ADYSE Project

ADapt Your Speed to the urban Environment

Final Report

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ABSTRACT

The current Portuguese economic situation increasingly justifies the adoption of effective, knowledge-based and articulated road safety policies, particularly for urban areas where road fatalities are considerably higher than those in other developed countries. Portugal has adopted an ambition National Road Safety Strategy in 2009. However, its on-going mid-term evaluation is suggesting that many of its prescribed actions have not been implemented. Whist the reasons for this lack of actions´ implementation are neither necessarily only a Portuguese trait nor will be discussed within the framework of this work, they did lead the authors at aiming to contribute to tangibly change the situation by carrying out a project involving physical infrastructure changes and respective evaluation.

ADapt Your Speed to the urban Environment (ADYSE) is the ambition Portuguese project proposed and developed under the framework of the STudents Acting to Reduce Speed project (STARS), a European project coordinated by European Transport Safety Council (ETSC). STARS aims at contributing to increase awareness towards speed in accident consequences. The Portuguese ADSYE big challenge has been the implementation of infrastructure measures -- chicanes - in *Coelho da Rocha* Street in Lisbon.

The circumstances for altering about 180 meters of parking layout to create two chicanes could hardly be more adverse for at least three reasons: (1) there were no economic resources available, (2) parking in the chosen neighbourhood is extremely limited and therefore a very sensitive issue and (3) there will be local elections next year (2013) which greatly decrease local politians´ willingness to risk potential controversial alteration in the street environment.

To evaluate the implemented chicanes, speed measurements and road users´ perception and acceptability surveys were carried out. The V_{85}-speed has decreased from 32 to 29 km/h and the overall number of drivers driving above 30km/h has decreased 11%. On the other hand, risk perceptions' assessment demonstrates that the performed intervention had a direct and positive effect on road users' risk perception. It can also be stated that people in general considered this street safer after the implementation of the chicanes.

Recognised limitations on the evaluation method – greatly linked to resources, including time limitations - do not allow bold conclusions about the real average speed changes associated with the chicanes or on road users´ increased awareness towards the importance of reducing speed in streets. However, it can confidently be stated that ADYSE succeeded in: (1) implementing the first Portuguese chicanes of this kind that the authors are aware of with the support of a network of committed individuals from different backgrounds linked to public and private organisations as well as the academia. Initiatives like ADYSE will contribute to slowly change Portuguese corporations culture towards road safety projects; (2) carrying out an evaluation of the measures in a country where assessment of road policies and measures is rare; (3) identifying key non-technical factors which (often) prevent actions to be taken; (4) reaching out to the greater public through a national newspaper, the web, distributed leaflets, national presentations and requested publication as well as the international impact through ETSC. Also the crucial participation of Portuguese Association of Road Signs and Safety (AFESP) has greatly increased the potential impact of the project and (5) demonstrating that

few resources combined with serious commitment will secure success of well design projects. It is our conviction that demonstrated required dedication to early road safety practical projects might benefit from their careful ranking and selection, *i.e.*, choosing to have fewer good projects. The authors believed that the ADYSE aim has been fully achieved within the recognised existing resources limitations.

ACKNOWLEDGMENTS

The successful implementation of ADYSE project was largely due to the commitment and cooperation of several institutions and individuals who contributed to its execution and to enhancing its success. The authors are grateful to (institutions in alphabetic order):

- **AFESP - Portuguese Association of Road Signs and Safety (*Associação Portuguesa de Sinalização e Segurança Rodoviária*)**
  to Nuno Balula, the President, and Ana Raposo, Secretary-General, for their support and measure implementation sponsorship;
- **CML - Lisbon Municipal Council**
  to Fernando Nunes da Silva, Lisbon's mobility Councilman, for his enthusiasm and political efforts aimed at the implementation of the project in Lisbon and its integration into existing plans for implementing 30 zones;
- ***Casa Fernando Pessoa*** (a municipal museum located at the intervention location)
  to Carmo Mota, Manager, for temporarily provide one of their parking space and in this way allowing for speed measurements;
- **ETSC – European Transport Safety Council**
  to ETSC for the opportunity to participate in STARS project and particularly to Ilyas Daoud, STARS Project Officer, for its systematic support and enthusiasm ;
- **IST – *Instituto Superior Técnico***
  to Sílvia Shrubsall for believing in this project and for formally and informally establishing institutional contacts with some of the project partners, providing technical advices and suggestions;
- **JFSC – *Santo Condestável* Civil Parish**
  to Pedro Cegonho, the President, for approving for the implementation of measure;
- ***Psicólogos Associados*** (company where Joana Nogueira works)
  to Ana Cardoso de Oliveira for believing in this project and to Mafalda Galvão Teles for helping us carrying out the questionnaires;
- **PSP – Public Security Police (*Polícia de Segurança Pública*)**
  to *Comissário* Paulo Flores, *Sub-comissário* Gancho, *Chefe* Pereira, *Chefe* Martins and *Agente* Almeida for PSP support and cooperation in speed assessments;
- **TRAFIURBE**
  to Pedro Oliveira, Project Manager, who was responsible for the infrastructural implementation of the project.

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ACRONYMS LIST

ADYSE – Adapt Your Speed to Urban Environment

AFESP - Portuguese Association of Road Signs and Safety (*Associação Portuguesa de Sinalização e Segurança Rodoviária*)

ANSR - National Agency of Road Safety (*Agência Nacional de Segurança Rodoviária*)

CESUR - Center for Urban and Regional Systems

CML - Lisbon Municipal Council (*Câmara Municipal de Lisboa*)

ETSC – European Transport Safety Council

EU – European Union

ISPA – *Instituto Superior de Psicologia Aplicada*

IST – *Instituto Superior Técnico*

ITF – Internacional Transport Forum

JFSC - *Santo Condestável* Civil Parish (*Junta de Freguesia de Santo Condestável*)

OECD - Organisation for Economic Co-operation and Development

PSP - Public Security Police (*Polícia de Segurança Pública*)

STARS – Students Acting to Reduce Speed

UN – United Nations

WHO – World Health Organization

1 INTRODUCTION

ADapt Your Speed to the urban Environment project (ADYSE) is the Portuguese project developed under the framework of the STudents Acting to Reduce Speed project (STARS) an European project coordinated by European Transport Safety Council (ETSC), presented in Section 1.3. STARS´ main objective is to increase awareness towards the speed on the consequences of road accidents. Indeed, road users - both drivers and vulnerable ones - are not always sensitive to this issue and do not adopt appropriate behaviour to the circumstances. The project has been set as a competition between actions - either changes on the infrastructure or communication projects - developed across Europe by groups of young elements.

ADYSE involved the implementation of the first chicanes formed by staged parked vehicles on a traditional narrowed street neighbourhood in Lisbon with a strong communication emphasis.

