APPENDIX

D

ROAD SAFETY CASE STUDIES
EX POST EVALUATION OF COHESION POLICY PROGRAMMES 2000-2006 CO-FINANCED BY THE EUROPEAN FUND FOR REGIONAL DEVELOPMENT (OBJECTIVES 1 AND 2) - WORK PACKAGE 5A: TRANSPORT

Road safety case study

Poland

November 2009

Prepared for:
European Commission
Directorate General for Regional Policy
Evaluation unit

Prepared by:
Steer Davies Gleave
28-32 Upper Ground
London
SE1 9PD

+44 (0)20 7919 8500
www.steerdaviesgleave.com
1. INTRODUCTION

Overview and theory

1.1 Road safety projects co-financed by the ERDF have concentrated both on the improvement of infrastructure as well as on addressing those behavioural aspects mentioned in the previous paragraph. These projects are the subject of this case study which looks at the measures undertaken in Poland and assesses how effective they have been. The report is structured as follows.

- The remainder of this chapter provides background information on road safety in Poland;
- Chapter 2 provides a summary of the road safety measures that were undertaken in the 2000-2006 ERDF programming period;
- Chapter 3 provides an evaluation of the measures; and
- Chapter 4 draws out the key conclusions about the impact of the measures and more specifically, the impact of the ERDF contribution.

Background

Road safety statistics before the start of the programming period

1.2 The European Union, through its Transport White Paper and subsequent policy initiatives, set itself the goal of reducing the number of road deaths by half by 2010. This was an ambitious target that will be difficult to meet, although some Member States have been more successful than others.

1.3 The number of fatalities in Poland dropped by 14% between 1990 and 2000 (from 7,333 to 6,294 per year). This reduction was less than that seen in other Member States and by 2000, Poland’s fatality figures remained much higher than the EU average as shown in Figure 1.1.

FIGURE 1.1 FATALITIES COMPARISON EU-25 2000


1.4 In 1993 the NRSC (National Road Safety Council) was created to co-ordinate activities aimed at improving road safety and at reducing road accidents. The NRSC
subsequently agreed on appropriate steps to develop a national road safety programme.

1.5 Poland’s poor road safety record in the early nineties led to a multidisciplinary approach to prevent further increases in road accidents. This involved the development of a national road safety plan (GAMBIT 2000) to provide a solid basis for guidance and strategy to lead to sustainable road safety improvements.

Road safety statistics during the programming period

1.6 Poland experienced an improvement in road safety before and during the programming period as shown in Table 1.1. In this period the number of accidents, fatalities and injuries decreased by between 17% and 18%. Some of this may also have been due to a fall in the population over the period.

TABLE 1.1 ACCIDENT STATISTICS, POLAND (2000-2006)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total No of accidents</th>
<th>Total No of fatalities</th>
<th>Total No of injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>57,331</td>
<td>6,294</td>
<td>71,638</td>
</tr>
<tr>
<td>2001</td>
<td>53,799</td>
<td>5,534</td>
<td>68,194</td>
</tr>
<tr>
<td>2002</td>
<td>53,559</td>
<td>5,868</td>
<td>67,828</td>
</tr>
<tr>
<td>2003</td>
<td>51,078</td>
<td>5,677</td>
<td>64,253</td>
</tr>
<tr>
<td>2004</td>
<td>51,069</td>
<td>5,754</td>
<td>64,979</td>
</tr>
<tr>
<td>2005</td>
<td>48,100</td>
<td>5,477</td>
<td>61,523</td>
</tr>
<tr>
<td>2006</td>
<td>46,876</td>
<td>5,243</td>
<td>59,123</td>
</tr>
<tr>
<td>% change 2000-2006</td>
<td>-18%</td>
<td>-17%</td>
<td>-17%</td>
</tr>
<tr>
<td>2007</td>
<td>49,536</td>
<td>5,583</td>
<td>63,224</td>
</tr>
</tbody>
</table>

Data Source: UNECE Transport Division Database and Concise Statistical Yearbook of Poland 2008

1.7 Although this table shows a broadly positive trend, more recent data for 2007 suggests that fatality rates increased to 5,583 and injuries to 63,224\(^1\).

1.8 The statistics for different road types (presented in Table 1.2) show that the highest reduction in fatalities was seen on the motorways. However, the overall numbers are low for motorways, mainly due to the fact that there is not an extensive network in Poland. In comparison, the greatest reduction in road accident injuries was seen in built-up areas.

\(^1\) Global status report on road safety: time for action. Geneva, World Health Organization, 2009
<table>
<thead>
<tr>
<th></th>
<th>Motorway</th>
<th>In built-up areas</th>
<th>Outside built-up areas</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fatalities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>45</td>
<td>2,880</td>
<td>3,369</td>
</tr>
<tr>
<td>2001</td>
<td>57</td>
<td>2,528</td>
<td>2,949</td>
</tr>
<tr>
<td>2002</td>
<td>41</td>
<td>2,762</td>
<td>3,065</td>
</tr>
<tr>
<td>2003</td>
<td>37</td>
<td>2,654</td>
<td>2,986</td>
</tr>
<tr>
<td>2004</td>
<td>42</td>
<td>2,755</td>
<td>2,957</td>
</tr>
<tr>
<td>2005</td>
<td>33</td>
<td>2,495</td>
<td>2,949</td>
</tr>
<tr>
<td>% change 2000-2005</td>
<td>-27%</td>
<td>-13%</td>
<td>-12%</td>
</tr>
<tr>
<td><strong>Injured</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>357</td>
<td>49,594</td>
<td>21,687</td>
</tr>
<tr>
<td>2001</td>
<td>342</td>
<td>46,480</td>
<td>21,372</td>
</tr>
<tr>
<td>2002</td>
<td>339</td>
<td>46,378</td>
<td>21,111</td>
</tr>
<tr>
<td>2003</td>
<td>353</td>
<td>44,147</td>
<td>19,753</td>
</tr>
<tr>
<td>2004</td>
<td>318</td>
<td>44,372</td>
<td>20,289</td>
</tr>
<tr>
<td>2005</td>
<td>333</td>
<td>41,393</td>
<td>19,797</td>
</tr>
<tr>
<td>% change 2000-2005</td>
<td>-7%</td>
<td>-17%</td>
<td>-9%</td>
</tr>
</tbody>
</table>

Data Source: UNECE Transport Division Database

The downward trend in absolute fatalities is evident in some, but not all road user groups. In particular, Poland’s cyclists experienced a substantial reduction, closely followed by pedestrians as shown in Table 1.3 below.
## TABLE 1.3 FATALITIES AND INJURIES BY ROAD USER TYPE, POLAND (2000-2005)

<table>
<thead>
<tr>
<th>Year</th>
<th>Pedestrians</th>
<th>Cyclists</th>
<th>Motorcyclist</th>
<th>Car driver</th>
<th>Public transport users</th>
<th>Other vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2,256</td>
<td>765</td>
<td>178</td>
<td>2,710</td>
<td>15</td>
<td>260</td>
</tr>
<tr>
<td>2001</td>
<td>1,867</td>
<td>672</td>
<td>169</td>
<td>2,438</td>
<td>32</td>
<td>271</td>
</tr>
<tr>
<td>2002</td>
<td>1,987</td>
<td>740</td>
<td>167</td>
<td>2,548</td>
<td>22</td>
<td>291</td>
</tr>
<tr>
<td>2003</td>
<td>1,878</td>
<td>701</td>
<td>147</td>
<td>2,541</td>
<td>24</td>
<td>292</td>
</tr>
<tr>
<td>2004</td>
<td>1,988</td>
<td>743</td>
<td>183</td>
<td>2,462</td>
<td>13</td>
<td>260</td>
</tr>
<tr>
<td>2005</td>
<td>979</td>
<td>336</td>
<td>164</td>
<td>3,071</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

% change 2000-2005: -57% for Pedestrians, -56% for Cyclists, -8% for Motorcyclists, +13% for Car drivers. N.A. (-13% from 00-04) for Public transport users, N.A. (0% from 00-04) for Other vehicles.

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatalities</th>
<th>Injuries</th>
<th>% change 2000-2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>19,834</td>
<td>37,146</td>
<td>-68%</td>
</tr>
<tr>
<td>2001</td>
<td>18,323</td>
<td>36,162</td>
<td>-62%</td>
</tr>
<tr>
<td>2002</td>
<td>17,651</td>
<td>36,029</td>
<td>-14%</td>
</tr>
<tr>
<td>2003</td>
<td>16,039</td>
<td>33,444</td>
<td>+26%</td>
</tr>
<tr>
<td>2004</td>
<td>6,363</td>
<td>35,193</td>
<td>+1%</td>
</tr>
<tr>
<td>2005</td>
<td>3,008</td>
<td>41,508</td>
<td></td>
</tr>
</tbody>
</table>

Data Source: UNECE Transport Division Database NB: 2005 figures are not available for public transport and other users.

1.10 It should be noted, when considering this table, that the fatality and injury figures for 2005 show a substantial shift - they show dramatic decreases in the case of pedestrians and cyclists compared to the previous year, as well as a relatively large change for car drivers in 2005 compared to 2004. This is may also be due to the change in the way statistics are calculated. Stakeholders did not identify any specific reason for this.

1.11 Motorcyclists experienced a steady drop in fatalities and injuries between 2000 and 2005, as did public transport users between 2000-2004. Car driver fatalities and injuries increased over the five year period. Pedestrians and cyclists experienced a modest reduction in injuries and fatalities until 2005 when there was a significant drop.

1.12 In absolute terms, and compared to other Member States, Poland's road safety statistics remain some of the worst in Europe. Figure 1.2 shows the values for 2006 and shows that the values have actually worsened over the period from being 30% higher in 2000 to being 50% higher in 2006.
The figure below shows that per 100,000 inhabitants, levels of fatalities have changed very little between 2000 and 2007. While absolute numbers of fatalities have fallen slightly (the total population has also decreased).


Source: World Health Organisation 2009
2. DESCRIPTION OF ROAD SAFETY MEASURES

2.1 This chapter provides an overview of road safety related interventions carried out in Poland during the programming period. The chapter first sets out the key components of the national road safety strategy during this period and details the investment in specific ERDF financed measures.

Road safety strategy

2.2 The National Road Safety Programme in Poland, the GAMBIT 2000, was approved by the Government in May 2001. The overall aim was to achieve an effective and sustainable improvement of road safety conditions, mainly in terms of the number of road fatalities. Funding of road safety activities was ensured by a combination of the state budget, loans from the World Bank and the European Investment Bank. After EU accession an increased level of financing was made available for road safety from ERDF resources. Private investors including individuals and private sector companies also play a role, however to a lesser extent.²

2.3 The Programme included the major areas in which measures had to be taken, with a strong focus on vulnerable road users (pedestrians and cyclists). Seven factors were identified as main road safety problems in Poland, they were:

- excessive speed;
- the inexperience of young drivers;
- unprotected road users, particularly pedestrians and cyclists;
- drink driving;
- accident severity;
- roads passing through small towns; and
- accident black spots.

2.4 The National Road Safety Programme was updated in 2005, termed ‘Poland’s Vision Zero. It included the aims of halving the number of road deaths in the period 2003-2013 and bringing the level to no more than 2,800, and then reducing it further to no more than 1,500 fatalities by 2020. Within the GAMBIT 2005 programme five specific objectives were established which were further divided into different priorities and actions. These are discussed below.

1. Creating the basis for performing effective and long-term road safety

2.5 This included improving the legal, organisational and financial foundations that underpin a functioning road safety system. Most elements of this system already existed or were in the process of being implemented at the time of GAMBIT 2005 was launched. The measures included:

- organising professional road safety training for relevant staff;
- system improvements for the road safety programme;

² European Commission e-safety support (2005-7)
2. Improving the behaviour of road users

The behaviour of road users is a serious problem in Poland. According to research by the National Road Safety Council in 2006, 75%-78% of drivers drive over the speed limit in built up areas. Only 74% of drivers and passengers wear safety belts while sitting in the front of the car, and only 45% do so sitting in the back. Furthermore, approximately 14% of road fatalities were due to accidents caused by drivers under the influence of alcohol. The measures that were to be pursued related to:

- education and communication to promote speed reduction;
- updating road traffic enforcement in relation to speeding;
- enforcement of speed limits;
- education and communication to increase the use of seat belts;
- enforcement of seat belt use;
- education and communication on the implications of drink-driving; and
- enforcement of drink-driving law.

3. Pedestrian, child and cyclist protection

In 2005 in Poland one in three traffic fatalities were pedestrians and 46% of road accident fatalities were vulnerable road users (pedestrians, cyclists, and children). Their protection can be assured by the education of all road users, enforcement and infrastructure measures designed for pedestrians and cyclists. Measures in the GAMBIT 2005 include:

- education and communication relating to the role of pedestrians, children and cyclists in road traffic and ensuring their protection;
- intensifying traffic enforcement to increase their protection; and
- conducting systematic research into the safety of vulnerable road users.

4. Development and maintenance of safe road infrastructure

In 2003, there were over 2000 fatalities on national roads, which accounted for 36% of all road accident fatalities, despite the fact that national roads account for only 6% of the length of all roads. The road safety measures implemented on national roads are therefore of crucial importance. However regional and local roads are also the site of

---

3 ETSC Fact sheet ‘Vulnerable road users in Poland’ 2006
many crashes, injuries and fatalities and also addressed in measures. The measures include:

- improving the system of road inspection;
- conducting road safety audits of roads being planned and built;
- conducting systematic analyses of road safety condition on roads;
- reorganising the road network into a clear hierarchy;
- designing safe roads;
- increasing the quality of road surfaces and equipment; and
- conducting systematic analyses and research with the aim of increasing the quality of design tools.

5. Diminishing the severity and consequences of road accidents

Road accident severity is also very problematic in Poland and the rate of 11.4 fatalities per 100 accidents (in 2005) was one of the highest in Europe. Of all fatalities about 70% of the victims die at the scene of the accident. It is not clear, however, what number of those died while waiting to be rescued as opposed to dieing on impact. Diminishing the severity and consequences of road accidents can be achieved primarily by improving safety features of vehicles (both from the perspective of those within and outside the vehicle), introducing more intuitive road signs, removing the other road-side hazards, improving road-side rescue and providing first aid education. Measures include:

- improvement of active security measures;
- improvement of passive security measures;
- securing or eliminating hazardous objects in the road and immediate surroundings;
- Ensuring that the road lanes are of the correct width;
- improving the facilities for reporting and locating a road incident;
- reducing the time needed for travelling to accident site and transporting the injured to the nearest emergency unit hospital;
- improving knowledge of standard CPR and emergency actions;
- development of specialised medical units; and
- improving the equipment supporting road rescue.

Interventions and measures funded by the ERDF

In total €1,202M of ERDF resources were invested in transport in Poland between 2004-2007. The overall strategy for the use of European Structural Funds in Objective 1 regions in Poland are set out in the Community Support Framework (CSF). Of the four Operational Programmes allocating ERDF resources in Poland, two were relevant to road safety:

- Integrated Regional Operational Programme (IROP)
- Sectoral Operational Programme Transport (SOPT).

Integrated Regional Operational Programme (IROP)

Although there were no projects under the IROP that specifically addressed road
safety many of the road upgrading projects will have contributed to building a safer road network. In total €606M of ERDF resources were spent under IROP by 2007. Some included improvements at intersections, but it is not possible to determine the proportion of this spend that was dedicated to road safety.

**Sectoral Operational Programme Transport (SOPT)**

2.12 The vast majority of the projects focused on road safety came under SOPT, which was dedicated to the incorporation of Poland into the European infrastructure network. The overarching objective of the SOPT was to increase the transport cohesion of Poland and improve spatial accessibility of Polish cities, areas and regions within EU. The SOPT was divided into a number of priorities of which one (priority 2) was providing safer road infrastructure.

