENTAL FOLLOW-UP (1st STEP)

- **Concept**: the phase that follows the approval or environmental assessment of a project

- It covers the construction, operation and decommissioning phases of a project
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- Study/Research Methods

ENVIRONMENTAL FOLLOW-UP (1st STEP)

- International Best Practice Principles (IAIA)

Operationalizing EIA Follow-Up

Few internationally accepted guidelines promote EIA follow-up. These principles provide a starting point for this. Similarly, there is a need for education in, and capacity building for, EIA follow-up across a range of international practice and individual practitioner competencies.

There is no single “right” way to conduct EIA follow-up; it can and should be adapted to suit the evolving needs of stakeholders, activity type and EIA system in question. Whatever approach is adopted, the management controls promoted through EIA follow-up should strengthen the overall structure and process for EIA, contributing to the disciplines involved and improving EIA practice and systems.
Lisbon Metro’s Red Line (Oriente – Aeroporto)

- Study/Research Methods

ENVIRONMENTAL FOLLOW-UP (1st STEP) in Lisbon Metro

- Construction phase
  - Started at the beginning of each construction
  - Requirements for each construction: Environmental Officer; Environmental Follow-up Plan before the start of the works; Reports during the construction phase and a Final Report upon completion
  - Implementation and compliance with mitigation measures, which were assessed and redefined as a function of environmental monitoring
  - Report to the National Authority for EIA
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Study/Research Methods

ENVIRONMENTAL FOLLOW-UP (1st STEP) in Lisbon Metro

- Operation phase
  - Identifying and quantifying the environmental and social benefits, centered on travel time savings and reduction of energy consumption per passenger
  - Implementation of environmental monitoring
  - Report to the National Authority for EIA
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE (1st STEP)

 Mitigation measures

• Noise

*Use of specially silent and enclosed equipment*

*Site equipment far from noise-sensitive areas*
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE (1st STEP)

▪ Mitigation measures

• Air Quality

Wheels washing

Materials coverage
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE (1st STEP)

▪ Mitigation measures

• Wastewater

Treatment systems - sedimentation tanks

pH control
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE (1st STEP)

▪ Mitigation measures
• Soils

Spill absorption
Specific areas for hazardous materials
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE (1st STEP)

- Mitigation measures

• Waste

On-site sorting of construction and demolition waste

Big bags for hazardous waste
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE (1st STEP)

 Mitigation measures

• Vegetation

*Tree protection*

*Transplant of trees*
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE (1st STEP)

▪ Mitigation measures

• Social aspects

Public information office

Newsletters to the population
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE

- Environmental monitoring

Noise  Vibrations
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE

- Environmental monitoring

Air quality   Wastewater   Soils
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE

- Environmental monitoring

Architectural heritage  Archeology
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

CONSTRUCTION PHASE

- Impacts remaining after mitigation

HUMAN DISTURBANCE
- Noise
- Vibrations
- Air Quality (particles)
- Social aspects

ENVIRONMENTAL
- Wastewater (pH, total suspended solids and oils)
- Soils and waste (diversity and quantity)

ARCHITECTURAL HERITAGE

ARCHAEOLOGY
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

OPERATION PHASE

- Environmental and social benefits
  - High level of acceptance:
    o favourability rating of 98% in the Media
  - 2nd year after opening to operation:
    o 15,3 million passengers
    o global demand lower than expected (-37%)
    o Airport station attracts 16% more demand than estimated
  - Improved mobility and sustainability in Lisbon - environmental, social and economic benefits
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• **Results**

**OPERATION PHASE**

- Environmental and social benefits

• **Landscaping**

**MOSCAVIDE STATION**

*Before*  
*After*
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

OPERATION PHASE

■ Environmental and social benefits

• Landscaping

ENCARNAÇÃO STATION

Before

After
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

OPERATION PHASE

- Environmental and social benefits
- Landscaping

AEROPORTO STATION

Before

After
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

OPERATION PHASE

- Environmental and social benefits
- Architectural projects

MOSCAVIDE STATION   ENCARNAÇÃO STATION   AEROPORTO STATION
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

OPERATION PHASE

- Environmental and social benefits

• Art work

AEROPORTO STATION
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

OPERATION PHASE

- Environmental monitoring

- No significant negative impacts in terms of Noise and Vibrations disturbance, but some environmental complaints received
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

OPERATION PHASE

- Environmental monitoring

• 4 places with **some significant negative impacts** (structural pathologies) related with the project
Results

OPERATION PHASE

- Impacts remaining after mitigation

ENVIRONMENTAL, SOCIAL AND ECONOMIC BENEFITS

HUMAN DISTURBANCE
- Noise
- Vibrations

ARCHITECTURAL HERITAGE
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

EIS’ PREDICTIONS AND REALITY (2nd STEP)

WEATHER PREDICTION

Tomorrow it will be a sunny day!
Lisbon Metro’s Red Line (Oriente – Aeroporto)

• Results

EIS’ PREDICTIONS AND REALITY (2nd STEP)

• Construction phase

• PREDICTION:

  o Among the various environmental and socio-cultural factors analysed under the EIS, the following are highlighted for their great significance: Noise, Vibrations and the Socio-economic component, which will considerably impact, for a period of approximately 40 months, primarily the residential areas located in the vicinity of the areas
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• Results

EIS’ PREDICTIONS AND REALITY (2nd STEP)

• Construction phase

• REALITY:

  o Environmental complaints received concerning Noise, Vibration and Air Quality

  o Additional mitigation measures for Noise, Air Quality and Wastewater + Archaeological artefacts

  o **GENERALLY, there is correspondence with the reality observed during the construction phase and the EIS (except for Air Quality, Wastewater and Archaeological Heritage; the impacts were not estimated as potential significant and for which the adoption of mitigation measures was crucial)**
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• Results

EIS’ PREDICTIONS AND REALITY (2nd STEP)

- Operation phase

• PREDICTION: The project will be particularly positive in terms of:
  - improving accessibility in Lisbon
  - increasing intermodality of the city’s transport system
  - creation and/or strengthening of new urban hubs

• REALITY: For most of the environmental factors considered in the EIS there is no exact match with reality - undeniable environmental and socio-economic benefits associated with the operation phase were underestimated
Conclusions

- This presentation describes 10 years of experience on Environmental Follow-up at Lisbon Metro’s Red Line (Oriente – Aeroporto).
- It demonstrates how Environmental Follow-up was a crucial tool for the Lisbon Metro to report periodically on how the mitigation measures, the environmental monitoring and the Environmental Follow-up stipulated by the Ministry of Environment were implemented.
- The Environmental Follow-up was extremely important in order to identify the real impacts during the construction and operations phases and to find practical ways to solve or reduce them.
The Red Line (Oriente-Aeroporto) of Lisbon's Metro

• Recommendations

LESSONS LEARNED (3rd STEP)

• Greater proximity between the estimated (EIS) and verified than in previous projects
• Practical implementation of the Environmental Follow-up model - effective process, very matured and experienced
• Actual knowledge of the truly significant and relevant environmental factors to the construction and operation phases of projects of this nature
• Experience that can help in future development both in Lisbon and on other infrastructure projects
• Knowledge that will indubitably lead to better projects
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- Questions
The Metro takes you... everywhere!
Thank You!

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