The Portuguese Group, based in Lisbon, (Portugal) is a multidisciplinary team formed by Frederico Henriques and Joana Nogueira, whose scientific backgrounds are respectively engineering and psychology. The team believes that their complementary backgrounds benefited the necessary holistic approach to road safety subjects, including speed management, and contributed for the project to reach greater and more diverse audiences.

This report describes the design and implementation of ADYSE project: Section 1, describes the context of road safety in Portugal in reaction to that of the European Union with a focus on road safety inside urban areas as well as the presentation of the project aims and partners involved; in Section 2 is presented the intervention measure and its implementation site as well as key phases of the project; in Section 3 is carried out an in depth analysis on the effectiveness of the measures, including speed and road users' risk perceptions before and after analysis , as well as the presentation of actions carried out to promote ADYSE project and raise awareness about speeding consequences; finally a conclusive chapter is presented at Section 4.

1.1 Portuguese context

Notwithstanding progress of recent past - a reduction of 53% in the number of road deaths between 2001 and 2011 (Figure 1) - recent data (2011) shows that the number of road deaths in Portugal is still very high when compared with other European countries (Figure 2):

- Portugal road mortality – 74 deaths/million inhabitants;
- EU27 road mortality – 60 deaths/million inhabitants;
- United Kingdom road mortality (best performing European country) – 31 deaths/million inhabitants.

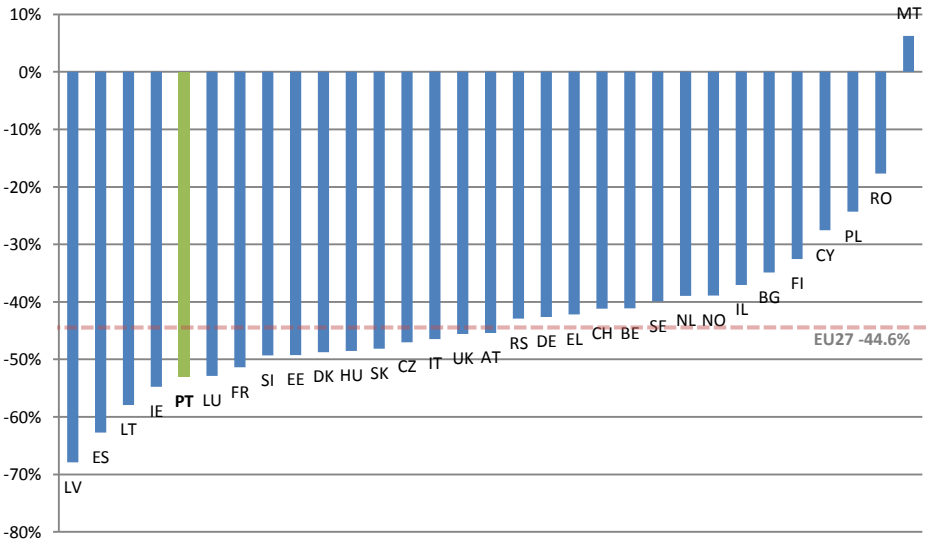

Figure 1 - Percentage change in road deaths between 2001 and 2011.
(ETSC, 2012)

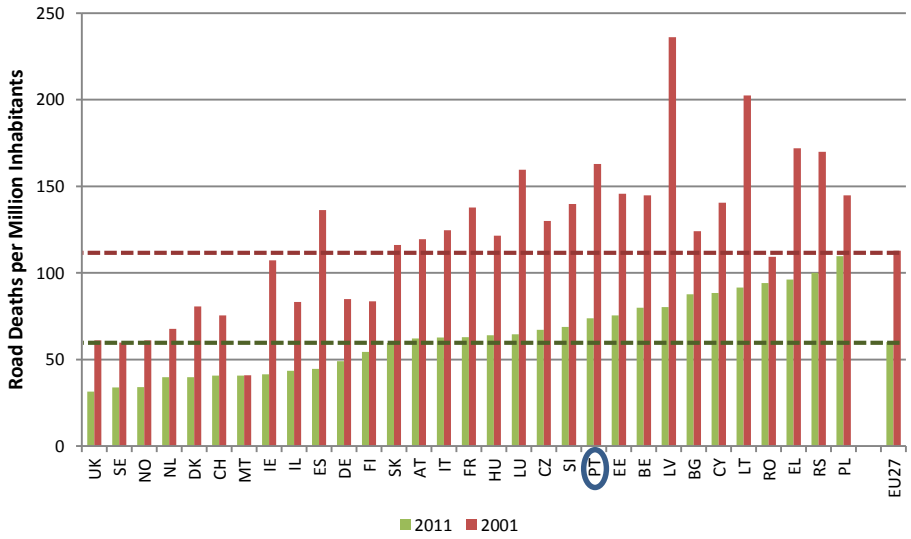

Figure 2 – Road deaths per million inhabitants in 2001 and 2011.
(ETSC, 2012)

The decrease in fatalities inside urban areas, however, progressed at a pace below the national average which suggests that the reduction in the overall road deaths in Portugal was to a great extent due to the recognized improvement of the road environment outside urban areas (ANSR, 2009), which involved building many kilometres of motorway which now carried for traffic previously on dual carriageway highways. Figure 3 shows percentage share of road deaths per road type at EU countries.

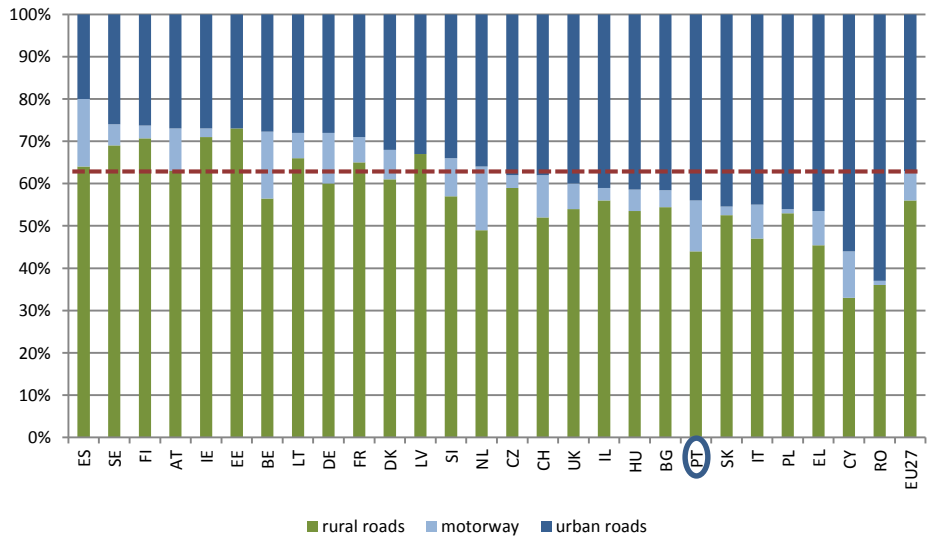

Figure 3 - Percentage share of road deaths per road type (2007-2009 average). (ETSC, 2011)

The National Agency of Road Safety (*Agência Nacional de Segurança Rodoviária* - ANSR) has recognized the need for more safety actions within urban areas. Indeed, its National Road Safety Strategy (ANSR, 2009) includes the following strategic and operational objectives:

- **STRATEGIC OBJECTIVE 4 – Fatalities in urban agglomerations**

  Reduction of the number of deaths amongst:

  - light vehicle. users of 32% to 49% ;
  - two-wheeled users, of 22% to 32% and;
  - pedestrians, of 15% to 32% .