2.13 This priority accounted for 64 of the 84 SPOT projects. This priority was then divided into a number of sub-measures:

- 2.1 Rebuild national roads - predominantly road build/ upgrades on national roads (10 projects);
- 2.2 Improve transit through cities and towns - predominantly bypasses (39 projects); and
- 2.3 Implement monitoring systems increasing safety (15 projects).

2.14 In measure 2.1, €460 M of projects were co-financing of which 70% on average came from ERDF resources. Interventions affected 165 km of road including the construction of 25 km of new roads. In measure 2.2, about €410 M of which an average of 71% on average were co-financed by ERDF resources. The interventions were carried out on 120 km of road including the construction of 12 km of new infrastructure.

2.15 Measure 2.3 was much more specifically focused on road safety and was much less cost intensive. ERDF investment totalled approximately €167M and an average of 68% was co-financed by ERDF resources. The measures funded are set out in table 2.1. The largest project was the reconstruction of dangerous intersections, accounting for almost half the ERDF contribution. Other measures included providing equipment for emergency services and carrying out safety studies.

2.16 These measures address both the "Improving safe behaviour of road users" and the "Diminishing the severity and consequences of road accidents" objectives of the National Road Safety Programme. Although the programming documents do not refer specifically to the goal of seeking to address the objectives set out in the GAMBIT mentioned above, it is clear that the objectives that were included in the programming documents are derived directly from that document.

<table>
<thead>
<tr>
<th>Intervention number</th>
<th>Measure description</th>
<th>Total value of measure (€ M)</th>
<th>ERDF contribution (€ M)</th>
<th>% ERDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>Reconstruction of particularly dangerous intersections on the national road network</td>
<td>67.7</td>
<td>43.7</td>
<td>65%</td>
</tr>
<tr>
<td>69</td>
<td>Increasing efficiency of Road Transport Inspectorate’s oversight activities</td>
<td>3.2</td>
<td>2.4</td>
<td>75%</td>
</tr>
<tr>
<td>70</td>
<td>Equipping fire-fighting units - rescue vehicles in a chemical emergency</td>
<td>11.7</td>
<td>7.6</td>
<td>65%</td>
</tr>
<tr>
<td>71</td>
<td>Equipping fire-fighting units - technical emergency rescue vehicles</td>
<td>10.1</td>
<td>7.6</td>
<td>75%</td>
</tr>
<tr>
<td>72</td>
<td>Equipping police with instruments measuring drivers’ level of alcohol intake</td>
<td>27.9</td>
<td>2.1</td>
<td>7%</td>
</tr>
<tr>
<td>73, 80</td>
<td>Equipping police with instruments recording drivers’ behaviour mounted on patrol cars</td>
<td>2.8</td>
<td>2.2</td>
<td>75%</td>
</tr>
<tr>
<td>74</td>
<td>Construction of the system performing tasks for Accident and Incident Recording System (SEWiK)</td>
<td>20.0</td>
<td>14.8</td>
<td>74%</td>
</tr>
<tr>
<td>75, 79</td>
<td>Equipping police with devices detecting level of alcohol in the driver's body</td>
<td>4.8</td>
<td>3.6</td>
<td>75%</td>
</tr>
<tr>
<td>76</td>
<td>Modernisation of Communications Techniques Laboratory with aim of developing Central Transport Database</td>
<td>4.9</td>
<td>3.0</td>
<td>61%</td>
</tr>
<tr>
<td>77</td>
<td>National study of the speed of vehicles and the use of safety belts</td>
<td>1.8</td>
<td>1.4</td>
<td>75%</td>
</tr>
<tr>
<td>78</td>
<td>Equipping police with speed cameras</td>
<td>9.6</td>
<td>7.2</td>
<td>75%</td>
</tr>
<tr>
<td>81</td>
<td>Increasing safety on national road Nr 8 by reducing the impact of local hazards</td>
<td>0.7</td>
<td>0.5</td>
<td>71%</td>
</tr>
<tr>
<td>82</td>
<td>Increasing safety on national road Nr 8, 19 and 65 by reducing the impact of local hazards</td>
<td>2.0</td>
<td>1.5</td>
<td>75%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>167.3</strong></td>
<td><strong>97.5</strong></td>
<td><strong>68%</strong></td>
</tr>
</tbody>
</table>

Source: SOPT Annual Report
3. EVALUATION OF ROAD SAFETY MEASURES

Progress towards national safety targets

3.1 GAMBIT 2005 was to be ‘Poland’s Vision Zero’. Within this road safety programme two long-term goals were stated.

- a reduction of fatalities to 2,800 by 2013;
- a further reduction of fatalities to 1,500 by 2020

3.2 In order to reach these ambitious goals it was estimated that by 2007 the number of fatalities should not be higher than 4,300. This intermediate goal was not met and 5,583 fatalities occurred (an increase of 6.5% compared to 5,243 in 2006).

3.3 In terms of driver behaviour an OECD report found that there was a slight decrease of 3% in the number of drivers over the speed limit on rural roads between 2004 and 2005. However, 57% of drivers still speed on rural roads. In urban areas 81% of drivers in 2006 were speeding (a 1% increase on the previous year).

3.4 The same report estimates that the number of fatal crashes where speed was the main factor increased slightly between 2004 to 2006 from 28.0% to 30%. Our understanding from stakeholders is that the extent of speeding can be explained by a lack of enforcement. Efforts to reduce drink-driving have been slightly more successful. Between 2000 and 2006 the percentage of fatal accidents caused by alcohol fell from 17% to 11%.6

Effectiveness of ERDF interventions

Output indicators

3.5 The IROP planned 24,283km of new and reconstructed roads under SOPT priority 2, providing safer road infrastructure. By 2007, 28,222km had been construction or upgraded much higher than the target. As for the IROP however, Table 3.1 shows that under measure 2.1 (reconstruction of national roads) significant progress was made only on the national roads. The achieved values for the expressways and motorways has not been provided in the annual reports.

3.6 Similarly, under measure 2.2 (improvement of transit through cities and towns) only 25% of the work was completed. No results indicators were monitored for measure 2.3 (implementation of monitoring systems increasing safety).

---

6 OECD 2008 Country Reports on Road Safety Performance – Poland.
Table 3.1: Operational Programme Output Indicators

<table>
<thead>
<tr>
<th>Measure</th>
<th>Indicators</th>
<th>Target (Km)</th>
<th>Achieved 2007 (Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Length of reconstructed national roads</td>
<td>62.00</td>
<td>50.85</td>
</tr>
<tr>
<td></td>
<td>Length of constructed express ways</td>
<td>38.00</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Length of reconstructed express ways</td>
<td>20.00</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Length of reconstructed – motorways</td>
<td>24.00</td>
<td>7.73</td>
</tr>
<tr>
<td>2.2</td>
<td>Improvement of transit through cities &amp; towns</td>
<td>Length of reconstructed national roads</td>
<td>350</td>
</tr>
</tbody>
</table>

Results Indicators

3.7 Table 3.2 shows that the targets set for results indicators on reducing deaths and injuries were not met. In fact little progress was made and, relative to the rest of Europe, the situation in Poland became worse.

Table 3.2: Operational Programmes Result Indicators

<table>
<thead>
<tr>
<th>Measure</th>
<th>Indicators</th>
<th>Unit</th>
<th>Target</th>
<th>Achieved 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3</td>
<td>Decrease in No. killed in road accidents</td>
<td>N</td>
<td>1,400</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Decrease in % killed in road accidents</td>
<td>%</td>
<td>30.0</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>Decrease in No. of road injuries</td>
<td>N</td>
<td>4,000</td>
<td>1,400</td>
</tr>
<tr>
<td></td>
<td>Decrease in % of road injuries</td>
<td>%</td>
<td>20.0</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Note: the targets relate to them being achieved over the programming period

3.8 The accident statistics in Table 1.2 imply that, in terms of reducing fatalities, work on motorways was most successful as there was a 27% reduction in motorway deaths between 2000 and 2005, compared to 13% in built up areas and 12% outside built up areas. In terms of injuries most improvement took place in built up areas, with a reduction of 17%, compared to 9% outside built up areas and 7% on motorways. These statistics need to be compared to the change that has occurred during the programming period as set out in the table above which show a fall of only 3.6%, showing that the contribution that was made by the ERDF in improving road safety in Poland was minimal.

3.9 Regarding the main causes for traffic accidents in Poland there were no changes in the order between 2000 and 2006 (viz. 2007). The main reason for traffic accidents is inappropriate speed which is the main factor for almost 11,000 accidents followed by not giving way and drink-driving. For these three main causes a reduction could be observed between 2000 and 2006. Again this downward trend was reversed in 2007 when more accidents were caused by these factors, although this could simply be a one year exception. On the other hand there was an increase in the number of accidents between 2000 and 2006 due to fatigue/distraction, mechanical failure, and road maintenance problems in the same period. These figures are shown in more detail in the table below.
### TABLE 3.4  MAIN CAUSES FOR TRAFFIC ACCIDENTS (2000-2007))

<table>
<thead>
<tr>
<th>Year</th>
<th>Speed</th>
<th>Not giving way</th>
<th>Drink driving</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>12,471</td>
<td>10,448</td>
<td>9,367</td>
</tr>
<tr>
<td>2001</td>
<td>12,117</td>
<td>9,915</td>
<td>7,432</td>
</tr>
<tr>
<td>2002</td>
<td>11,905</td>
<td>10,265</td>
<td>7,801</td>
</tr>
<tr>
<td>2003</td>
<td>11,265</td>
<td>9,937</td>
<td>6,913</td>
</tr>
<tr>
<td>2004</td>
<td>12,082</td>
<td>9,944</td>
<td>6,929</td>
</tr>
<tr>
<td>2005</td>
<td>11,419</td>
<td>9,511</td>
<td>6,798</td>
</tr>
<tr>
<td>2006</td>
<td>10,987</td>
<td>9,094</td>
<td>6,392</td>
</tr>
<tr>
<td>2007</td>
<td>11,978</td>
<td>9,286</td>
<td>6,503</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatigue / inattentiveness</th>
<th>Mechanical Failure</th>
<th>Road maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>606</td>
<td>207</td>
<td>56</td>
</tr>
<tr>
<td>2001</td>
<td>536</td>
<td>163</td>
<td>56</td>
</tr>
<tr>
<td>2002</td>
<td>497</td>
<td>175</td>
<td>74</td>
</tr>
<tr>
<td>2003</td>
<td>440</td>
<td>154</td>
<td>78</td>
</tr>
<tr>
<td>2004</td>
<td>459</td>
<td>148</td>
<td>76</td>
</tr>
<tr>
<td>2005</td>
<td>508</td>
<td>121</td>
<td>92</td>
</tr>
<tr>
<td>2006</td>
<td>643</td>
<td>349</td>
<td>89</td>
</tr>
<tr>
<td>2007</td>
<td>642</td>
<td>222</td>
<td>69</td>
</tr>
</tbody>
</table>

Data Source: Police accident database SEWIK

3.10 This shows clearly that the main cause of accidents in Poland was behavioural rather than as a result of poor infrastructure.

3.11 Looking at the average speed in Poland on urban and rural roads one can see that the average speeds on rural roads hardly changed between 2003 and 2007. The decrease in average speed on urban roads by 3 km/h in this period can be explained by the introduction of a speed limit of 50 km/h in urban areas in 2004 as well as by increases in congestion. But nevertheless it seems that the ERDF projects did not have a significant impact on driver speeds in Poland.
### TABLE 4.3 AVERAGE SPEED, POLAND (2003-2007) FOR URBAN AND RURAL ROADS

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban roads (50-60 km/h zones)</th>
<th>Rural roads (90 km/h zones)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>67.3</td>
<td>89.9</td>
</tr>
<tr>
<td>2004</td>
<td>64.9</td>
<td>88.4</td>
</tr>
<tr>
<td>2005</td>
<td>64.4</td>
<td>89.4</td>
</tr>
<tr>
<td>2006</td>
<td>64.7</td>
<td>89.2</td>
</tr>
<tr>
<td>2007</td>
<td>64.2</td>
<td>89.8</td>
</tr>
</tbody>
</table>

Source: National Road Safety Council

3.12 Only a slight decrease of 3% in the number of drivers who are driving over the posted speed limit on rural roads was observed between 2004 and 2005. Neither did other initiatives like the implementation of a speed limit of 50 km/h in urban areas in 2004 have the planned effect as the percentage of drivers which were speeding in urban areas increased in the year after the implementation. Our understanding of what stakeholders say is that the extent of speeding can be explained by a lack of enforcement.

### Expert interviews

3.13 A series of interviews were carried out with a Senior Researcher at the Motor Transport Institute in Warsaw who is co-author of the Polish national road safety programme GAMBIT and the Regional Road Safety Programmes for the Warsaw and Mazowieckie regions. The Institute's main objectives are: conducting, co-ordinating and popularising scientific research as well as development work on road transport, working out new technical solutions, organisational and economic ones concerning mainly such subjects as road traffic participants’ behaviour safety and environmental protection.

3.14 Three main projects were looked at in detail during the interviews. These three projects are examples of how ERDF co-financed projects were used in order to improve traffic safety in Poland.

**Priority 2.1: Project number SPOT/2.1.3/152/05 – improvement of national road nr. 7 to the parameters of an express road on the section from Białobrzegi to Jedlińsk”**

3.15 The Białobrzegi - Jedlińsk section of national road 7 is considered a high risk road with a high accident rate. While the accident and casualty rates had been falling before the improvements, the same was not true for road deaths. The table gives the numbers of accidents, injuries and deaths on the stretch from Białobrzegi to Jedlińsk in the years 2002 - 2004 (i.e. three years before the start of the project).
TABLE 4.1: NUMBER OF ACCIDENTS, KILLED AND INJURED ON THE BIAŁOBZRZEÑ-JEDLIŃSK SECTION OF NATIONAL ROAD 7

<table>
<thead>
<tr>
<th>Event</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005 (Quarter 1 to 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidents</td>
<td>40</td>
<td>27</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>Killed</td>
<td>12</td>
<td>9</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Injured</td>
<td>72</td>
<td>48</td>
<td>36</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: GDDKiA

3.16 The averaged accident rate for the entire Białobrzegi - Jedlińsk section was:
- in 2002 – 0.34 accident per 1 million vehicle kilometres,
- in 2003 – 0.24 accident per 1 million vehicle kilometres,
- in 2004 – 0.19 accident per 1 million vehicle kilometres.

3.17 The 2004 accident rate was closer to the national average which for this road category and traffic volume was 0.19 (this was estimated by using tables in “Guidelines for calculating the economic effectiveness of road and bridge projects” IBDiM 2005).

3.18 Other problems affecting safety included:
- The poor condition of roadway and in particular its weak structure making it impossible for vehicles with an axle load higher than 115kN (kilo Newton)/axis to use it,
- single carriageways not meeting the standards of an important international road,
- poor drainage,
- high road safety risk in particular in small towns due to growing traffic,
- insufficient capacity.

3.19 The aim of the project was to improve the national road to meet the parameters of an express road.

3.20 While the project was implemented in the Mazowieckie region, its location covers international and national roads. Consequently, the project is both regional and national. This project was to be of great benefit to users of national road 7 providing important national road links.

3.21 The project’s objectives were to:
- ensure better conditions for national and international transit traffic,
- improve the links between the sub-region and Warsaw conurbation,
- enhance the area’s development opportunities,
- contribute to a higher standard of living in the region,
- increase capacity,
- improve traffic conditions,
- improve wheel load capacity to national road parameters,
- To reduce deaths to 8 annually.

3.22 The Project’s total eligible expenditure was: PLN 458.7 M, including:
- ERDF resources: PLN 344.0 M which is 75 % of the Project’s total eligible
expenditure;
- National resources: PLN 114.7 M.