- **OPERATIONAL OBJECTIVE 11 – Improve urban road environment**

  Promotion of the requalification of public urban areas, ensuring safe circulation for pedestrians and cyclists by reducing speed limits in critical areas.

The need for improving urban road safety in Portugal is also demonstrated by the comparison between road mortality of different European capital cities, as can be seen in Figure 4. In this ranking, Lisbon is ranked 17th amongst 25 European capitals, with 5.9 deaths *per* 100 000 inhabitants. Indeed, the average road mortality of the top 10 safest European capitals is about one third, 2.2 deaths *per* 100 000 inhabitants.

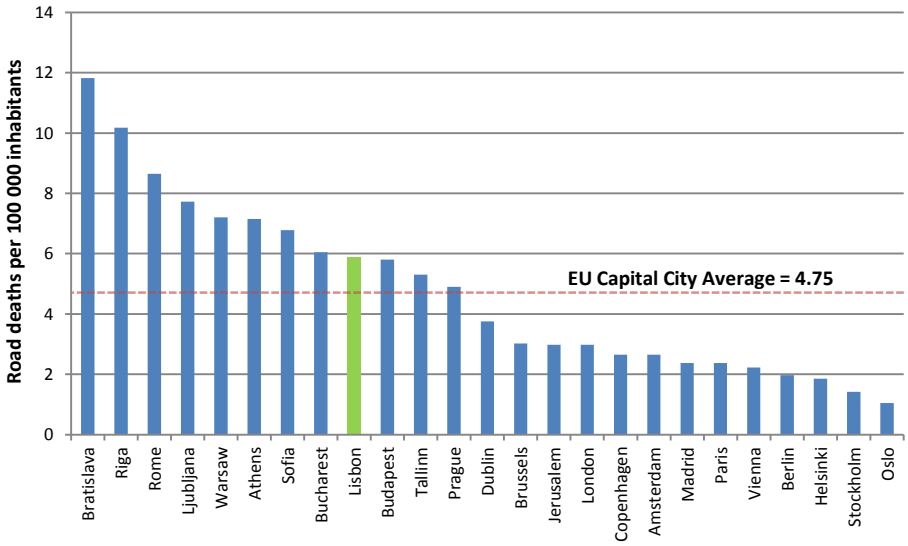

Figure 4 – Road deaths in capital cities per 100 000 resident capitals' population (2004-2007 average). (ETSC, 2009)

Table 1 presents the average number of fatalities (24-hours deaths[1]) as well as serious and slight injuries in Lisbon between 2004 and 2007. As can be seen, around two thirds of fatalities and serious injuries involve pedestrians.

	Deaths	Serious injuries	Slight injuries
Pedestrians (running over)	12 (63%)	121 (59%)	810 (45%)
Other collisions	7 (37%)	84 (41%)	982 (55%)

Table 1 - Number of fatalities (24-hours deaths), serious and slight injuries in Lisbon (2004-2007 average). Data collected from SACRA research project (IST-CESUR, 2011)

However, recent data (30-days deaths[2]) in Portugal indicates that the number of fatalities, particularly amongst pedestrians and inside urban areas, are substantially greater than considering 24 hours deaths. Indeed, data from 2010 and 2011, shows that the number of fatalities, considering 30-days deaths, is 42.4% greater inside urban areas, 74.3% greater for pedestrian users and 27.8% greater concerning all the collisions, which is twice the correction factor (+14%) used until now to estimate the number of 30-days deaths in Portugal (ANSR, 2012) (ANSR, 2011).

Moreover, concerns associated to road safety in the world have led to a number of initiatives, including United Nations' *Decade for Action on Road Safety*. Their aim is to raise of the profile of road safety amongst world leaders and includes: strengthening institutional and operational capacity to achieve national road safety objectives; improving the planning, design, construction and operation of road networks to ensure safety for all users; putting vulnerable

[1] Victim whose death occurs immediately after a collision or within 24 hours.

[2] Victim whose death occurs immediately after a collision or within 30 days.

road users, like pedestrians and cyclists, first in policy encouraging; improving emergency response and trauma care and; setting and enforcing effective speed limits.

Although ADYSE project (officially) is not part of the United Nations' *Decade for Action on Road Safety* its objectives aim to contribute in the same direction (Section 1.2).

1.2 Objectives

The aim of the STARS project is to contribute to increase awareness towards speed in road accident consequences. Within this context the Portuguese ADSYE project has defined one vision and two main short term objectives. Its vision is to implement simple cost effective speed management actions urban road in Portugal, including its capital, Lisbon. The immediate objectives are:

1) **Reduction of the speed in one particular street, *Rua Coelho da Rocha*,-in Lisbon**

   Through the implementation of infrastructure measures, chicanes, created through parking modes reconversion, this project aims at contributing to reduce the actual speed in the street, which in turns will contribute to increasing road users real and perceived safety, in particular, vulnerable road users (pedestrians). The chicane scheme aims at changing drivers' road perception and lead them to adapt their speed to the urban environment as it avoid excessive speed (Figure 5).

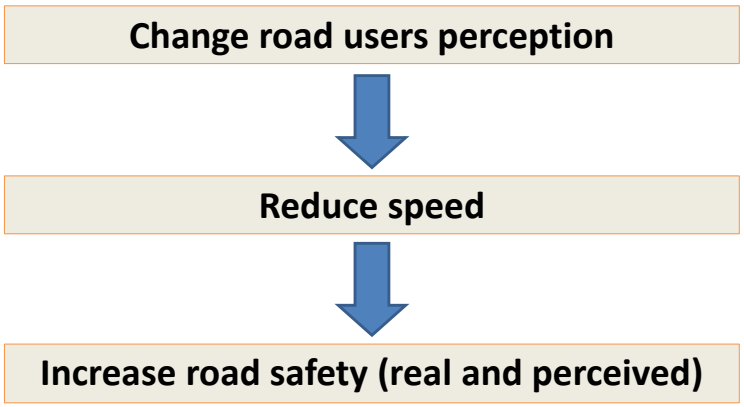

Figure 5 – Chicane scheme aim.

2) **Increase awareness to road safety issue in Portugal.**

   Through the implementation of this local action (one chicane scheme at Coelho da Rocha Street, Lisbon) in the extremely adverse current economic, political and social Portuguese context and with very limited outset resources, ADYSE project aims at that road safety measures can still be successful implemented. This will contribute to slowly change Portuguese institutional culture towards road safety projects and hopefully be a source of inspiration and optimism. Above all, ADYSE project aims at increasing awareness to the importance of road safety actions by reaching out to the greater public through the web, media, distribution of leaflets, presentations and publications and least but not last its value recognition by an European organisation like ETSC.

In the long-term, hopefully ADYSE project will have a real impact on the implementation of speed management policies and actions in other streets of Lisbon as well as in other Portuguese cities.

1.3 Partners

The implementation and success of ADYSE project depended on the commitment and the cooperation of many public and private partners whose roles are described in detail in Section 2. Partners' presentation as well as a brief description of their collaboration in the project is below:

- **ETSC - European Transport Safety Council**

  ETSC is a Brussels-based independent non-profit organisation dedicated to reducing the numbers of deaths and injuries in transport in Europe. Founded in 1993, ETSC presents itself as an impartial source of expert advice on transport safety matters to the European Commission, the European Parliament, and Member States. ETSC has contributed to this project by providing factual information through scientific road safety reports and a comprehensive list of best practice and transport safety research. ETSC provided guidance, support and inspiration to materialise the project, sharing tools and valuable advices over the STARS camp (Brussels, January-February 2012) and their visit to Lisbon (October 2012), and reliably remotely.

- **Sílvia Shrubsall, researcher at *Instituto Superior Técnico***

  Sílvia Shrubsall is a researcher at IST on transportation systems and road safety, Sílvia helped us from the project application to its implementation and has facilitated several institutional contacts as well as technical advices and suggestions.

- **AFESP - Portuguese Association of Road Signs and Safety (*Associação Portuguesa de Sinalização e Segurança Rodoviária*)**

  AFESP main aims are to protect its members´ interests as well as promoting and developing the signalisation sector in Portugal. This Association has had an active and systematic role in contributing to promoting road safety and liaising key individuals and organisations working in transportation problems in Portugal. Amongst its several activities, they promote an annual Conference and associated Journal with selected best applications and research developed nationally. The enthusiasm and key role played in the implementation of ADYSE, particularly through its President and Secretary-General, is another example of their key leading role in the country. AFESP is the sponsor of the project and guaranteed the material and human resources to implement the chicanes. Moreover, it is fair to say that its determination played a unique role in negotiating the political approval of the project.

- **TRAFIURBE - *Sinalização, Construção e Engenharia, S.A.***

  TRAFIURBE is a company of signalization and engineering associated with AFESP. It carried out the implementation of the chicane scheme.

- **CML - Lisbon Municipal Council (*Câmara Municipal de Lisboa*)**

  The Lisbon Municipal Council is the governing body of the municipality of Lisbon and its mission is to define and implement policies in its territory. The project was defined and implemented in close collaboration with CML since its implementation depended on the political and technical approval of CML.

- **JFSC - *Santo Condestável* Civil Parish (*Junta de Freguesia de Santo Condestável*)**

  In Portugal, Civil Parishes are a secondary local administrative unit and are subdivisions of a municipality. Lisbon is subdivided into 53 civil parishes with Coelho da Rocha Street being located at *Santo Condestável* Civil Parish. The political approval of ADYSE project was also done at this administrative level.

- **PSP - Public Security Police (*Polícia de Segurança Pública*)**

  PSP is a security force, uniformed and armed, with the nature of public service and endowed with administrative autonomy. PSP is responsible for ensuring the democratic legality; ensure internal security and the rights of citizens under the Constitution and the law. PSP collaboration was very valuable in measuring vehicles speeds in order to evaluate speed changes before and after the implementation of the chicanes.

2 SPEED MANAGEMENT PROJECT

In this section is described the location of the intervention (Section 2.1) as well as all phases of the decision process (Section 2.2) and the implementation of measures (Section 2.3).

Table 2 and Table 3 present the project planned and real timeline, respectively. There was a delay of around two months between the planned and real schedule which reasons are explained in Section 2.2. Given the current national circumstances, the innovation of the concept (for Portugal) and its potential political and social impact, the authors considers that delay is negligible and is extremely happy with its actual completion (often questioned in face of so many and diverse obstacles).

Activities	2012											2013
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Contact Sponsors & Partners												
Identify the intervention site												
Design the project												
Assess actual situation												
Middle term report												
ETSC visit												
Implement the project												
Assess future situation												
Data analysis												
Final report												

Table 2 – Project planned timeline after STARS Camp.

Activities	2012											2013
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Contact Sponsors & Partners												
Local Authorities decision												
Identify the intervention site												
Design the project												
Assess actual situation												
Middle term report												
ETSC visit												
Implement the project												
Assess future situation												
Data analysis												
Final report												

Table 3 – Project real timeline.

2.1 Description of the location

In the STARS project application phase, the choice of *Coelho da Rocha* Street as the location of the project was based on authors' empirical knowledge of speeding in that street as well as on informal surveys with local people who had the perception that some drivers were speeding even if they were driving at 50km/h (the legal speed limit). These perceptions conveyed the message that people considered that the 50km/h limit is unsafe for that urban environment. This was later complemented with real accident data, as described below.

The chosen street - section of *Coelho da Rocha* Street between *Ferreira Borges* Street and *Silva Carvalho* Street - is located in the city of Lisbon (*Santo Condestável* Civil Parish) at *Campo de Ourique* neighbourhood (see Figure 6).

Figure 6 – Location of *Coelho da Rocha* Street.
Source: Google Maps

Campo de Ourique is an old residential and commercial neighbourhood and its urban characteristics, particularly the street commerce, generate high travel demand for all the transport modes and high parking pressure, even though it is paid. These mobility and urban characteristics cause many conflicts between pedestrians and road traffic as road accident data collected within the context of the SACRA research project shows (Figure 7). In addition, at the selected street section there were three running overs between 2004 to 2007.