3.23 As declared in the beneficiary’s final report in 2008 the target of no more than 8 fatalities was achieved. Also the beneficiary reported that from 16 July 2008 (date of road completion) to 31 December 2008 there were 2 accidents with no fatalities. Given the project ended in September 2008, it is too early to evaluate the effectiveness of the interventions. Project monitoring and data collection is carried out by the Ministry of Infrastructure. As set out in the agreement the Beneficiary is required to provide specific information to the Ministry of Infrastructure within three years from the final payment from the Programme’s Paying Authority.

**Priority 2.1: Project number: SPOT/2.2/50/04 – Improvement of road links within National Road 4 (88)**

3.24 National road 4 (88) runs across north Zabrze and links directly into the A4 motorway going from Gliwice to Zgorzelec. It also provides an alternative to national road 94 going from Kraków to Legnica. Because the A-4 Kraków - Katowice motorway is a toll road, traffic on the road has increased in recent years. This has had a negative effect on the roadway for the users and the local inhabitants. The heavy traffic also causes some of the motorists to leave road 94 at Bytom and use national road 4 (88).

3.25 The road was in a poor state of repair. The necessary works included improving the foundations and surfacing. The conditions of the road hamper the free flow of traffic going to Gliwice, Bytom and Zabrze city centre. Heavy goods vehicles cause substantial congestion on the section towards Zabrze – Biskupice. In summary NR 4 (88) was in urgent need of repair so as to:

- Improve the roadway up to the standards of 115 kN/axis of wheel load capacity,
- Eliminate the limitations of the road width,
- Improve the geometry and parameters of interchanges,
- Improve road safety,
- Improve the environment by limiting air pollution and sewage,
- Improve roadside management with minimum interference in the environment.

3.26 Without these works, conditions were set to deteriorate further causing more traffic problems, a higher accident risk and intensify current problems.

3.27 In this project, the SPOT’s Managing Authority was the minister responsible for regional development (MRD). Some of the Ministry’s responsibility for programming, project development and SPOT implementation was delegated in an agreement to the minister responsible for transport who is the Intermediate Body. The target group included the inhabitants of the town of Zabrze and the Śląskie region and drivers using international links and some of the users of road 94 who use NR4(88) as a detour to avoid paying the A-4 motorway tolls. Within the town of Zabrze the road is used by the inhabitants of the town with a population of 192,148 and by the people living in neighbouring areas. The road also carries transit traffic (E40).

3.28 This is largely a regional project covering the region of Śląskie, and to be exact the city of Gliwice and the surrounding area of Zabrze, but because it is so close to the A-4 motorway, international and national roads it is also a national project.
The project will generate the following cost savings according to the beneficiary:

- Vehicle operation by PLN 516,949 (2007-2008),
- Passenger time and driver working hours by PLN 32,151,000 (2007-2028),
- Road accidents by PLN 7,481,259 (2007-2028),
- Environmental pollution by PLN 4,055,547 (2007-2028),
- Improved road safety through accident reduction by about 6%.

The total project expenditure cost is PLN 18.5 M. Non-eligible expenditure amounts to a total for the project of PLN 29 thousand. The project’s total eligible expenditure is PLN 18.5 M including: ERDF resources amounting to PLN 13.9 M. The results outlined in the feasibility study for the years 2007-2009 included:

- higher traffic volume from 21,721 vehicles/day to 23,157 vehicles/day,
- easier access for about 30,000 inhabitants from Zabrze and its neighbouring areas,
- shorter travel time by improving the roadway and its technical condition,
- accident reduction by approximately 2 %,
- reduced vehicle operation costs by PLN 892,205,
- reduced travelling time and driver working hours by PLN 1,590,269,
- reduced accident costs by PLN 302,784,
- reduced environmental costs by PLN 344,879.

The key targets for the project were:

- Number of fatalities:
  - 4.33 people/year – baseline value given in the Funding Agreement (FA),
  - 4.0 people/year – value to be achieved after the project,
  - 0 people/year - value in real terms after project completion (2007 data).
- Number of road accidents:
  - 12.30 accidents/year – baseline given in the FA,
  - 10.10 accidents/year – value to be achieved after the project,
  - 4.30 accidents/year – value in real terms after project completion (2007 data).

In 2007, road accidents fell to 15 with no fatalities, a similar picture was seen in 2008.

**Priority 2.1: Project number: SPOT/2.3/155/05 – Improvement to high risk junctions within the national road network**

The feasibility study included extensive road safety analyses using national and international experience. The results made it clear that with proper junction interventions, safety could be significantly improved. Economic analysis conducted for each of the 25 junctions demonstrated the safety advantages of the project. The aim of the project was to improve 25 high risk junctions in the national road network including: the conversion of 9 junctions into mini roundabouts, the creation of 6 channelled junctions, the creation of 8 channelled and signalised junctions and the closure of 2 level crossings. The Managing Authority for the SPOT was the entity responsible for regional development (MRD). The main beneficiary of the project was the General Directorate for National Roads and Motorways. The project’s target group
included all national road users from more than ten regions including: Podlaskie, Kujawsko-pomorskie, Pomorskie, Śląskie, Świętokrzyskie, Lubelskie, Łódzkie, Warmińsko-mazurskie, Opolskie, Wielkopolskie, Podkarpackie, Zachodniopomorskie, Dolnośląskie, and Lubuskie.

3.34 The total expenditure was PLN 75.4 M, but total eligible expenditure was PLN 67.7 M including ERDF resources of PLN 50.8M i.e. 75% of eligible expenditure.

3.35 The project was designed to reduce accidents to a maximum of 50 annually starting from a baseline value of 54, and reduce the number of fatalities to under 10, from a baseline value of more than 10. Both of the targets were achieved even though the project has only recently been finished and so to date can be seen as a success.

**Evaluation of all results**

3.36 There are three main reasons why, despite this ERDF investment in road safety focused measures, Poland has made little progress in reducing death and injury on the roads.

1. Traffic growth

3.37 Traffic has been growing rapidly in Poland and this has undoubtedly made targets to reduce crashes and their consequences more challenging. Between 1990 and 2004 the number of vehicles registered increased by 88% and the vehicle-km travelled increased by 190%. These trends have continued and have meant that reducing the absolute number of casualties is difficult.

2. Short timescales

3.38 ERDF infrastructure investments in Poland only began in 2004 and were at relatively low levels until 2005. Several measures, particularly those under sub-measure 2.3 are likely to require several more years before the impacts are realised.

3. Interventions have been predominantly infrastructure focused (less on enforcement and education)

3.39 The vast majority of ERDF road safety focused resources in Poland were invested in road construction and upgrading. Many of these projects will have improved the infrastructure, making it safer for drivers to navigate, more forgiving when crashes occur and providing better facilities for pedestrians. The opinion of the road safety expert was that it was assumed that, with better roads there would be an automatic accident and fatality reduction.

3.40 However, these interventions have done nothing to address the behavioural issues set out in GAMBIT – including speeding, lack of safety belt use and drink driving. It is also possible that certain road improvements such as widening and re-surfacing actually encouraged drivers to speed. Analysis has shown that speeding is a particular problem in urban areas and that most urban accidents in Poland occur at intersections.

---

7 ETSC Fact sheet ‘Vulnerable road users in Poland’ 2006
suggesting again that separate intervention are needed to change and enforce driver behaviour. 8

4. Minimal focus on road user behaviour

3.41 Very little investment was made in changing road user behaviour. Under Measure 2.3 of the SOPT, several projects involved providing the emergency services and the police with equipment. However, there is no indicator to suggest how much of the equipment was delivered, nor how effectively it was used. Stakeholders have mentioned that there may have been deficiencies in training the users.

3.42 The perception of drivers of the likelihood of being stopped by the police may also be a factor. If drivers were not aware that these measures were being used by police, or did not believe that they were being used effectively, they would have been unlikely to act as a deterrent.

Indicators and other measures to be used going forward

3.43 The currently available indicators, published by a number of institutions including the European Commission, already provide an important picture about road safety and road safety improvements in each Member State and across the EU. Those that are particularly useful relate to the number of fatalities. Output indicators such as km of road reconstructed maybe contribute to improved road safety but this cannot be assumed.

3.44 Monitoring for these types of interventions should therefore be more focused on results indicators than outputs. Future monitoring should also reflect the current challenges for Poland with poor driver behaviour and the impact that this has, particularly on vulnerable road users. Current results indicators are limited to the total number of accidents, injuries and deaths. However, it would be useful if future monitoring included a breakdown of the mode of travel of crash victims as well as more information on enforcement including such things as the number of people caught speeding compared to the total population.

---

8 Ibid.
4. CONCLUSIONS

4.1 The European Union, through its Transport White Paper and subsequent policy initiatives, set itself the goal of reducing the number of road deaths by half by 2010. This was an ambitious target that will be difficult to meet, although some Member States have been more successful than others.

4.2 In 2000 Poland had one of the worst road traffic crash fatality rates in Europe. Poland’s poor road safety record led to a multidisciplinary approach to prevent further increases in road accidents. This involved the development of a national road safety plan (GAMBIT 2000) to provide a solid basis for guidance and strategy to lead to sustainable road safety improvements.

4.3 Between 2004 and 2006 ERDF resources were invested in infrastructure in Poland. A proportion of this was spent on measures relating to road safety. It is difficult to assess the specific contribution of the ERDF to improvements in road safety as many measures funded, contributed to a range of transport aims, not just safety. However, analysing output and results indicators can help generate an overall view of the effectiveness of measures.

4.4 For example a much higher number of kilometres were completed than the target had envisaged in the NSP, and this is bound to have had some impact on improving road safety. However this is less likely to be the case in the regional programme where the kilometres completed have fallen short of the kilometres envisaged at the start of the programme. Furthermore, Poland set targets of a 30% and 20% reduction in deaths and injuries respectively, but achieved less than 4% reduction in each.

4.5 Analysis of other data shows that, despite modest reductions in absolute levels of traffic accidents, Poland has worsened its position compared to other EU Member States: in 2000 the fatalities value in Poland was about 30% higher than the EU average; but in 2006 it had become about 50% higher than the EU average.

4.6 There are four main reasons for this:

- Traffic has continued to grow consistently, making absolute reductions of traffic accidents more difficult;
- ERDF resources only began in 2004 and results from some measures may take several more years to materialise;
- Despite the fact that the National Road Safety Strategy set out a balanced range of measures the ERDF resources was overly focused on road building and upgrading. This has considerably limited the impact of the funding on outturn fatality and injury statistics. In some cases ‘improving’ roads may actually have led to increased speeds and increased accident severity; and
- There has been insufficient attention given to addressing road user behaviour, both through education and better enforcement.

4.7 The two most important issues that need to be addressed for future road safety strategy in Poland are managing speeding and protecting vulnerable road users. Speed is still a major cause of accidents. Measures taken to date have had little effect. A speed limit of 50 km/h was implemented in urban areas in 2004, but enforcement is still widely believed to be relatively weak. In 2006 the National Road Safety Council did launch a
number of campaigns on raising awareness of the issues surrounding speeding, alcohol and not-wearing a seat-belt. This is encouraging and we recommend that further work is done in raising awareness of these issues.

4.8 Vulnerable road users – pedestrians and cyclists – are particularly at risk in Poland, relative to other Member States. This is in part due to a driver-orientated approach to infrastructure design and is particularly a problem in urban areas. Future measures should therefore include efforts to:

- Improve road infrastructure:
  - Develop infrastructure to protect pedestrians and cyclists
  - Consider engineering measures to manage speed in urban areas (e.g. speed humps);
- Education and training:
  - Continue to raise awareness among drivers, of the dangers of speeding and the implications of being caught;
  - Raise awareness of drivers, of the vulnerability of pedestrians, cyclists and children;
  - Teach road safety education to vulnerable road users;
- Enforcement:
  - Build the capacity of police to monitor and enforce speed restrictions;

4.9 Monitoring for these types of interventions should therefore be more focused on results indicators than outputs. Future monitoring should also reflect the current challenges for Poland with poor driver behaviour and the impact that this has, particularly on vulnerable road users. Current results indicators are limited to the total number of accidents, injuries and deaths. However, it would be useful if future monitoring included a breakdown of the mode of travel of crash victims as well as more information on enforcement including such things as the number of people caught speeding compared to the total population.
EX POST EVALUATION OF COHESION POLICY PROGRAMMES 2000-2006 CO-FINANCED BY THE EUROPEAN FUND FOR REGIONAL DEVELOPMENT (OBJECTIVES 1 AND 2) - WORK PACKAGE 5A: TRANSPORT

Road safety case study

Portugal

November 2009

Prepared for:

European Commission
Directorate General for Regional Policy
Evaluation unit

Prepared by:

Steer Davies Gleave
28-32 Upper Ground
London
SE1 9PD

+44 (0)20 7919 8500
www.steerdaviesgleave.com
1. INTRODUCTION

Background

Road safety statistics before the start of the programming period

1.1 The European Union, through its Transport White Paper and subsequent policy initiatives, set itself the goal of reducing the number of road deaths by half by 2010. This is an ambitious target that will be difficult to meet, although some Member States have been more successful than others. Portugal is one of the countries that has improved significantly since the early 1990s and has seen a substantial drop in road fatalities and accident severity. This has been as a result of improvements in driver behaviour, as well as the technical characteristics of road vehicles and infrastructure.

1.2 Between 1991 and 2000, the number of road fatalities fell from 3,218 to 1,857 in Portugal, which is equivalent to a drop of about 42%. An improvement in urban roads and additional urban roads contributed to the road safety improvements, whilst traffic and congestion in Portugal continued to grow.

1.3 Despite these improvements, road safety in Portugal remained considerably worse than in other Member States. This is shown in Figure 1.1 which compares road safety fatalities across the Member States.

**FIGURE 1.1  FATALITIES PER MILLION INHABITANTS BY COUNTRY 2000**

![Figure 1.1](source: CARE Database / EC and national publications 2008 in Traffic safety basic facts 2008, 2008 European road safety observatory)

1.4 The areas highlighted for road safety improvements in Portugal relate to vehicle speeds, pedestrian safety, drink driving and infrastructure.

Road safety statistics during the programming period

1.5 Road safety in Portugal further improved between 2000 and 2006, during which time there was a drop in fatalities of approximately 48%. By 2006 Portugal’s road fatality
rate was just below the EU average, as shown in Figure 1.2.

FIGURE 1.2 FATALITIES PER MILLION INHABITANTS BY COUNTRY 2006


1.6 As was the case for the period leading up to the programming period, the 2000-2006 fall in road fatalities needs to be put in the context of:

- An increase in population (from 10.2 million to 10.6 million inhabitants, an increase of 4%);
- An increase in the number of vehicles in Portugal (from 7.1 million to 8.2 million, an increase of 15%); and
- An increase in road length (from 7.8 thousand km to 8.2 thousand km, an increase of 5%)

1.7 The table below presents additional accident statistics over the programming period for Portugal. The figures are very positive and show significant reductions in the number of accidents, casualties, fatalities and injuries.