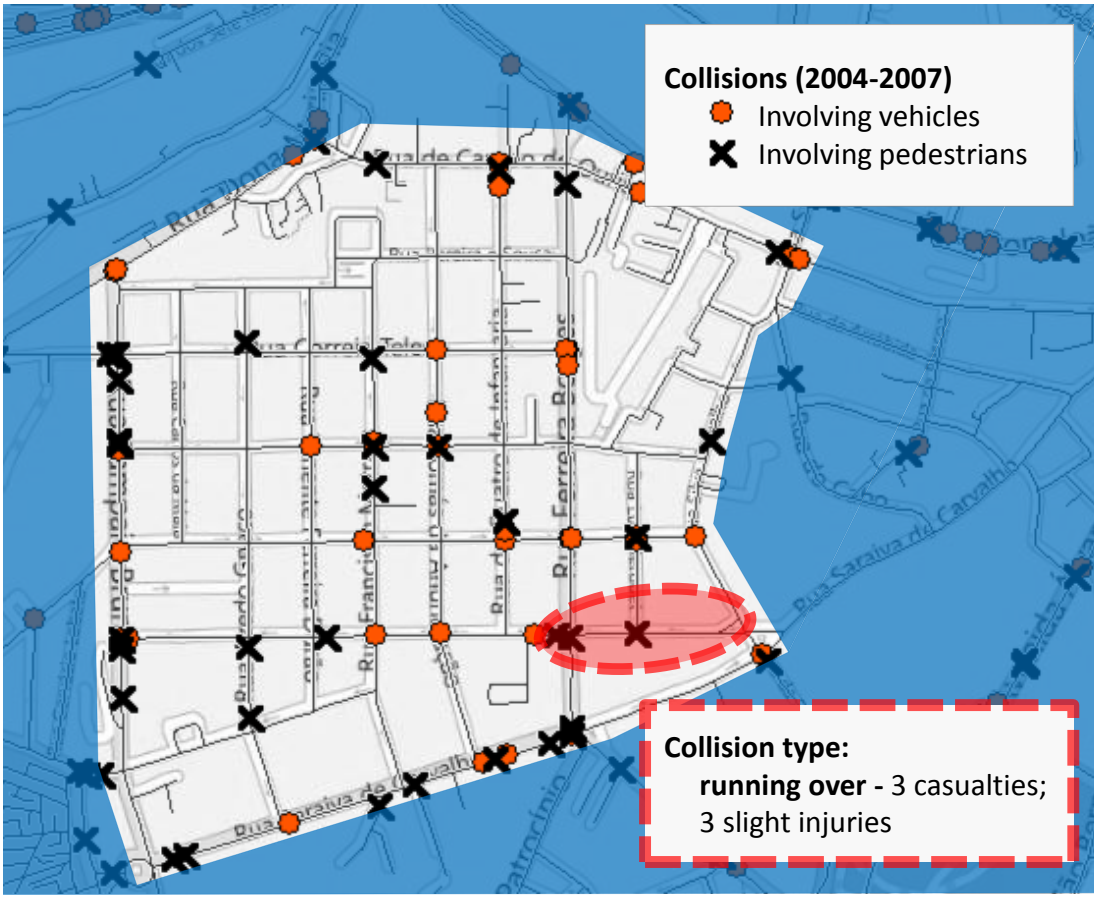

Figure 7 – *Campo de Ourique* neighbourhood's accidentology between 2004 and 2007.
Data collected from SACRA research project (IST-CESUR, 2011)

Below are described some of the main characteristics of the selected street section prior to the ADYSE project:

- is one of the entries in *Campo de Ourique* neighbourhood;
- belongs to a mixed residential and commerce street and has one small but important Lisbon museum (*Casa Fernando Pessoa*) increasing the high parking pressure, There are schools and parks nearby;
- is a one way street belonging to a orthogonal network which is prone to favouring confidence and speeding (Figure 7 and Figure 8). The selected section is about 180 meters long;
- the buildings are between 4 and 5 floors high (Figure 8). They were built in the beginning of the 20th century and as a default do not have garages;
- the speed limit is 50 km/h;
- there were car parking spaces in both sides of the street: angled parking on the South side and longitudinal parking on the North side (Figure 8 and Figure 9, respectively);
- there were no pedestrian crossings along the street section (Figure 9) therefore, pedestrians often cross the street out without any protection (Figure 11);
- there was no pedestrian crossing at the beginning of the street creating an unsafe situation for these vulnerable road users (Figure 9 and Figure 10);
- there was no parking space for motorcycles and these frequently parked on the pedestrian paths (Figure 12).

Figure 8 – Picture from the beginning of the selected street section (before intervention).

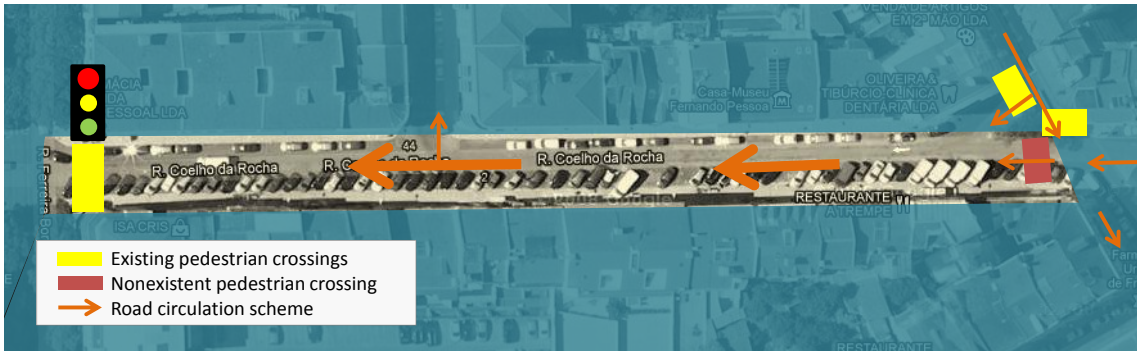

Figure 9 – Road circulation scheme and pedestrian crossings localization (before intervention).
Source: Google Maps

Figure 10 – Picture of "non-existent pedestrian crossing" (before intervention).
(see its location at Figure 9)

Figure 11 – Picture of pedestrian crossing the street out of the pedestrian crossing (before intervention).

Figure 12 – Picture of motorcycles parked on the sidewalk (before intervention).

2.2 Key phases of the project implementation

This section describes the main steps of the project are described: from its application phase, followed by selection and implementation of technical and non-technical aspects, including decisional stages.

2.2.1 STARS project application

ETSC lecture by Ilyas Daoud at IST, Lisbon, on 10th October 2011, about the STARS project inviting the creation of working groups and presentation of ideas was followed by the preparation of an application and subsequent selection of ADYSE.

The idea for ADYSE was developed on the basis of knowledge about the Portuguese problems regarding urban road safety. Two further points were considered important to pursue:

1. to implement an infrastructure measure in one public busy street to increase its visibility and promote the liaison between different actors with responsibility in road safety. Awareness towards the increased difficulty posed by of this requirement was recognised from the outset;
2. to choose a speed management measure that, although maybe common in other countries, was innovative in Portugal to stimulate receptivity to diversity.

To complete the application the next steps were to identify:

1. a suitable location – *Coelho da Rocha* Street in Lisbon, see Section 2.1 and;
2. an appropriated speed management measure to that location – implementation of a chicane scheme created by allowing alternatively different parking mode on both sides of the street, see Section 2.3.1. The team is not aware of any other application of this measure in Portugal.

2.2.2 STARS camp

ADYSE project was one of eleven applications selected by the ETSC to be implemented and the following phase was the STARS camp. This camp, for all the members of the eleven teams, was held in Brussels between 31th January and 4th February 2012.