---

1 EUROSTAT, Statistical Yearbook of Portugal 2007, OECD Factbook 2008
### TABLE 1.1 ACCIDENT STATISTICS, PORTUGAL (2000-2008)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number of accidents</th>
<th>Total number of casualties</th>
<th>Total number of fatalities</th>
<th>Total number of injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>44,159</td>
<td>61,781</td>
<td>1,857</td>
<td>59,924</td>
</tr>
<tr>
<td>2001</td>
<td>42,521</td>
<td>58,715</td>
<td>1,671</td>
<td>57,044</td>
</tr>
<tr>
<td>2002</td>
<td>42,219</td>
<td>58,260</td>
<td>1,675</td>
<td>56,585</td>
</tr>
<tr>
<td>2003</td>
<td>41,495</td>
<td>56,804</td>
<td>1,546</td>
<td>55,258</td>
</tr>
<tr>
<td>2004</td>
<td>38,930</td>
<td>53,303</td>
<td>1,294</td>
<td>52,009</td>
</tr>
<tr>
<td>2005</td>
<td>37,066</td>
<td>50,496</td>
<td>1,247</td>
<td>49,249</td>
</tr>
<tr>
<td>2006</td>
<td>35,680</td>
<td>48,106</td>
<td>969</td>
<td>47,137</td>
</tr>
<tr>
<td>2007</td>
<td>35,311</td>
<td>47,292</td>
<td>974</td>
<td>46,318</td>
</tr>
<tr>
<td>2008</td>
<td>33,613</td>
<td>44,818</td>
<td>885</td>
<td>43,933</td>
</tr>
</tbody>
</table>

% reduction 2000-2008 24% 27% 52% 27%

Data Source: Statistical Yearbook of Portugal 2007 and CARE database

1.8 Results, however, are not so positive for motorway accidents and fatalities. Table 1.2 shows that motorway accidents and total casualties increased in Portugal between 2000 and 2008, upwards of 21%. This may be as a result of increased average motorway speeds, but can also be due to the increased length of the motorway network (and the conversion of many secondary roads in motorways) as well as to increased trip length and total vehicle km. This is likely to have lead to a decrease in the number of accidents per vehicle km travelled, although there is no data available to confirm this.

### TABLE 1.2 MOTORWAY ACCIDENTS AND CASUALTIES (2000-2008)

<table>
<thead>
<tr>
<th>Year</th>
<th>Accidents</th>
<th>Total Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1,918</td>
<td>3,104</td>
</tr>
<tr>
<td>2001</td>
<td>1,809</td>
<td>2,895</td>
</tr>
<tr>
<td>2002</td>
<td>1,980</td>
<td>3,200</td>
</tr>
<tr>
<td>2003</td>
<td>2,076</td>
<td>3,323</td>
</tr>
<tr>
<td>2004</td>
<td>1,957</td>
<td>3,062</td>
</tr>
<tr>
<td>2005</td>
<td>2,035</td>
<td>3,153</td>
</tr>
<tr>
<td>2006</td>
<td>2,327</td>
<td>3,603</td>
</tr>
<tr>
<td>2007</td>
<td>2,282</td>
<td>3,600</td>
</tr>
<tr>
<td>2008</td>
<td>2,501</td>
<td>3,749</td>
</tr>
</tbody>
</table>

% increase 2000-2008 30% 21%

Data Source: Statistical Yearbook of Portugal 2007 and CARE database

1.9 Table 1.3 examines accident figures by user group. Data was not available for all groups in 2004 so the table compares data between 2000 and 2003.
### TABLE 1.3 FATALITIES AND INJURIES BY ROAD USER TYPE, PORTUGAL (2000-2008)

<table>
<thead>
<tr>
<th></th>
<th>Pedestrians</th>
<th>Cyclists</th>
<th>Mopeds</th>
<th>Motorcyclist</th>
<th>Car driver</th>
<th>Public transport users</th>
<th>Other vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fatalities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>384</td>
<td>56</td>
<td>225</td>
<td>212</td>
<td>611</td>
<td>4</td>
<td>169</td>
</tr>
<tr>
<td>2001</td>
<td>337</td>
<td>50</td>
<td>184</td>
<td>229</td>
<td>543</td>
<td>25</td>
<td>141</td>
</tr>
<tr>
<td>2002</td>
<td>339</td>
<td>58</td>
<td>145</td>
<td>225</td>
<td>605</td>
<td>7</td>
<td>136</td>
</tr>
<tr>
<td>2003</td>
<td>280</td>
<td>63</td>
<td>157</td>
<td>213</td>
<td>539</td>
<td>2</td>
<td>135</td>
</tr>
<tr>
<td>2004</td>
<td>233</td>
<td>47</td>
<td>121</td>
<td>181</td>
<td>463</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2005</td>
<td>214</td>
<td>48</td>
<td>106</td>
<td>188</td>
<td></td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>2006</td>
<td>156</td>
<td>40</td>
<td>97</td>
<td>137</td>
<td></td>
<td></td>
<td>43</td>
</tr>
<tr>
<td>2007</td>
<td>214</td>
<td>34</td>
<td>71</td>
<td>145</td>
<td></td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>2008</td>
<td>156</td>
<td>42</td>
<td>71</td>
<td>116</td>
<td></td>
<td></td>
<td>33</td>
</tr>
<tr>
<td><strong>% change 2000-2003</strong></td>
<td><strong>-27%</strong></td>
<td><strong>13%</strong></td>
<td><strong>-30%</strong></td>
<td><strong>0%</strong></td>
<td><strong>-12%</strong></td>
<td><strong>-50%</strong></td>
<td><strong>-20%</strong></td>
</tr>
<tr>
<td><strong>Injuries</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>7,839</td>
<td>1,275</td>
<td>8,662</td>
<td>5,602</td>
<td>28,276</td>
<td>486</td>
<td>5,984</td>
</tr>
<tr>
<td>2001</td>
<td>7,687</td>
<td>1,335</td>
<td>7,367</td>
<td>5,388</td>
<td>26,941</td>
<td>507</td>
<td>5,913</td>
</tr>
<tr>
<td>2002</td>
<td>7,434</td>
<td>1,318</td>
<td>6,431</td>
<td>4,904</td>
<td>27,938</td>
<td>463</td>
<td>6,126</td>
</tr>
<tr>
<td>2003</td>
<td>7,228</td>
<td>1,315</td>
<td>6,110</td>
<td>4,671</td>
<td>27,630</td>
<td>364</td>
<td>6,969</td>
</tr>
<tr>
<td>2004</td>
<td>6,615</td>
<td>1,386</td>
<td>5,782</td>
<td>4,382</td>
<td>26,258</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2005</td>
<td>6,282</td>
<td>1,427</td>
<td>5,044</td>
<td>4,249</td>
<td></td>
<td></td>
<td>311</td>
</tr>
<tr>
<td>2006</td>
<td>6,229</td>
<td>1,513</td>
<td>4,546</td>
<td>3,897</td>
<td></td>
<td></td>
<td>268</td>
</tr>
<tr>
<td>2007</td>
<td>6,189</td>
<td>1,388</td>
<td>4,494</td>
<td>3,977</td>
<td></td>
<td></td>
<td>317</td>
</tr>
<tr>
<td>2008</td>
<td>5,676</td>
<td>1,338</td>
<td>3,844</td>
<td>3,696</td>
<td></td>
<td></td>
<td>272</td>
</tr>
<tr>
<td><strong>% change 2000-2003</strong></td>
<td><strong>-8%</strong></td>
<td><strong>+3%</strong></td>
<td><strong>-29%</strong></td>
<td><strong>-17%</strong></td>
<td><strong>-2%</strong></td>
<td><strong>-25%</strong></td>
<td><strong>+16%</strong></td>
</tr>
</tbody>
</table>

Data Source: Statistical Yearbook of Portugal 2007 and CARE database

1.10 The data shows that all groups experienced a reduction of fatalities and injuries except for cyclists (when the 2000-2008 period is considered even for cyclist there’s a reduction in fatalities, although there’s still an increase in injuries).
### TABLE 1.4  
**FATALITIES AND CASUALTIES BY REGION (NUTS II), PORTUGAL (2000-2008)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Norte</th>
<th>Centro</th>
<th>Lisboa e Vale Tejo</th>
<th>Alentejo</th>
<th>Algarve</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>430</td>
<td>564</td>
<td>570</td>
<td>157</td>
<td>136</td>
</tr>
<tr>
<td>2001</td>
<td>438</td>
<td>497</td>
<td>477</td>
<td>139</td>
<td>121</td>
</tr>
<tr>
<td>2002</td>
<td>424</td>
<td>462</td>
<td>467</td>
<td>161</td>
<td>161</td>
</tr>
<tr>
<td>2003</td>
<td>378</td>
<td>466</td>
<td>429</td>
<td>149</td>
<td>123</td>
</tr>
<tr>
<td>2004</td>
<td>353</td>
<td>417</td>
<td>357</td>
<td>81</td>
<td>86</td>
</tr>
<tr>
<td>2005</td>
<td>312</td>
<td>351</td>
<td>374</td>
<td>125</td>
<td>84</td>
</tr>
<tr>
<td>2006</td>
<td>250</td>
<td>303</td>
<td>270</td>
<td>88</td>
<td>58</td>
</tr>
<tr>
<td>2007</td>
<td>222</td>
<td>299</td>
<td>304</td>
<td>66</td>
<td>82</td>
</tr>
<tr>
<td>2008</td>
<td>225</td>
<td>270</td>
<td>252</td>
<td>86</td>
<td>52</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% change 2000-2008</th>
<th>Norte</th>
<th>Centro</th>
<th>Lisboa e Vale Tejo</th>
<th>Alentejo</th>
<th>Algarve</th>
</tr>
</thead>
<tbody>
<tr>
<td>48%</td>
<td>52%</td>
<td>56%</td>
<td>46%</td>
<td>61%</td>
<td></td>
</tr>
</tbody>
</table>

### Total Casualties

<table>
<thead>
<tr>
<th>Year</th>
<th>Norte</th>
<th>Centro</th>
<th>Lisboa e Vale Tejo</th>
<th>Alentejo</th>
<th>Algarve</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>16,954</td>
<td>16,868</td>
<td>21,007</td>
<td>3,051</td>
<td>3,901</td>
</tr>
<tr>
<td>2001</td>
<td>16,815</td>
<td>16,336</td>
<td>18,532</td>
<td>3,016</td>
<td>4,017</td>
</tr>
<tr>
<td>2002</td>
<td>15,513</td>
<td>16,961</td>
<td>18,822</td>
<td>3,055</td>
<td>3,909</td>
</tr>
<tr>
<td>2003</td>
<td>16,332</td>
<td>16,007</td>
<td>17,824</td>
<td>2,994</td>
<td>3,646</td>
</tr>
<tr>
<td>2004</td>
<td>14,752</td>
<td>15,067</td>
<td>17,753</td>
<td>2,588</td>
<td>3,143</td>
</tr>
<tr>
<td>2005</td>
<td>14,176</td>
<td>14,495</td>
<td>16,382</td>
<td>2,363</td>
<td>3,079</td>
</tr>
<tr>
<td>2006</td>
<td>13,473</td>
<td>13,884</td>
<td>15,825</td>
<td>2,065</td>
<td>2,859</td>
</tr>
<tr>
<td>2007</td>
<td>13,359</td>
<td>13,400</td>
<td>15,499</td>
<td>2,124</td>
<td>2,909</td>
</tr>
<tr>
<td>2008</td>
<td>12,975</td>
<td>12,885</td>
<td>14,421</td>
<td>1,976</td>
<td>2,561</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% change 2000-2008</th>
<th>Norte</th>
<th>Centro</th>
<th>Lisboa e Vale Tejo</th>
<th>Alentejo</th>
<th>Algarve</th>
</tr>
</thead>
<tbody>
<tr>
<td>23%</td>
<td>24%</td>
<td>31%</td>
<td>35%</td>
<td>34%</td>
<td></td>
</tr>
</tbody>
</table>

1.11 Data on regional distribution of fatalities and total casualties and its respective evolution shows that all regions significantly improved their road safety during the period 2000-2008. Regarding fatalities, all regions reduce until 2008 their figures to approximately half the 2000 value. In Norte and Centro regions the percent change in the number of total casualties was a bit lower than in other regions.
2. DESCRIPTION OF ROAD SAFETY MEASURES

Overview on different interventions carried out in Portugal 2000 – 2006

2.1 A number of actions to improve road safety have been undertaken in Portugal since the early 1990s. They have been undertaken by national and local authorities in the different fields, including infrastructure, education and information, vehicles and enforcement.

2.2 For example, improving road safety was one of the primary objectives of the National Road Plan 2000, which was approved in 1998 and revised in 1999 and 2003. The plan defined the interventions required to the:

- Primary and secondary road network (with a total of 11,350 km of new road space to be built);
- Regional road network (5000 km of new road space to be built); and
- To the motorways network (3000 km of new road space to be built).

2.3 The aim of the Plan was to enhance the development, functionality, maintenance and the safety of all the different types of road network.

2.4 The government’s first specific Road Safety Plan (Plano Nacional de Prevenção Rodoviária, PNPR) was established in 2003 and set out a comprehensive strategy to tackle road safety issues. This included priority areas for intervention as well as measures to apply in different circumstances. These related to education/information, road infrastructure as well as legislation and compliance and included:

- Education/Information:
  - Production of learning material for primary school students (booklets, competitions, website, etc.);
  - Production of material about the dangers of mixing medication and driving;
  - More general advertising campaigns; and
  - Rehabilitation procedures for drivers involved in serious accidents;

- Road Infrastructure:
  - Traffic calming in accident black spot areas;
  - Particular attention on zones used by vulnerable users (pedestrians, cyclists, school children etc.). Measures include the construction of adequate protection barriers, pavements and street lightning; and
  - Improvement of several dangerous stretches of road with the application of reflective plastic position marker posts at the road axes, luminous signs, rough pavement surface, suppression of overtaking lanes;
  - Upgrade of several kms of the main route IP5;
  - Improvement in road environment in rural areas (construction of rest and police observation platforms, paved shoulders; inspections of existing road signing; access control to major roads; risk mitigation at bus stops); and
  - Application of road safety audits for new road projects in accordance with a
Road safety Portugal

- Legislation and compliance:
  - Revision of the Road Code - issued to all those taking a driving license test (introduced differentiated and higher penalties for speeding inside and outside urban areas, increased penalties for drinking and driving, increased the provisional period for novice drivers from two to three year, etc);
  - Enhanced enforcement regarding cycle helmet usage, seat-belt usage, child car seats, driving under the influence of alcohol and narcotics, and speed limits; and
  - Use of automatic speed control cameras, increase in police radar provision and increase in the number of drink-driving checks; and
  - More stringent legislation relating to driving schools, examination centres and vehicle inspection centres.

2.5 The PNPR’s overall objective was to reduce the average number fatalities and serious injuries at the start of the programming period by 50% by 2010. Other objectives included a 60% reduction in:

- The number of fatalities and serious injuries inside urban areas;
- The number of pedestrian fatalities and serious injuries; and
- The number of 2-wheel vehicle users fatalities and serious injuries.

2.6 The figure on the following page sets out the interventions that have taken place over the last 20 years that have had an impact on road safety in Portugal.
FIGURE 2.1  EVOLUTION OF FATALITIES AND ROAD SAFETY MEASURES

1990: 1.2 Grams of alcohol per litre of blood or higher are considered as crime

1992: Compulsory periodical vehicle inspections

1994: Changes in the Road Code: Compulsory use of seatbelt within urban areas. Reduction of the speed limit in urban areas, to 50km/h. Compulsory use of helmet. Increase in penalties.

1995: Compulsory child car seats.

1998: Compulsory use of the tacograph. Increase in penalties.

2001: Changes in the Road Code: Increase in penalties.

2003: Plano Nacional de Prevenção Rodoviária (PNPR)


Source: Associação Nacional de Segurança Rodoviária
Information about different interventions and measures funded by the ERDF in Portugal

2.7 ERDF transport resources in Portugal have primarily been spent on roads (more than 50%), as opposed to other modes such as air and rail. The programme to distribute funding to national initiatives in Portugal is the Accessibility and Transport Operational Programme (POAT).

2.8 The Ex-ante POAT Evaluation concluded Portugal’s road safety was poor compared to the rest of Europe (as shown in the previous chapter). This was as a result of both driver behaviour and road infrastructure, and therefore the solution needed to tackle all elements of road safety, rather than focusing on just one aspect alone.

2.9 The ERDF’s road spend was distributed amongst a number of POAT measures, namely:

- The elimination of level crossings, of “black spots” on roads and the development of accident prevention systems (POAT measure 4.2);
- The construction, renovation, and modernisation of the national road network (POAT measures 1.1 and 1.2 and road interventions in Regional Operational Programmes); and
- The construction, renovation, and modernisation of the local road network (POAT measures 2.2 and 3.2 and rail interventions in Regional Operational Programmes).

2.10 The first area mentioned above (measure 4.2) specifically related to road safety whereas the others do not, although improved road safety is a direct outcome of infrastructure improvements. ERDF co-financing on road interventions in the programming period is shown in Table 2.1.
TABLE 2.1  ROAD INTERVENTIONS FINANCED BY THE ERDF FUNDS IN PORTUGAL
2000 – 2006 (€ M)

<table>
<thead>
<tr>
<th>Road Interventions</th>
<th>National Expenditure</th>
<th>ERDF Expenditure</th>
<th>Total Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total POAT</td>
<td>459</td>
<td>571</td>
<td>1,030</td>
</tr>
<tr>
<td>Road Safety (POAT Measure 4.2)</td>
<td>50</td>
<td>51</td>
<td>101</td>
</tr>
<tr>
<td>Road safety as a percentage of total POAT</td>
<td>11%</td>
<td>9%</td>
<td>10%</td>
</tr>
<tr>
<td>Alentejo ROP</td>
<td>79</td>
<td>102</td>
<td>181</td>
</tr>
<tr>
<td>Algarve ROP</td>
<td>50</td>
<td>67</td>
<td>115</td>
</tr>
<tr>
<td>Centro ROP</td>
<td>155</td>
<td>230</td>
<td>385</td>
</tr>
<tr>
<td>Lisboa e Vale do Tejo ROP</td>
<td>79</td>
<td>82</td>
<td>161</td>
</tr>
<tr>
<td>Madeira ROP</td>
<td>115</td>
<td>137</td>
<td>252</td>
</tr>
<tr>
<td>Norte ROP</td>
<td>359</td>
<td>367</td>
<td>726</td>
</tr>
<tr>
<td>Total Road Interventions</td>
<td>1,297</td>
<td>1,555</td>
<td>2,852</td>
</tr>
</tbody>
</table>

Road safety expenditure as a percentage of total road expenditure 4% 3% 4%

Data Source: Data from the European Commission (information on Expenditure until the end of 2008)

2.11 Table 2.1 shows that about 10% of the ERDF resources allocated by the POAT were spent directly on road safety measures; this amounted to just 4% of the total road interventions, and all other investment was directed towards the construction of new roads or to the renewal and upgrade of existing roads. Furthermore, of the total € 101 M spent directly on road safety interventions, only an amount equivalent to € 0.1 M was allocated to safety measures other than infrastructure improvements, much lower than other transport modes.

TABLE 2.2  POAT ACTIONS WITH THE MAIN AIM TO ENHANCE SAFETY FROM 2000 – 2006 (€ M)

<table>
<thead>
<tr>
<th>Intervention Type</th>
<th>Transport Mode</th>
<th>National Expenditure</th>
<th>ERDF Expenditure</th>
<th>Total Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enforcement of security conditions in the transport system (Infrastructure Interventions)</td>
<td>Air</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Maritime</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Rail</td>
<td>20</td>
<td>18</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Road</td>
<td>50</td>
<td>51</td>
<td>101</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>72</td>
<td>144</td>
<td></td>
</tr>
<tr>
<td>Enforcement of security conditions in the transport system (Other Safety Interventions)</td>
<td>Air</td>
<td>10</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Maritime</td>
<td>56</td>
<td>51</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>Rail</td>
<td>7</td>
<td>7</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Road</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>73</td>
<td>62</td>
<td>135</td>
<td></td>
</tr>
<tr>
<td>Total (POAT Measure 4.2)</td>
<td>145</td>
<td>134</td>
<td>279</td>
<td></td>
</tr>
</tbody>
</table>

2.12 The POAT’s investment in “Enforcement of security conditions in the transport system” (measure 4.2) was directed to two kinds of interventions: infrastructure
interventions and other safety interventions (road safety audits, acquisition of VTS systems, modernization of rail rolling stock, etc.). Table 2.2 shows that, in general, road and rail interventions were mainly related to infrastructure improvements: in the case of road projects, renewal of road infrastructure, and, in the case of rail projects, elimination of rail crossings.

2.13 Considering the amount invested in road infrastructure, the improvements in road safety cannot be dissociated from the improvements in the overall infrastructure.

2.14 The Regional Operational Programmes didn’t finance any project with the specific target of enhancing road safety. On the other hand, they invested a lot in the improvement of road infrastructure (Table 2.1), which is, according to the Managing Authority of the POAT, the main reason for fatalities and accidents reduction during the programming period. Although, Norte and Centro were the regions that invested most in infrastructure improvements, these are the regions were fatalities and injuries reduced at a slower pace. We have no information relating to the reasons behind this.
3. EVALUATION OF ROAD SAFETY MEASURES

Progress towards safety targets

3.1 In 2005, the Portuguese government revised its road safety targets set out in the PNPR. It made them more challenging due to the significant reduction in road accidents by bringing forward the target year from 2010 to the year 2009.

<table>
<thead>
<tr>
<th>Year</th>
<th>General</th>
<th>Inside Urban Areas</th>
<th>Pedestrians</th>
<th>2-wheel vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fatalities</td>
<td>Injuries</td>
<td>Fatalities</td>
<td>Injuries</td>
</tr>
<tr>
<td>98/00 average</td>
<td>1748</td>
<td>7597</td>
<td>718</td>
<td>4715</td>
</tr>
<tr>
<td>2003</td>
<td>1356</td>
<td>4659</td>
<td>578</td>
<td>2734</td>
</tr>
<tr>
<td>2006</td>
<td>850</td>
<td>3483</td>
<td>393</td>
<td>2064</td>
</tr>
<tr>
<td>2009 (target)</td>
<td>874</td>
<td>3799</td>
<td>287</td>
<td>1886</td>
</tr>
<tr>
<td>% change</td>
<td>-50%</td>
<td>-50%</td>
<td>-60%</td>
<td>-60%</td>
</tr>
</tbody>
</table>

Data Source: Plano Nacional de Prevenção Rodoviária

3.2 By 2006 some of the above targets had been achieved and some had not been:

- The general fatality and injury targets were met by 2006 but those for inside urban areas were not; and
- Pedestrian fatality targets were met by 2006 but only partially so for pedestrian injuries (targets were met for pedestrian injuries on certain road types but not on the national road network).

**ERDF interventions**

3.3 In addition to the targets set within the PNPR, the POAT contains output and results indicators that were to be monitored during the programming period. Table 3.2 shows progress against the POAT targets. As can be seen from the table, and is the case for a large number of Operational Programmes, not all of the values that are included above actually contain a baseline value or an achieved value. It can be seen that in terms of output indicators:

- The number of level crossings removed has surpassed the target value: from an initial figure of 2,670 level crossings, the achieved value is 2,172, nearly 100 more level crossings removed than was included in the original target.
- Monitoring of road black spots has not been undertaken and therefore the target has not been met.

3.4 While in terms of results indicators:

- The 2007 accident figures are significantly below the 2006 target levels in terms
of accidents with all types of injuries and fatalities.

<table>
<thead>
<tr>
<th>OP</th>
<th>Indicator</th>
<th>Unit of measure</th>
<th>Baseline Value in 2000</th>
<th>Target Value</th>
<th>Target Year</th>
<th>Achieved Value</th>
<th>Year Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>POAT</td>
<td>Rail crossing removal</td>
<td>No. of rail crossings</td>
<td>2,670</td>
<td>2,270</td>
<td>2006</td>
<td>2,172</td>
<td>2007</td>
</tr>
<tr>
<td>POAT</td>
<td>Actions to remove road black spots</td>
<td>Number</td>
<td></td>
<td>20</td>
<td>2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO NORTE</td>
<td>Monitoring of road black spots</td>
<td>Number</td>
<td>30</td>
<td>2006</td>
<td>0</td>
<td>2007</td>
<td></td>
</tr>
</tbody>
</table>

**Result indicators**

<table>
<thead>
<tr>
<th>OP</th>
<th>Indicator</th>
<th>Unit of measure</th>
<th>Baseline Value in 2000</th>
<th>Target Value</th>
<th>Target Year</th>
<th>Achieved Value</th>
<th>Year Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>POAT</td>
<td>No. accidents with fatalities p.a.</td>
<td>Number</td>
<td>1,865</td>
<td>1,165</td>
<td>2006</td>
<td>854</td>
<td>2007</td>
</tr>
</tbody>
</table>

3.5 Furthermore, as shown by the figure below, this substantial fall in injuries and fatalities has occurred in the context of a substantial increase in car use (shown by increased fuel consumption), thus making the achievements in improving road safety that much more remarkable. This has been further confirmed by the substantial fall in fatalities at level crossings which has fallen from a figure of 150 in 1999 to 55 in 2008.

3.6 Considering the relevance of the ERDF in financing road infrastructure improvements such as rail crossings eliminations (the ERDF financed all rail crossing interventions during this period), this data shows that the ERDF made a clear contribution to increasing road safety in Portugal.
3.7 The currently available indicators on road fatalities and road injuries, published by a number of institutions including the European Commission, already provide an important picture about road safety and road safety improvements in each Member State and across the EU. Those that are particularly useful relate to the number of fatalities.

3.8 However there are improvements that can be made to measure road safety and in particular, to the detail behind the accident and casualty figures. It would be useful to have a break down of figures by type of transport user and age group across all Member States. (This is already done in some Members States but not in others). This more detailed information would provide further insight into the type of audience that should be targeted for education programmes and training, as well as for vehicle safety improvements.

3.9 Another issue is that the ERDF indicators often use proxies to measure road safety – such as the number of level crossings removed or km of road reconstructed. Such measures are linked to improved road safety but one does not necessarily follow the other (especially in terms of reconstructed roads). Going forward, it would be useful to measure the road safety outcomes of specific interventions in terms of accident rates rather than outputs (for example: number of interventions, new/upgraded/renewed infrastructure, etc.).
4. CONCLUSIONS

4.1 This report has shown the positive progress Portugal has made in terms of road safety. This is evident from the statistics measured during the programming period, which are particularly important in the context of increasing traffic levels.

4.2 During this period there has been substantial expenditure in road improvements in Portugal from a number of sources and has involved expenditure in creating new infrastructure, providing education and information as well as enforcement. Of this expenditure, only the NSP identified expenditure that was directed specifically at road safety measures (equivalent to 9% of the total) while the regional OPs invested in improving road infrastructure but not necessarily related to the achievement of road safety objectives. The exception to this though is investment in the removal of level crossings which has had a direct effect on road safety and where the removal of many level crossings has lead to a dramatic fall in fatalities from 150 in 1999 to 55 in 2008.

4.3 As is also seen within the regional case study for Lisboa, there have been a large number of interventions on the road sector across Portugal and these have lead to substantial improvements in road safety simply because new and upgraded infrastructure needed to be built to higher standards to include such things as carriageway separation and barriers on the hard shoulder.

4.4 Discussions with stakeholders have confirmed that the major improvements in road safety have come as a result of investments on the road network, primarily co-financed by the ERDF and not by interventions related to education or enforcement which in any case amounted to only a small fraction of the overall investment.

4.5 Therefore, while it is clear that the ERDF co-financed investments made a substantial contribution to improving road safety in Portugal, this improvement was largely a result of a quasi exogenous factor of improving the road network rather than targeted interventions such as removing accident black spots or reducing speeding.

4.6 However, it is important to note that it is not possible to split out the ERDF’s successes from those achieved by other policies, nor those achieved in previous programming periods. The reason for the latter is that, although some actions provide almost immediate (but often short-term) results such as the introduction of penalty points systems, others require much more time to feed through.

4.7 While road safety has improved substantially in recent times in Portugal, there are still some problems that continue to affect the Member State (and these problems are common to some Member States):

- Excessive or inappropriate speed;
- Pedestrian safety;
- Safety for two-wheeled motor vehicle users;
- Use of safety devices;
• Drink driving;
• The safety of infrastructure; and
• Trauma management.

4.8 As a result, future interventions should be targeted at tackling safety issues affecting particular groups of road users, primarily pedestrians, cyclists, and other more vulnerable groups). This can best be done by ensuring that the monitoring of accidents and the impacts of investments is disaggregated to this level so as to be able to better assess what the results of these investments are and thus allowing the better correlation of other types of investments (such as the creation of cycle paths) with their impact on road safety. Furthermore, the other key indicators that need to be used to the impact of road safety need to be disaggregated further to look at such areas as the number of accident black spots removed (an output rather than an impact indicator) or such things as the number of checks undertaken on drivers in relation to drink driving and speeding so as to give a value to the investment that has been made in enforcement.
APPENDIX

E

GOOD PRACTICE IN URBAN TRANSPORT
EX POST EVALUATION OF COHESION POLICY
PROGRAMMES 2000-2006 CO-FINANCED BY THE EUROPEAN FUND FOR REGIONAL DEVELOPMENT (OBJECTIVES 1 AND 2) - WORK PACKAGE 5A: TRANSPORT

Good practice in Urban Transport – Athens Metro

October 2009

Prepared for:
European Commission
Directorate General for Regional Policy
Evaluation unit

Prepared by:
Steer Davies Gleave
28-32 Upper Ground
London
SE1 9PD

+44 (0)20 7919 8500
www.steerdaviesgleave.com
1. THE PROJECT\(^1\)

**Project Objectives**

1.1 The main objective of the project was the provision of a high quality urban transportation network within Athens and its suburbs to cater for the increasing demand in transport and offer a more sustainable alternative to limit the continued increase in traffic congestion. Other objectives of the project included:

- Improve the quality of life for Athens citizens;
- Reduce traffic congestion;
- Reduce journey times;
- Reduce air pollution; and
- Integrate modes of public transport such as bus, trolley-bus, trams and railways.

**Strategic and Policy Context**

1.2 The Greater Athens Area experienced a substantial increase in population in recent decades. As a result, the urban areas in Athens have become densely populated and the high demand for transport put pressure on the public transport system. With the increase in population and the lack of a high quality public transport network traffic congestion and car ownership increased rapidly over the last few decades.

1.3 The following table shows the increase in the total number of cars in the Greater Athens Area and the Attiki Region over the last few decades. According to research published by the National Technical University of Athens, this equates to 510 cars per 1,000 inhabitants in Attiki in 2003.

<table>
<thead>
<tr>
<th>TABLE 1.1 GREATER ATHENS AREA NUMBER OF CARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>1961</td>
</tr>
<tr>
<td>1971</td>
</tr>
<tr>
<td>1981</td>
</tr>
<tr>
<td>1991</td>
</tr>
<tr>
<td>2001</td>
</tr>
<tr>
<td>2004</td>
</tr>
</tbody>
</table>

*Note: Data for 2001 & 2004 is for Attiki Region Source: Attiko Metro SA and Eurostat Database for 2001 & 2004

1.4 The high levels of car ownership had a negative effect on the share of public transport in the total number of journeys undertaken. The use of public transport dropped from a peak of 973 million passengers in 1965 to 510 million passengers in 1983. The following figure shows the share of public transport in Athens traffic between 1973 and 2001.

\(^1\) Where possible and depending on the availability of data, we have aimed to distinguish the impact generated by the base project (mostly funded within the 1996-1999 programming period) and the extensions (mostly funded within the 2000-2006 programming period
The Athens Metro project was identified as a solution to enhance the public transport network in order to address the declining trend in public transport passenger numbers and to tackle the increasing traffic congestion problem.