The STARS camp comprise lectures on a wide range of themes related to speed and its management by guest speakers coming from a variety of backgrounds (academia, industry, civil service, international institutions, the police and NGOs), as well as the opportunity to meet all the teams and learn about their projects and deepen the understanding on the ETSC work.

The presentation of the ADYSE project to a panel of road safety experts was an excellent opportunity to exchange ideas and hear their recommendations for its successful implementation.

Back to Lisbon the three main initial tasks were:

1) engage a sponsor to implement the selected measure;
2) present and get permission from the local authorities to change the street environment and;
3) identify, make available and plan for the require resources, including speed, noise and air emissions measurement equipment.

2.2.3 Engaging a Sponsor

After the results of ADYSE selection were announced and before STARS camp Sílvia Shrubsall (IST) held a meeting with Nuno Balula, the President of Portuguese Association of Road Signs and Safety (AFESP), and briefly presented the STARS/ADYSE project securing the partnership for the funding of the ADYSE project implementation. Indeed, AFESP statutes include "the promotion and development of the road signs industry, road signs standardization and product certification, and contribution for the reduction of collisions, in achieving the public interest in

road safety". In this meeting, it was agreed that the authors would subsequently make a formal documented presentation of ADYSE project, preferably after the STARS camp to benefit from the knowledge meanwhile generated on which would be defined in detail the partnership with AFESP.

Subsequent to the STARS camp the authors met Ana Raposo, AFESP Secretary-General, on 17th February 2012, in which the project was detailed. AFESP reiterated their interest in supporting the project and after they analysed and reviewed it, formalised their sponsorship to ADYSE project on 22nd February. AFESP participated in key meeting with other partners.

AFESP has had an important role in promoting road safety in Portugal (Section 1.3), as it was reflected by the prompt and enthusiastic support to ADYSE, as part of their stated mission. This would, however, be hardly as effective without the full commitment demonstrated by their high management. Also, AFESP invited the authors to present ADYSE project at the 4th AFESP Conference on "Signalling and Road Safety" that would take place in the city of Faro in October 2012, however this presentation did not happen due to delays in the project implementation.

2.2.4 Liaising with Local Authorities

Prior to ADYSE application, an initial contact was established with the Local Authority of Lisbon (CML) to assess their acceptance to the project. This initial interaction was greatly facilitated by Fernando Nunes da Silva, who is a Full Professor at IST currently on leave as the elected Lisbon's mobility councilman. Fernando Nunes da Silva, on behalf of CML, immediately demonstrated interest in supporting the implementation of the project and the members of his staff have since been supportive as well. However it was clear from the outset that no funding would be available from the CML for project implementation. Moreover, ADYSE project was considered to be integrated into existing plans for implementing 30 zones within *Campo de Ourique* neighbourhood. Unfortunately, due to the Portuguese financial situation, 30 zones plan has not yet been implemented.

Despite the initial enthusiasm, the authors were aware that the actual implementation of the project was highly depend on the existence of a private sponsor. So, the early sponsorship from AFESP (Section 2.2.3) was truly helpful to initiate the formal contacts with CML.

On 2nd March 2012 the team had a meeting with João Sabino, CML's Director of Transportation and Mobility Planning Department, and António Alfaro Martins, CML's Chief of Road Planning and Mobility Division, in which Sílvia Shrubsall (IST) and Ana Raposo (AFESP) also attended. This meeting was the formal project presentation to CML and its representatives showed interest in supporting ADYSE, although they had to analyse its implications regarding the existing *Campo de Ourique*'s 30 zones plans.

On 24th April, CML informed the team that, conditioned by *Santo Condestável* Civil Parish (JFSC) approval, they were ready to formally support the project. Internal institutional politics associated with local elections in 2013 led to an extremely lengthy - over three months - networking persistent efforts just to schedule a meeting. This meeting took place on 27th July and involved about 15 persons: Pedro Cegonho (President of JFSC) and the other JFSC's executive members, Ana Raposo (AFESP), Fernando Nunes da Silva (CML), António Alfaro Martins (CML) and other staff from his division and Sílvia Shrubsall, beside the authors. Partners lend a big support and enthusiasm to the meeting, despite its non-conclusive finish.

JFSC's reluctance concerning the implementation of chicanes in *Coelho da Rocha* Street was mainly due to the following aspects;

- a decrease in the number of parking spaces wouldn't be approved by JFSC;
- citizens wouldn't like the changes;
- the street needs pavement rehabilitation" (Figure 13).

On 3rd October, after one solution have been presented for each condition, and a long analysis and thinking period, JFSC finally approved followed by CML accepting to carry out the paving works at the intervention site.

Figure 13 – Picture of pavement condition (before intervention).

Between mid-June and October, and given the lack of response from the JFSC, the choice of another location in Lisbon to implement a speed management project was considered. However, various factors including time and expectations management discouraged this course. The length and the number of obstacles faced by the project preparation did pose real risk of losing important previous support, including from AFESP which had the expected to implement the project in August.

2.2.5 Gathering required equipment for measures assessment

Another key non easily accomplishable task for the project required was assembling equipment to speed measurement, noise and air emissions.

Once the required equipment was identified, various attempts to borrow it started in early February 2012 in various scientific centres of IST. However, only the equipment for measuring speed has been ensured.

Meanwhile, and due to the uncertainties regarding the implementation of the project (due to local authorities approval, see Section 2.2.4) the group decided not to search more partners that could loan the noise and gas emissions equipments because there was no sure regarding

the authorization of project implementation. Therefore, assessment was limited to speed and road users risk perceptions evaluation.

In August, the group faced another problem: the IST speed measuring equipment was broken. So, ETSC was contacted hoping that they could loan one, however ETSC has no speed measuring equipment and has suggested the group to contact local police.

Lisbon have two polices - Municipal Police of Lisbon (PML) and Public Security Police (PSP) - but only PSP showed availability to cooperate in ADYSE project.

A couple of meetings took place with the Lisbon traffic division of PSP (on 20th September) and with the Public Relations National Office of PSP (on 27th September), where ADYSE project was formally presented to PSP as well as the request for partnership. On 15th October PSP communicated that they will support ADYSE project in terms of speed measurement and the pre-intervention speed measurement was scheduled for 31st October.

2.2.6 ETSC Mid-term Visit

ETSC mid-term visit, by Ilyas Daoud, occurred on 19th October 2012. It was scheduled in August and then there was the expectation that infrastructural measures were already implemented on mid-October. However, it was not implemented neither pre-intervention assessment had been carried out. Nevertheless, Ilyas Daoud had the opportunity to visit the site as well as feedback on some project details, technical and non-technical ones, including the key phases of decision process and the assessment methodology.

2.2.7 Pavement works

As mentioned, CML notified the team on 3rd October 2012about their approval support to ADYSE project and defined that the paving works would be carried out on the second half of October. However, these works were successively and unilaterally postponed by CML until December.