**Project Description / Type of Activity / Programming**

Before the implementation of the current Athens Metro the network of public transport in Athens was provided by buses and the Athens-Piraeus Electric Railway (ISAP), which has now been incorporated into the Athens Metro system as Line 1.

Currently, Lines 2 and 3 of the Athens Metro system are 51.1km long in total (including 20.7km of Suburban Railway line from Doukissi Plakentias to the Airport) with 28 modern stations (plus 4 stations in common use with the Suburban Railway). Metro Lines 2 and 3 serve approximately 650,000 passengers on a daily basis, while Line 1 serves 415,000 passengers. There has also been an improvement in the interchange between modes, thus, saving valuable time in their every day journeys.

The Athens Metro was developed in two distinct phases (and many sub projects) comprising the “Base Project” and the “Metro Extensions”. The following sections provide information on the programming of these phases. The Metro Extensions are those that have been funded under the 2000-2006 programming period.

**Base Project**

The construction of the “Base Project” commenced in 1992 and included the section of Line 2 between “Dafni-Sepolia” and the section of Line 3 between “Ethniki Amyna-Kerameikos”. The sections of the Base Project completed up to April 2003 were co funded by national and EU funds in the programming periods prior to 2000.

**Athens Metro Extensions + Base Project Section between “Monastiraki-Sepolia”**

In summer 2004 the construction of the first extensions were completed and handed over, in time for the Athens Olympic Games for:

- Line 2 between “Sepolia-Dafni” was extended on either side reaching Agios Antonios (Peristeri) station to the west and Agios Dimitrios station to the south.
- Line 3 between “Monastiraki-Ethniki Amyna” was extended to the north (by 5.9km) up to Doukissis Plakentias station, where Metro interchanges with the
Suburban Railway connecting to the International Athens Airport “Eleftherios Venizelos”.

1.11 In May 2007, the Metro Line 3 Extension from Monastiraki to Egaleo was added to the Metro network. This 4.2km long extension, comprised three new modern stations of Kerameikos, Eleonas and Egaleo and provided a major public transport improvement for the densely populated western suburbs of Athens.

1.12 Part of this section (between Monastiraki-Kerameikos) was originally expected to be completed much earlier as part of the Base Project, however, due to lengthy negotiations and changes to the design of this section as a result of archaeological finds in the Kerameikos area, construction was delayed.

1.13 The following map shows the Athens Metro network, including the base project and extensions.

FIGURE 1.2 ATHENS METRO NETWORK

Source: Attiko Metro SA

Beneficiaries

1.14 The main beneficiaries of the Athens Metro system are the citizens of the Greater Athens Area and the tourists and visitors that use the system in their millions on an annual basis. In general, the introduction of a high quality urban transport system has increased the quality of life in Greater Athens and also produced benefits for the local business in terms of fast, comfortable and reliable trips; reduced congestion, parking problems and pollution; improved urban realm around Metro stations; and significant economic benefits in terms of time savings and jobs.

Innovation

1.15 The introduction of the Athens Metro Project offering a high quality, fast, reliable and
efficient public transportation system has accomplished a major innovation for public transport in the Greater Athens area.

1.16 In general, state of the art technology and complex machinery, engineering tools and construction methods have been deployed for the construction of the Athens Metro network and stations. The trains, stations and platforms are equipped with state of the art systems such as air conditioning, communication systems, signalling and safety equipment.

1.17 The introduction of Athens Metro has also triggered a tariff innovation in the form of a travelcard valid over the entire bus, tram and metro network in Athens. This allows passengers to issue a daily, monthly or annual travelcard that allows them to travel on all public transport networks in Athens within the entire system, except for journeys to the Athens International airport.

1.18 Athens Metro has also accomplished cultural and social innovations. The significant archaeological findings and important works of art displayed in the metro stations have essentially transformed them into museums and art galleries that can be appreciated by the millions of system users. The increased accessibility and specific facilities for the disabled that was provided across the whole network forms a significant social innovation within the Greater Athens area. The upgrade of the surrounding areas of metro stations has improved the quality of public space and urban realm and have contributed to re-generation of the local areas.

**Political Support**

1.19 Since its beginning in 1992, the Athens Metro project has been the largest project undertaken in the Attiki Region and has been supported by a significant level of National and European Community support and funds. The project was also of strategic importance for the delivery of the Athens Olympic Games in 2004 and therefore received significant support by both local and national government. Funding support has been provided by authorities in Greece both at national and regional level through the Ministry of Regional Planning and Physical Works (YPEHODE) and the Regional Authority of Attiki.

**Management structure quality and effectiveness**

1.20 The management structure adopted for the design and delivery of the Athens Metro project was complex. However, Attiko Metro SA was in the heart of the management structure and ultimately responsible for the delivery of the project.

1.21 The main objective of Attiko Metro SA was to undertake the design, construction, organization, administration, operation, running and development of the Athens Metro system. To monitor efficiency, Attiko Metro SA was supervised by the Minister of the Environment, Regional Planning and Public Works, as well as by the Minister of Commerce. The funding for the project came from various national and European Union sources, which were allocated through the Attiki ROP and the national Operational Programme of OP-RAPUD. The ministries monitored the funding and progress of the Attiko Metro project and intervened as necessary to ensure that appropriate funding was in place to keep the project running.
1.22 The overall project investment, construction and operation of the Athens Metro System and Attiko Metro SA is currently being supervised by the Greek Ministry of Economy and Finance, Ministry of Regional Planning & Physical Works and Ministry of Transport. The construction of the base metro project was carried out by the Olympic Metro Consortium comprising Greek, French and German companies. Bechtel International was commissioned by the Greek government to provide support to Attiko Metro SA on the management of the Athens Metro project.

1.23 Attiko Metro SA was the main coordinator of the partnership among these organisations, which worked closely to ensure an efficient allocation of funds, carried out monitoring for the progress of work and expenditure and delivered the Athens Metro project and its extensions.

**Total Investment and funding sources**

1.24 The overall Athens Metro project has received funding from a number of different sources:

- European Regional Development Fund;
- Cohesion Fund;
- European Investment Bank loans; and
- State grants.

1.25 The total Cohesion Fund allocation for the Athens Metro extensions between 2000 and 2004 was €265 million. The remaining EU funds within the 2000-2006 programming period have been provided through the ERDF. The figure below shows the breakdown of the funding.

**FIGURE 1.3 METRO PROJECT FUNDING**

![Graph showing Metro Project Funding]

Source: Attiko Metro SA

1.26 ERDF resources were allocated to the Athens Metro project through the:

- Regional Operational Programme (ROP) for Attiki
- Operational Programme “Road Axes, Ports and Urban Development” (OP-RAPUD).
OP-RAPUD allocated a significant amount of ERDF resources for the construction of four separate extensions to Line 2 and 3 between Sintagma and Monastiraki; Monastiraki and Egaleo; Ethniki Amyna and the airport; and Dafni and Agios Dimitrios. Funds through OP-RAPUD were also allocated for the construction of six interchange stations along Line 3 and the purchase of rolling stock. While the construction of all the extensions and three of the interchange stations has been successfully completed (most of them in time for the 2004 Olympic Games, the main driving force for this investment) the construction of three stations on the section of Line 3 between Ethniki Amyna-Airport is still ongoing. In addition, OP-RAPUD allocated resources for the initial works of the extensions of Line 3 sections between Egaleo and Haidari and between Haidari and Piraeus the construction work will be financed in the following programming period.

The Attiki ROP allocated funds for the northbound extension of Line 2 between Sepolia-Anthoupoli and the construction of the stations along this extension. The construction of the section between Sepolia-Agios Antonios has already been completed and is in operation serving one of the most densely populated areas in Athens. According to the Attiki ROP Managing Authority an average of 50,000 passengers use this section of the metro a day.

**Partnership**

The project has been an example of how partnership between a number of institutions has worked well. This has been demonstrated by the collaboration of the various Managing Authorities in terms of coordinating their input into the project. Attiko Metro SA has played a key role in the successful partnership by coordinating the use of different funds in a manner in which the project could be completed within the strict deadlines associated with the Athens Olympics.

The excavation, preservation, transportation and display of the ancient finds through the archaeological excavations were undertaken in close cooperation between Attiko Metro SA, Olympic Metro Consortium, which constructed the Athens Metro Base Project, and finally the Ministry of Culture (MoC). The MoC supervised all phases of the archaeological works, while Attiko Metro funded and coordinated the excavations in cooperation with the various contractors, all involved Authorities and Services.

The project construction crossed a number of prefecture areas and required the integration with the existing road network and other public transport operations. As a result, the project included a partnership with a number of local authorities and public transport operators requiring their close involvement.

**Marketing**

The implementation of the Athens Metro system and the opening of its sections were communicated to the members of the public through extensive coverage in the media, press and other forms of communication. The Attiko Metro SA website (www.ametro.gr) and Amel website (www.amel.gr) provide significant information about the project and extensive passenger information that includes maps and station information.
1.33 In addition a number of documentaries have been prepared on the construction of the Metro project presenting its cultural as well as engineering innovations mentioned above.

Obstacles in terms of design or implementation

1.34 There have been various obstacles that have increased the complexity of the Athens Metro project and in some cases resulted to delays in the delivery of the construction and implementation. Some of these obstacles were the following:

- Poor soil conditions
- The presence of archaeological remains
- Contractor disputes and legal objections
- Earthquakes

Transferability

1.35 Following the successful management and construction of the Athens Metro project, Attiko Metro SA has also been awarded the project for the design, construction, running and development of the Thessaloniki Metro project, showing that the lessons learnt on the project can be transferred to other similar projects. Experience and knowledge gained through the Athens Metro project in areas such as the following are transferable to other projects such as the Thessaloniki Metro construction:

- Impact of archaeological excavations on metro construction;
- Impact of metro construction on public utilities and their diversions;
- Management of the impact of construction on citizens and local businesses in the form of road closures, congestion, interruption of traffic and pedestrian movements etc;
- Integration of the metro network with the remaining public transport system;
- Integration of the metro network with road network and surface transport;
- Impact of soil and geological characteristics on excavations;
- Technological innovations in the specifications of metro trains, stations and platforms and equipment; and
- Social and cultural innovations achieved in the form of regeneration of metro stations and environs, display of archaeological artefacts at metro stations and improved accessibility for the disabled.
2. EFFECTIVENESS AND RESULTS OF THE PROJECT

Usage

2.1 The following figure shows the change in passenger numbers across the whole public transport system in the Greater Athens Area. As shown in the following figure, there was a steep decline in the total number of public transport passengers in the Greater Athens Area between 1989 and 1992. Between 1992 and 2000 an increase in the number of public transport passengers can be observed mainly due to the bus fleet modernisation efforts that were pursued in the 1990s.

**FIGURE 2.1 TOTAL NUMBER OF PASSENGERS IN ATHENS PUBLIC TRANSPORT**

![Graph showing the total number of passengers in Athens public transport from 1985 to 2007.](image)


2.2 A steep increase can be observed in the total number of public transport passengers after 2000, which coincides with the introduction of the Athens Metro Base Project. The following graph shows a more detailed analysis of the total number of passengers in the public transport system by mode of transport between 2001 and 2007. A steady increase can be observed in the total number of passengers attracted by the Athens Metro system between 2000 and 2007. The introduction of the extensions in Lines 2 and 3, co-financed by ERDF resources within the 2000-2006 programming period have continued adding further capacity to the Athens metro system increasing the total number of passengers using it.

2.3 The following figure shows the total number of passengers between 2001 and 2007 across all public transport modes in Athens. As shown in the figure the Athens Metro passenger numbers have been increasing steadily. According to figures supplied by Attiko Metro, the first generation of Athens Metro extensions (mostly funded in the 2000-2006 programming period) will have a total ridership of 70.8 million passengers by year 2010.
FIGURE 2.2 NUMBER OF PASSENGERS BY PUBLIC TRANSPORT MODE

<table>
<thead>
<tr>
<th>Year</th>
<th>Bus (ETHEL)</th>
<th>Trolley-bus (ILPAP)</th>
<th>Rail (ISAP)</th>
<th>Bus (ISAP)</th>
<th>Athens Metro (AMEL)</th>
<th>Athens Tram</th>
<th>Suburban Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>350</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>2002</td>
<td>330</td>
<td>110</td>
<td>140</td>
<td>200</td>
<td>280</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>2003</td>
<td>320</td>
<td>120</td>
<td>130</td>
<td>200</td>
<td>290</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>2004</td>
<td>310</td>
<td>130</td>
<td>120</td>
<td>200</td>
<td>300</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>2005</td>
<td>300</td>
<td>140</td>
<td>110</td>
<td>200</td>
<td>310</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>2006</td>
<td>290</td>
<td>150</td>
<td>100</td>
<td>200</td>
<td>320</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>2007</td>
<td>280</td>
<td>160</td>
<td>90</td>
<td>200</td>
<td>330</td>
<td>100</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: Athens Public Transport Organisation (OASA)

Bus (ISAP): Bus Division of ISAP Electric Railway established in 1955 to serve the needs of passengers of the Piraeus area. In 2001, their operation was gradually ceded to ETHEL bus company.

2.4 The following figure shows the results of a survey carried out to identify the impact of the Athens Metro Base Project following its implementation in 2000. According to the data collected, the majority of the Athens Metro passengers have shifted from buses onto Athens Metro. The introduction of Athens Metro has provided a higher quality and capacity alternative for a considerable number of buses and bus routes in central Athens. This has resulted to a reduction in the number of buses in central Athens, particularly for bus routes travelling along the metro alignments. This is probably the reason for the decline in total number of bus passengers observed between 2001 and 2007.

2.5 However, a significant percentage of Athens Metro passengers (24%) have transferred from car and others have transferred to Athens Metro from combined modes of private car and other public transport. Interestingly, 3% of the trips transferred from walking particularly from trips within the Central Business District in Athens.

2.6 Overall, the Athens Metro project has resulted in both an increase in the total number of passengers using public transport in Athens and also to a significant mode shift from the private car to Athens Metro. We have not been able to identify or obtain from Attiko Metro SA evidence of mode shift caused by the Athens Metro extensions in specific. However, the evidence obtained for the base project and the rapid increase in total number of passengers between 2001 and 2007 suggests that mode shift may have been achieved also by the metro extensions.
Impact of Athens Metro

Introduction

2.7 At the inception of the Athens Metro project various targets were set with regards to improvements and benefits generated by the new metro system. It was estimated that the total number of daily private car trips would be reduced by 250,000, when the metro (base project and extensions) was fully operational resulting in reduction of congestion and air pollution. It was also expected that Athens Metro would contribute to saving energy, provide a unique opportunity for archaeological research, upgrade the image of Athens and provide challenges for further economic development.

Reduction of private car trips and congestion

2.8 Consequently, Athens Metro has had a significant impact on the improvement of public transport, the reduction of the use of private cars and the congestion relief mainly in the centre of Athens. However, Attiko Metro SA and other researchers acknowledge that some of the reduced congestion benefits have been cancelled out by the continued substantial increase in car ownership in Athens. Nevertheless, with a daily number of 650,000 passengers Athens Metro has helped alleviate a part of the traffic problem in central Athens and also along the traffic corridor served by the metro network.

2.9 It has been estimated by AMEL that the operation of the Athens Metro Base Project reduced the number of cars entering the city centre by 70,000, which equates to 335,000 vehicular kilometres on a daily basis. More recent estimates provided by Attiko Metro SA indicate a total reduction of 120,000 daily trips by private car has been achieved following the completion of the Athens Metro extensions. The reduction in the number of cars entering the centre of Athens has also resulted in the mitigation of previously acute parking problems in the city centre.

2.10 The integration of the Athens Piraeus Electric Railway (ISAP) and Athens bus network with the metro stations and the increased interchange opportunities have also resulted to a significant increase in the use of the Electric Railway and a reduction to the number of bus vehicles entering the centre of Athens.
Reduction of air pollution

2.11 The introduction of Athens Metro has resulted in the improvement of the environment and particularly to the reduction of air-pollution in the Attica basin. Various measurements undertaken between the periods before (30.01.1999-29.01.2000) and after (30.01.2000-29.01.2001) the implementation of the Athens Metro Base Project show a significant reduction of pollutions in terms of emitted gasses as shown in the following figure.

**FIGURE 2.4 GASSES EMITTED BEFORE AND AFTER METRO BASE PROJECT**

![Graph showing gasses emitted before and after Metro base project](image)

Source: The Transportation Efforts in the City of Athens (Greece) Towards Environmentally Friendly Transportation, R Mitoula, P Patargias, K Abeliotis, 39th ISOCARP Congress 2003

2.12 The extensions of the Athens Metro project have significantly increased the number of passengers carried by the metro system and caused a further reduction in the number of cars entering Athens city centre. The concentrations of air pollutants in the greater metropolitan area of Athens have been measured in recent years. It is difficult to quantify the impact of the metro extensions alone on the reduction of air pollutants as there have been various other measures for the reduction of air pollution in Athens over the recent years. Also, the metro extensions have been implemented at different stages post 2000. However, as shown in the following graphs, in the areas where the measurements were taken, there is a significant and consistent decline in air pollutants between 2000 and 2006 when most of the metro extensions were delivered.
FIGURE 2.5 ATMOSPHERIC CONCENTRATIONS AVERAGE OF VALUES MEASURED AT A NUMBER OF STATIONS IN ATHENS

Source: Ministry for the Environment, Physical Planning and Public Works, Country Profile: Greece, National Reporting to the Fourteenth & Fifteenth Sessions of the COMMISSION for SUSTAINABLE DEVELOPMENT of the UNITED NATIONS (UNCSD 14 – UNCSD 15)

Travel time reductions

2.13 The Athens Metro System has significantly reduced the travel times between the locations along the metro lines. Driving a car between Ethniki Amyna and Syntagma in rush hour would take 35 minutes, but with the Athens Metro it would take only 10 minutes. A similar car trip from Dafni to Omonia of 35 minutes takes 11 minutes by metro.

Employment benefits

2.14 An additional benefit of Athens metro has been the thousands of new jobs during its construction, as well as permanent jobs after its completion. A large number of workers are currently employed by Athens Metro in 40 different areas of the city. The following table shows the employment created by the extensions of Athens Metro.

TABLE 2.1 EMPLOYMENT BENEFITS CREATED BY ATHENS METRO

<table>
<thead>
<tr>
<th></th>
<th>Construction (temporary)</th>
<th>Operations (Permanent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>1,680</td>
<td>400</td>
</tr>
<tr>
<td>Indirect</td>
<td>2,520</td>
<td>200</td>
</tr>
</tbody>
</table>

Source: Attiko Metro

Cultural benefits

2.15 Athens Metro has also been acting as a vessel for cultural development in the city of Athens. The significant archaeological findings and important works of art are displayed in numerous metro stations and enhance the access of tourists and local
residents to the rich cultural heritage of the city thus providing a wider social impact of the project.

**Economic and regional development benefits**

2.16 The greatest contribution to the economic benefits by Athens Metro is generated through reductions in travel times for existing Public Transport modes (mainly bus) users. The travel time benefits, as calculated by Attiko Metro, amounts to 40% of the total benefits for the base metro system (18 kms in the city centre) versus 45% of the total benefits for the metro extensions (9 kms further away from the city centre determining this plausible relative increase). Other major contributions to the overall benefits created by Attiko Metro come from non-user benefits (e.g. reductions in travel time for road users, more in the case of the base system due to the increased congestion in the centre).

2.17 The enhanced urban development and improved accessibility provided through the introduction of the new metro stations boosted economic development along the areas served by the metro network. Areas of Athens that were previously considered as being secluded have been fully integrated with the city and the transport network of Athens through the metro system. This has provided opportunities for those areas served by the metro to develop and compete with other more advanced areas of the city and attract business and housing development.

2.18 The economic boost the metro provides in the form of time savings are also significant. A recent survey on the main road arterials along the metro network has shown that journey times have increased by 20-25% during peak hours when the metro is not operational. As a result, the operation of Metro provides significant savings in terms of time savings, energy savings, congestion and vehicle operating costs.

**Sustainability**

2.19 The following extensions and stations are currently under construction, which have received funding through various sources within the 2007-2013 programming period:

- Extension of Line 3 to Haidari (1.5km, 1 new station);
- Two new stations on the extension of Line 3, which is already in operation;
- Extension of Line 2, to Anthoupoli (1.5km, 2 new stations);
- Extension of Line 2, to Elliniko (5.5km, 4 new stations)

2.20 The experience and knowledge gained through the construction of the base project and extensions is currently being applied to these extensions. In light of the benefits established by the metro network constructed to date, there are aspirations to build Line 4 and to extend the Athens Metro System even further to cover 85% of the wider area of the Attiki Basin comprising a network of 8 lines which are 220km long and have 200 stations. It is envisaged that the development of the Athens Metro network will support the development of the city of Athens in a sustainable manner and continue improving the quality of life for its citizens.

2.21 It is currently anticipated that funding for line 4 and further development of the Athens
Metro network cannot be incorporated in the scheduling of the 2007-2013 programming period, which has been given priority to the construction of the Base Project and the Extensions of the Thessaloniki Metro (2 billion euros), as well as to Metro Line 3 extension to the western suburbs of Athens from Haidari to Piraeus and Zea (570 million euros). Therefore, all funding methods are under consideration by Attiko Metro SA and the Greek government.

**Conclusion**

**Lessons Learned – critical success factors**

2.22 The following lessons have been learned through the project and are being applied by Attiko Metro SA to the Thessaloniki metro project.

- Significant political support at both national and local levels partly due to its strategic importance for the 2004 Olympic Games which meant that the entire construction process was undertaken quickly and effectively.
- Coupled with the previous point: The effective partnership between the various institutions involved (public and private).
- The ability to coordinate the various funding sources effectively (national and EU) in order to ensure a quick and positive result to meet the stringent timescales.
- Extensive marketing and promotion of the results achieved and the facilities made available to the population of Athens including websites and television documentaries.
- The use of a mix of innovative as well as tried-and-tested construction techniques to ensure that the archeological heritage was not disturbed and that construction could be carried out in an effective manner with minimal surface disruption. Tied to this was the provision that future extensions could be added to the infrastructure with minimal disruptions to the surrounding areas.

**Good Practices**

2.23 The Line 2 and 3 extensions that were built between 2003 and 2008 and the remaining extensions that are currently under construction have been co-financed by the ERDF resources in the 2000-2006 programming period. The extensions to these lines have provided a significant increase in the total number of passengers carried by the Metro system, hence contributed to the reduction of congestion, pollution, travel times and energy in Athens and the Attiki Region. The Athens Metro project can be considered as good practice in the implementation of urban transport projects mainly due to the following:

- Significant increase in public transport usage in Greater Athens Metropolitan Area;
- A reduction in the total number of cars entering Athens city centre;
- Increased coverage of public transport reaching densely populated urban areas in Athens that had no access to high quality public transport previously;
- Reducing trend in the levels of air pollution in Athens following the opening of the metro and its extensions;
- Timely construction of the metro and most extensions for the Athens Olympic Games in 2004;
• Reduced journey times between major destination in Athens;
• Increased interchange possibilities with other transport modes such as bus, suburban rail and tram;
• Cultural benefits;
• Temporary and permanent employment generation;
• Economic and regional development benefits; and
• The role of Attiko Metro SA that ensured an integrated management of the different Operational Programmes and Funding Sources that contributed to the implementation of the project and creation of all the above benefits.

2.24 Overall, the Athens Metro has significantly improved the quality of life for millions of Athens residents and visiting tourists in the form of reduced travel times, pollution and congestion. The archaeological excavations, presentations of art and increased accessibility for the disabled have provided a boost to the cultural and social benefits in Athens. However, the steady increase in car ownership continues to put additional pressure on the road network in Athens. The ongoing extensions to the Metro and the ambitious extensions planned for the future provide an opportunity for Athens to reverse this trend with a mode of transport, which proved that can be competitive against the private car.

Community Added Value

2.25 The majority of the funding provided to the project has been directed through the EU funds. Without the support and funding of the European Union, especially the European Regional Development Funds, it would have been difficult to fund the Athens Metro Project. The benefits that have been mentioned above have meant that there has been considerable added value to the transport network in Athens, given the local nature of the project though, it is difficult to identify any wider EU added value.
EX POST EVALUATION OF COHESION POLICY PROGRAMMES 2000-2006 CO-FINANCED BY THE EUROPEAN FUND FOR REGIONAL DEVELOPMENT (OBJECTIVES 1 AND 2) - WORK PACKAGE 5A: TRANSPORT

Good practice in Urban Transport – Removal of level crossings and the new railway tunnel in Cadiz

October 2009

Prepared for:
European Commission
Directorate General for Regional Policy Evaluation unit

Prepared by:
Steer Davies Gleave
28-32 Upper Ground
London
SE1 9PD

+44 (0)20 7919 8500
www.steerdaviesgleave.com
1. INTRODUCTION

1.1 This case study sets out the good practice in urban transport project aimed at removing the physical barrier posed by the rail line which separated the historical centre from new residential developments in Cadiz and could only be crossed by a limited number of level crossings.

Description of the Project

Policy Context

1.2 Cadiz is a municipality located in the southern Spanish region of Andalucía. It is centred around the Bay of Cadiz with San Fernando, Santa María, Chiclana and Puerto Real. The economy of Cadiz is based on the maritime industry providing an important trade route through its port but also economic activity in its shipyards. The other main driver of economic activity is tourism. In 2008 the municipality of Cadiz had a population of 127,200 inhabitants with a population density of 9,564 inhabitants per km². The city is well connected with the most important cities of Spain through its airport, ports and rail links.

FIGURE 1.1 LOCATION OF CADIZ

1.3 Nevertheless the city had a significant urban transport problem; it was divided in two by the railway line. This created transportation difficulties particularly for road traffic but also for public transport and these lead to knock-on environmental problems. Congestion was a significant problem around the railway where roads were often blocked as a result of the limited number of rail crossings. In addition there was insufficient room for pedestrians on existing road infrastructure and adjacent to the railway.

1.4 Furthermore, rail travel times were too long forcing many users to remain off the railway and in their cars.
**Project objectives**

1.5 The main objective of the project was to provide a transport solution that was able to facilitate the regeneration of an area seeking to become the main intersection for different neighbourhoods, an area that was to become a fundamental link in the city’s transport system. To achieve this, the railway had to be moved underground.

1.6 While this was the main urban regeneration goal of the project, it also had a number of other transport objectives:

- to improve the public transport system by reducing the waiting time between services on rail and creating more appropriate routes for the buses;
- to create a new access road to the city centre, thus addressing the traffic and congestion problems;
- to overcome the division between the historical centre and the new residential developments; this division created significant economic, social and geographic problem;
- to remove overpasses and level crossings in the city;
- to improve the aesthetics of the city by providing a better balance between urban and park areas.

**The Project**

1.7 The project involved the construction of a new rail line (double track in the higher density sections) was constructed underground. This route connects the Cadiz - Sevilla line with the station of Cádiz. In particular the project involved the construction of 3.7km of new railway, between the stations of Termino de Cádiz and Termino Sur, 2.5km of which (almost 68%) were build underground. The work ended in 2002.

1.8 The project involved the *Ministerio de Fomento* (Ministry of Public Works), *Junta de Andalucía* (the organization in charge of the government of Andalucía) and *Ayuntamiento de Cádiz* (the City council). The *Ayuntamiento de Cádiz* was the beneficiary for the tunnelling and all the interventions associated while the Ministry looked after the construction of new passengers stations.

1.9 The *Junta de Andalucía* and the *Ayuntamiento de Cádiz* managed the re-urbanisation of the area and the removal of the level crossings. The figure below shows the new street that runs over the now underground line.

1.10 Moving the line underground enabled the area above ground to be regenerated and allowed for substantial improvements to be made to transport in the area. The figure below shows the new layout of the area.
The new street and the expansion of the most populous neighbourhood in Cadiz (“La Laguna”) was accompanied by the revitalization of the economy in this part of the city and by new residential developments along the new road with the aim of making it one of the focal points of the city.

**Total Investment and funding sources**

As described above the project involved three different authorities, the Ministry of Public Works, the Andalucían regional authority and finally the City council. Indeed in 1999 they signed a formal agreement (*Convenio de Colaboracion*) in which they raised the importance of the intervention and through which they agreed to share the management and the funding of the project.

The project required total funding of €79.5M. 65% were provided by the *Ministerio de Fomento*, which was mostly used for the construction of the new underground stations. The rest was split between the *Junta de Andalucía* and the Ayuntamiento de Cadiz that covered, respectively, 24% (€18.9 M.) 11% (€9.2 M.) of the total investment. Both these authorities drew on ERDF resources to make this investment, the former was covered by ERDF resources amounting to 75% of the total expenditure, while the latter covered 65% of the total expenditure.

While the *Ayuntamiento de Cádiz* was the manager for the tunnelling works, the management and cost of the works related to the new road (“Avenida Juan Carlos I”) were financed both by the *Junta de Andalucía* and the *Ayuntamiento de Cádiz*, (50% each one).

---

1 At least they considered the rail tunneling intervention within Cadiz (and the removal of the respective level crossings) as a part of the overall intervention of upgrading the railway line between Cadiz and the airport of Jerez de la Frontera.
1.15 The project has benefited different market segments. The main beneficiaries are the local inhabitants that have seen a substantial improvement in accessibility coupled with less congestion on their surrounding road network. The city also now has more transversal links which have alleviated congestion problems on the main access road and as such all road users are also beneficiaries of this project.

1.16 Furthermore, the accessibility improvement is clear in both directions as the historic centre of the city is no longer separated by a barrier from the urban residential areas, something that in the past had lead to the city developing differently on the two sides of the railway line.

1.17 The other beneficiaries are the rail users as they benefit now from reduced journey times. In particular, thanks to the tunnel and other interventions the travel time between Cádiz and Sevilla will be reduced from 138 minutes to 55 minutes, clearly, the tunnel section only brings a small part of this time saving.
2. RESULTS OF THE PROJECT

2.1 This project has been a success in terms of accessibility improvements. The presence of a physical barrier created a lot of problems to Cadiz, following the changes, the neighbourhoods are no more isolated and the commercial life in Cadiz has improved considerably.

FIGURE 2.1 AVENIDA JUAN CARLOS I

![Figure 2.1 AVENIDA JUAN CARLOS I](image)

Source: Urbanity

Rail enhancement

2.2 The tunnel was a key milestone in improving the rail network. While there has been an improvement in journey times, the waiting time between services still remains high and so it has not encouraged substantial modal shift.

2.3 The investment has however ensured that road safety in the area has improved as the closure of the level crossings as part of the works have removed the direct contact between the railway and road traffic, as well as between the railway and pedestrians. There is no specific accident data to underpin this, although it is information that we have received from stakeholders.

A new space

2.4 The removal of the railway and the creation of a new road, has not only improved transport in the urban environmental substantially, it has also regenerated an entire area and has provided open spaces and park area for the local community. This has had a perceived knock on effect on the environment in terms of reduced pollution.

Reduction of traffic congestion

2.5 The creation of the new street lead to a reduction in congestion as a result of the new links crossing the city. Before the tunnelling works there was only one access road to the city centre and it was severely congested. The removal of this congestion has also
had an effect on emission in the area making the air more breathable. Previously, travel by private car was limited by the railway infrastructure, but the reduced congestion has meant that there is also a saving in terms of travel time for the private car user. Furthermore, the removal of congestion has also meant that public transport passing through the area has become more efficient and these works have been accompanied by the introduction of new bus routes to maximise the benefits of better traffic flows.