On 5th December the paving works started and, after a few interruptions due to adverse weather conditions, they were concluded on 12th December. So, finally the measure implementation could be carried out (Figure 14).

Figure 14 – Pictures of paving works.

2.3 The implementation of the measure – a chicane in *Coelho da Rocha* Street, Lisbon

2.3.1 The development of the concept

From its outset, the project main aim consisted on implementing a traffic calming measure in one Portuguese urban environment. The selected measure was a series of chicanes: the idea is to take advantage of the high parking demand in the street to implement chicanes through the reconversion of parking modes parking, *i.e.*, alternate angle parking with parallel parking among both sides of the street as can be seen in Figure 15.

The aim of the deflections created by the chicane scheme is to contribute to reduce vehicles effective speed by changing drivers' road perception.

Changing the speed limit to 30 km/h by including this measure into existing plans for implementing 30 zones within *Campo de Ourique* neighbourhood was also considered. However, as previously was said CML's 30 zones plans were suspended during 2012 (Section 2.2.4), and this further function of the ADYSE measure in *Coelho da Rocha* Street will be utilize when the 30 km/h plan are materialised.

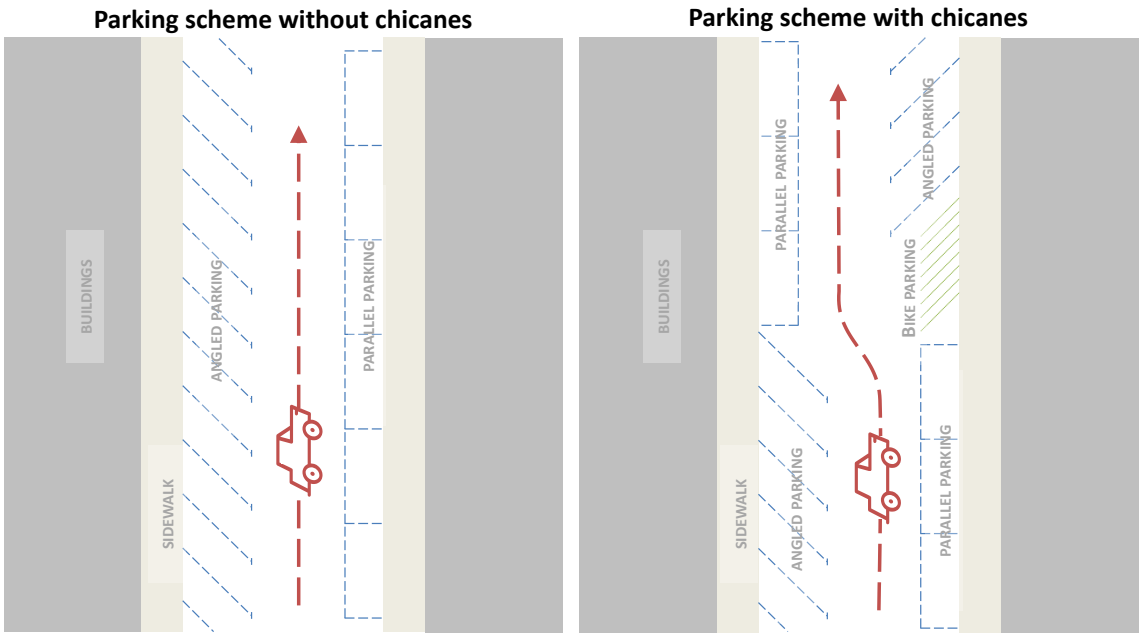

Figure 15 – Parking scheme with and without chicanes

Moreover, further issues identified in the characterization of intervention site (Section 2.1) were targeted by designing the new street layout taking into account:

- implementation of a pedestrian crossing at the beginning of the street (situation before the intervention: Figure 9 and Figure 10);
- creation of parking spaces for motorcycles to avoid motorcycles' illegal parking on the sidewalks (situation before the intervention: Figure 12).

These "extra-chicanes" components aim at contributing to increase the safety of pedestrians as well as promoting the use of more sustainable modes of transport (bicycles and motorcycles).

For the implementation of the measure, the following materials were required:

1. vertical barriers (Figure 16);
2. paint for parking lines (thermoplastic paint and acrylic paint; acrylic paint was used for temporary paintings, see Section 2.3.2);
3. paint for pedestrians crosses (thermoplastic paint).

Figure 16 – Example of vertical barrier.

These materials were provided by AFESP as well as the labour. The work was done by TRAFIURBE, one of AFESP associated (Section 1.3). The total cost of this intervention was 2.040€.

The design of the chicane scheme had several versions because initial versions reduced the number of public parking spaces in 1 or 2 spaces. In order that local authorities approve the project (Section 2.2.4) it was necessary to find other solutions and articulate the deflection points of the chicane with the location of buildings garages. In Table 4 is presented the number of parking spaces before and after intervention.

	Before	After
Public parking spaces	64	64
Parking spaces for motorcycles	0	1 **
Parking spaces for disabled people	1	1
Loading/unloading parking spaces	2	2
Local authorities reserved parking spaces	2	2
Parking spaces for ambulances	1	0 *

* the need for this parking space does not already exist

** this parking space allows to park several motorbikes

Table 4 - Number of parking spaces before and after intervention.

In Figure 17 is presented the blueprint of *Coelho da Rocha* Street before and after intervention with indication of the changes carried out.