**Obstacles and success factors of the project**

2.6 The high degree of popularity that this project has within the inhabitants of Cadiz is one of the main success factors. The population did not want to have a divided city; nor did they want to wait at level crossings or take long detours to get to their destinations.

2.7 The reduction of congestion in the main approach road to the historical centre of the city is a key success factor for this project. Before the tunnelling, there was only one approach road to the city centre causing severe traffic congestion, following the completion of the new infrastructure this has been reduced considerably.

2.8 A further key component of this investment was the knock on effect on public transport, while as we have mentioned above the gains for the rail sector were minimal as the number of services did not change substantially, although the removal of the railway and the closure of the level crossings lead to a reorganisation of the bus network that in turn lead to an increase in the number of services and an optimisation of their routes.

2.9 The main obstacle to the project was geological as the water table in the area was a problem and as such the railway tunnel walls needed to be 29 meters deep to ensure that the tunnel was protected appropriately. In addition to this was a large amount of sub-surface RENFE infrastructure that needed to be moved, this had not been planned at the start of the project and as a result needed to be dealt with accordingly.

2.10 In addition, there were a large number of teething problems in relation to the initial operation of the railway tunnel in terms of both water seepage and other infrastructure related delays. These were solved in the initial months of operation and no longer exist.

**Conclusion**

2.11 The project as a whole made a substantial contribution to improving urban transport in the city of Cadiz, both in terms of improving road traffic and congestion in the area as well as providing improved travel times for rail services and increased accessibility for the local inhabitants by:

- Removing a physical barrier to movements in the city;
- Removing a number of level crossings;
- Increasing accessibility to neighbouring areas;
- Improving access to public transport as a result of the introduction of new surface bus services as well as the construction of 4 new stations along the route;
• Increasing accessibility for local inhabitants to areas outside the city, and
• Reducing travel times to key areas around the city and beyond.
EX POST EVALUATION OF COHESION POLICY
PROGRAMMES 2000-2006 CO-FINANCED BY THE EUROPEAN FUND FOR REGIONAL DEVELOPMENT (OBJECTIVES 1 AND 2) - WORK PACKAGE 5A: TRANSPORT

Good practice in Urban Transport – Eco Bus Funchal

October 2009

Prepared for:
European Commission
Directorate General for Regional Policy
Evaluation unit

Prepared by:
Steer Davies Gleave
28-32 Upper Ground
London
SE1 9PD

+44 (0)20 7919 8500
www.steerdaviesgleave.com
1. ECO LINE BUS SERVICE IN FUNCHAL

Introduction

1.1 This case study describes the LINHA ECO (ECO LINE) bus service project in Funchal co-financed in the 2000-2006 programming period. The case study will initially describe the project as a whole and then will provide information on the impact that this project has had on urban transport in Funchal.

Description of the Project

Policy Context

1.2 Funchal is the main (capital) city of the Madeira Autonomous Region and has a population of 100,847 inhabitants (approximately 150,000 including the hinterland). The high population density (as well as the large number of tourists that visit the city) and the mountain setting of the city have been a strain on the Funchal public transport system. Nevertheless, the city has an extensive Public Transport (PT) system with a total of 66 routes, operating on 189 km of the road network, further details are included in the table below.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of urban routes</td>
<td>66</td>
</tr>
<tr>
<td>Number of journeys (in 2008)</td>
<td>1.0 million</td>
</tr>
<tr>
<td>Network length</td>
<td>189 km</td>
</tr>
<tr>
<td>Distance travelled (in 2008)</td>
<td>6.9 million km</td>
</tr>
<tr>
<td>Load factor (in 2008)</td>
<td>18%</td>
</tr>
<tr>
<td>Average vehicle capacity</td>
<td>80 seats</td>
</tr>
<tr>
<td>Commercial speed</td>
<td>18km/h</td>
</tr>
</tbody>
</table>

Source: Horários do Funchal - Transportes Públicos, S.A website

1.3 However the need to provide a connection between the coastal areas (where all public transport lines end) and the city centre of Fuchal and the lack of accessibility to public transport for those passengers living in the central areas of the city, has meant that the network needed to be extended through the creation of a new line.

1.4 The introduction of this new service also needed to meet the requirements set out in the Portuguese National Plan for Climate Changes (2001) and the Energetic Regional Plan (2002), related to promoting public transportation as a measure to reduce greenhouse gas emissions and meet the requirements of the Kyoto protocol.

Project objectives

1.5 The objectives that the local Managing Authority set for this project were the following:

- to enhance urban mobility in Funchal, particularly for people with reduced
mobility and car park users;
- to reduce traffic in the city centre;
- to reduce emissions of air pollutants and noise;
- to test new technologies;
- to improve quality of life in the historic centre of the city; and
- to improve the image of public transport.

The LINHA ECO (ECO LINE) Project

1.6 The new LINHA ECO (ECO LINE) bus service started in mid September 2006 and is operated by the local public transport company, Horários do Funchal - Transportes Públicos, S.A. The service is provided Monday to Friday from 08:00 a.m. to 20:00 p.m. and Saturday from 08:00 a.m. to 14:00 p.m. (on Sundays and public holidays the service is not provided).

1.7 The fleet is composed of 4 Gulliver mini electric buses, produced by the Italian company Tecnobus, powered by innovative batteries with no direct emissions of CO₂ and no noise pollution.

FIGURE 1.1 THE LINHA ECO BUSES

Source: Horários do Funchal - Transportes Públicos, S.A

1.8 These batteries (that have an autonomy of more than 100 Km) allow the vehicles to travel along a 5km route with minimal gradient through the city’s economic centre (see the figure below for a map of the LINHA ECO route). A further key benefit of the service is its interconnection with a number of central car parks allowing park and ride initiatives to develop.

FIGURE 1.2 LINHA ECO BUS SERVICE ROUTE
Total Investment and funding sources

1.9 The total cost of the project was €935,000, 50% of which was provided by the European Regional Development Fund (ERDF) through the Regional Operational Programme (ROP) for Madeira (POPRAM III).

1.10 The table below shows the initial budget allocation for each different cost category related to the project as well as what has been actually spent. Overall, the project has spent almost all of its budget even though some smaller cost category such as “graphic and design” or “bus decoration and image” have substantially underspent.

TABLE 1.2 BUDGET ALLOCATION AND EXPENDITURE FOR THE PROJECT

<table>
<thead>
<tr>
<th>Cost category</th>
<th>Allocation</th>
<th>Expenditure</th>
<th>% spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus and equipment purchase</td>
<td>870,772</td>
<td>870,772</td>
<td>100%</td>
</tr>
<tr>
<td>Graphic and design</td>
<td>7,000</td>
<td>2,978</td>
<td>43%</td>
</tr>
<tr>
<td>Information campaign</td>
<td>13,000</td>
<td>12,309</td>
<td>95%</td>
</tr>
<tr>
<td>Bus decoration and image</td>
<td>6,000</td>
<td>3,040</td>
<td>51%</td>
</tr>
<tr>
<td>Signalling</td>
<td>10,000</td>
<td>11,975</td>
<td>120%</td>
</tr>
<tr>
<td>Project monitoring</td>
<td>28,650</td>
<td>28,650</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>935,422</td>
<td>929,724</td>
<td>99%</td>
</tr>
<tr>
<td>- EU co-financing 50%</td>
<td>467,711</td>
<td>458,874</td>
<td>98%</td>
</tr>
</tbody>
</table>

Source: SDG elaboration based on data provided by the Horários do Funchal - Transportes Públicos.

1.11 It should be noted that originally the service was planned to be a revenue earning service (with a cost of €0.50 per journey) and as such was not eligible for more than 50% of co-financing. However given the public service nature of the line (targeted specifically at the mobility of elderly people and reduced mobility passengers) the decision was made (in September 2009) to make the service free of charge.

TABLE 1.3 REVENUE AND COST OF THE SERVICE

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>7,876</td>
<td>27,565</td>
<td>24,384</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total costs</th>
<th>116,564</th>
<th>134,921</th>
<th>149,518</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Depreciation</td>
<td>112,261</td>
<td>114,073</td>
<td>115,741</td>
</tr>
<tr>
<td>- Other Costs:</td>
<td>2,636</td>
<td>20,848</td>
<td>12,878</td>
</tr>
<tr>
<td>- Equipment</td>
<td>4,387</td>
<td>9,065</td>
<td></td>
</tr>
<tr>
<td>- Work time value</td>
<td>1,667</td>
<td>3,654</td>
<td>11,834</td>
</tr>
</tbody>
</table>

| Profit/Loss | -108,688 | -107,356 | -125,134 |

Source: Horários do Funchal - Transportes Públicos, S.A website
service. As a consequence of the decision to make the service free of charge, the revenue line will be considerably smaller in 2009 and will all but disappear in future years.
2. RESULTS OF THE PROJECT

Usage

2.1 The service has proven to be successful in terms of increasing accessibility to an area where no other services had been provided before and was dominated by car transport. In particular the LINHA ECO operator has reported that in 2008 the service transported more than 50,000 passengers, despite the decrease in the number of km. The figure below shows the number of passengers transported, the km travelled and the number of trips from 2006 to 2008.

FIGURE 2.1 LINHA ECO MAIN NUMBERS

![Chart showing LINHA ECO main numbers from 2006 to 2008]

Source: Material provided by Horários do Funchal - Transportes Públicos.

2.2 As can be seen, passenger numbers grew following 2006 and peaked at a total number of 52,737 passengers in 2008. In terms of km travelled, the 2007 value was +227% greater than the previous year (mainly as a result of the fact that 2006 was a short year – the line opened in mid September of that year), but has shown a significant decrease in 2008 (-17%) due to the poor reliability of the batteries in the initial years of the project. The LINHA ECO service carries 4,250 passengers, performs 920 journeys around the route and travels a total distance of 4,303 km on an average month.

Impact of LINHA ECO bus service

Introduction

2.3 The specific objectives set at the beginning of the project, as stated above, were to enhance mobility in Funchal, reduce environmental impacts and congestion within the city centre, to test new technologies and to improve the public transport image among citizens.

Mobility enhancement in Funchal

2.4 The new service has had a substantial impact on mobility in the area, both in terms of allowing the use of park and ride schemes, but also in more general terms by increasing accessibility to the centre via public transport and facilitating the mobility of those residents of the city centre looking to reach other parts of the city. This later point has been of particular importance to the residents with reduced mobility that live...
in the centre.

Reduction of environmental impact

2.5 While there has been no direct measurement of the environmental impact of the new service, as reported by the operator, the service contributed to a monthly reduction of 883 cars entering the city centre which is approximately equivalent to a 9% drop in traffic entering the area. This value has been estimated by taking the number of cars that either park their cars on the outskirts of the city centre or that no longer use their cars following the introduction of the Eco Line\(^1\). This is bound to have had a positive effect on emissions in the area as well as congestion.

2.6 Another aspect to consider is the low energy consumption and low operating costs of the service. The service optimises its electrical power (it makes use of only 0.15Kw per Km) and therefore presents a low electrical bill (€0.1/km) compared to a standard public transport service in Madeira, whose average costs stands for €0.64/km. These figures, however, have to be balanced with a slightly higher maintenance cost (an increase of €0.2/km) than the standard service’s average costs of maintenance of €0.3/km.

2.7 It is important to note however that given that this is a new line, there is actually an increase in electricity use which, depending on how the electricity is generated, can lead to more emissions elsewhere. Although this far outweighed by the reduction in car use that has been experienced.

Introduction of new technology

2.8 The service, as stated above, runs exclusively on electrical power stored in innovative batteries. In particular the system makes use of the so-called “Zebra” batteries that are the heart of the innovative technology used on the line. After 3 year of service the batteries have showed a good level of performance both in terms of their autonomy (far exceeding the 100km planned) and faster than expected recharge times. It should be noted though that the cost of these batteries is very high, as is the cost of the individual charging units. However, as discussed further below, there were some initial reliability problems with the batteries.

Public transport image

2.9 A customer survey was performed in February 2009 among 220 people who used the service. The aim of this survey was to understand how the service was used and the project’s key benefits. It was found that the service was mostly used by older people with an average passenger age of 51, the passengers were mostly women (65%), who used the line more than three times a week (60%) and who lived both in the central areas (45%) and the surroundings (55%). Finally 84% of the people rated the service as “Very Good” (the maximum).

\(^1\) In particular this estimation considered the average number of Eco Line users; the number of users that live in the surroundings and regularly use private transport; and also the average occupation rate among private transport mode.
2.10 More importantly the customers believed that the service could have a beneficial impact on the urban mobility in Funchal. In particular 95% of them affirmed that the LINHA ECO represented an essential driver in the urban mobility strategy within the city and how it was important to improve public transport systems especially by implementing more and more clean transport services.

**Obstacles and success factors of the project**

2.11 During the survey, the actual users of the LINHA ECO service were also asked to state which were the aspects of the service they liked the most. They stated that one of the key aspects of the service (appreciated by 95% of the sample) was the familiarity between the driver and the passenger.

2.12 This familiarity, the use of innovative technology, the park and ride benefits of the service and in particular the accessibility and congestion reduction benefits can be considered the key success factors of the project.

2.13 However the service was also characterized by some limits, most of them have now been solved. The first of these was the need to adapt the route to the hillside setting of the city. This problem has been dealt with by directing the service along mainly flat areas which has also meant that the route has been lengthened.

2.14 The low reliability levels of the buses (in particular the batteries) and high breakdown rates (37%) along with the long recharge time at the start of the project meant that substantial time was spent not in service. Cooperation between the supplier and the operator ensured that the problem could be resolved whilst at the same time increasing the knowledge base of the operator in maintaining the vehicle.

2.15 Finally, another problem was the lack of ticketing integration between the public transport services provided in Funchal and the new line. This problem has fallen away with the service becoming free of charge.

**Conclusion**

2.16 The LINHA ECO bus service has provided benefits to the local community and added value to the public transport system in the city with some passengers switching away from other forms of transport (particularly away from the car). The service has successfully met the demand of certain user groups proven by the high satisfaction rate achieved in the survey. Finally the service can be considered a good practice as a result of the increased mobility that it provides for the city of Funchal as well as for the perceived environmental benefits of the service.

2.17 A project of this nature, given its size and impact on the local community can be transferred to other medium sized cities across Europe and can have a beneficial effect on urban transport in these areas. It is important though that the route is studied carefully before services commence to ensure that it has the maximum possible impact, that sufficient funds are directed at ensuring the benefits of the service are understood by the community, and that all of its direct (environmental) impacts are measured fully to ensure the benefits can be identified in a coherent and consistent manner.
Project/Proposal Name: EX POST EVALUATION OF COHESION POLICY PROGRAMMES 2000-2006 CO-FINANCED BY THE EUROPEAN FUND FOR REGIONAL DEVELOPMENT (OBJECTIVES 1 AND 2) - WORK PACKAGE 5A: TRANSPORT

Document Title: Final Report

Client Contract/Project No.: Contract 2008.CE.16.AT.017

SDG Project/Proposal No.: 22044201

ISSUE HISTORY

<table>
<thead>
<tr>
<th>Issue No.</th>
<th>Date</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>04/09/09</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>03/11/09</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>07/12/09</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>08/01/10</td>
<td></td>
</tr>
</tbody>
</table>

REVIEW

Originator: Francesco Dionori

Other Contributors: Roberta Frisoni, Simon Ellis

Review by Print: Simon Ellis

Sign: 08/01/2010

DISTRIBUTION

Clients: DG REGIO

Steer Davies Gleave: As above