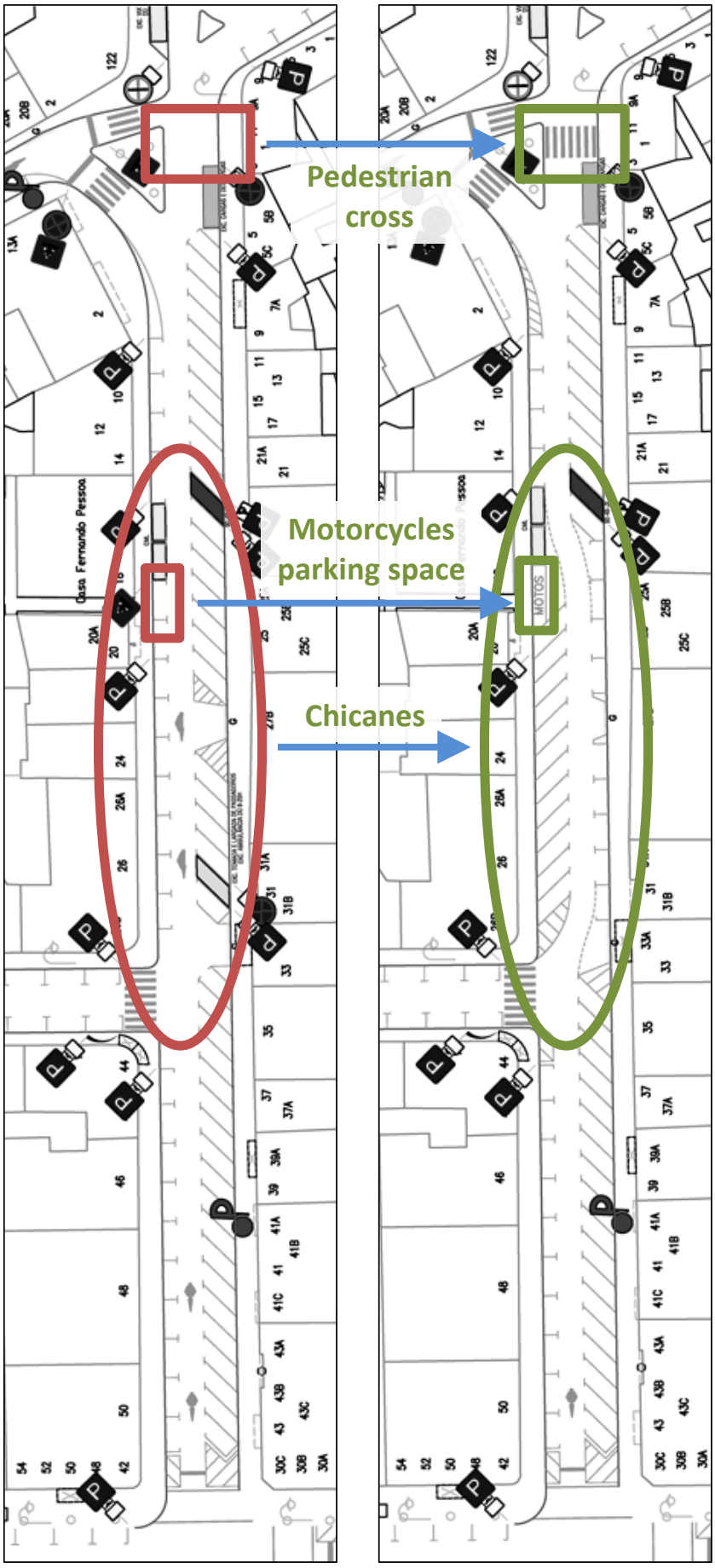

Figure 17 – Blueprint of *Coelho da Rocha* Street (before and after intervention)

2.3.2 The road works

As previously was described (Section 2.2), the start of the implementation of measures developed under ADYSE project was dependent on the conclusion of paving works. Paving works started on 5th December 2012 and last longer than expected due to adverse weather conditions which caused dissatisfaction among residents and traders since the street was closed to traffic for a longer time than expected and just before Christmas.

The time required to TRAFIRUBE perform the works under the ADYSE project was estimated in eight hours of good dry weather conditions.

On 11th December, due to growing dissatisfaction from street users regarding the street to be closed for so many days and bad weather forecast for the next couple of days, TRAFIURBE started and finished the implementation of ADYSE project simultaneously with the paving works on the section of the street where paving works had already been completed.

The paving works finished at noon on 12th December and the street remained closed to traffic so the painting works could be finished. On that afternoon when TRAFIURBE was going to complete the works it started to rain. In collaboration with local authorities it was decided to retain the street closure until the next day hoping that the weather conditions would improve.

On 13th December the weather conditions had not improved and weather forecasts for the next days were unfavourable while complaints about the inconveniences caused by street closure were increasing. Thus, and even without having completed the markings in the pavement, CML ordered for the street to be reopened to traffic. At this time, there were no reliable expectation on favourable weather conditions to complete the intervention and the team decided to cancel the speed measuring with PSP which had been scheduled for 18th December.

Finally, on 21st December the weather conditions had improved and TRAFIURBE was able to finish the intervention: chicane marking and organize parking and circulation. Once the pavement was not thoroughly dried, a temporary paint (acrylic paint) was used to finish the work.

Due to adverse weather conditions thermoplastic paint parking marks and the identification of motorcycle parking space (word “MOTOS” written on the pavement) as well as the placement of vertical barriers in the parking modes change locals and in motorcycle parking space delimitation are due to be carried out soon.

Presented below are some pictures of works done.

Figure 18 – Picture of the works being carried out (1).

Figure 19 - Picture of the works being carried out (2).

Figure 20 – Picture of the works being carried out (3).

Figure 21 – Picture of the finished works (1).

Figure 22 – Picture of the finished works (2).

Figure 23 – Picture of the finished works (3).

Figure 24 – Picture of the finished works (4).

Figure 25 – Picture of the finished works (5).

Figure 26 – Picture of the finished works (6).

Figure 27 – Picture of the finished works (7).

Figure 28 – Picture of the finished works (8).

3 PROJECT IMPACT

3.1 Effectiveness of Measures

The methodology initially proposed for assessing the impact of chicanes included a wide range of indicators for each three main categories, as listed below:

1. **Traffic:**
    a. Traffic demand (count);
    b. Pedestrian crossings (count); and
    c. Speed (measurement);
2. **Risk perceptions of:**
    a. Pedestrians;
    b. Drivers; and
    c. Traders;
3. **Environment:**
    a. Noise level; and
    b. Gas emissions.

However, resources needed to carry out all these evaluations were impossible to gather within the time available for the project, for a couple of reasons:

- pedestrian crossings - lack of human resources to count pedestrian crossings along the whole street; and
- noise level and a gas emissions - equipment was not made available although non-successful attempts of partnerships were carried out .

Consequently this part of the work focused a sub set of indicators which were evaluated before and after the implementation of measures, specifically:

1. **Traffic:**
    a. Traffic demand;
    b. Speed;
2. **Risk perceptions of:**
    a. Pedestrians;
    b. Drivers;
    c. Traders;

Nevertheless these two indicators allow the assessment of self-reported and actual road users' behaviour, as an indication of speed risk perception and actual speed.

In order to make this assessment more accurate there was also the intention to identify a control site where evaluation would also be conducted, before and after the intervention. Due to the delay in the local authorities' approval for project implementation and the need to act quickly when the project was approved, as well as to respect the deadline of STARS project, the evaluation using a control site is suggested as further work.

3.1.1 Speed Measurements

Speed measurements were run with the support of PSP (the police force, Section 2.2.5). These measurements were done by an uncharacterized police vehicle with a radar[3] (Figure 29) with the supervision of a police officer. The speed readings of each vehicle had to be handwritten as it was not possible to download the data from the radar computer. The combination of this aspect with PSP availability for prolonged measurements (e.g.: 24 hours) conditioned its duration and it was decided to perform each measurement assessment (pre and post intervention) in the following time periods: 9:30-12:30 and 14:30-17:30 of a working day.

Figure 29 – Uncharacterized police vehicle with radar.

Although it had been suggested by the ETSC to conduct two post-intervention measurements, one immediately after the intervention and another about three weeks after the intervention, it was not possible to carry out the speed measurements immediately after intervention due to time restrictions:

a) the uncertainty of the date on which the implementation of chicane would be finished, due to weather conditions which had already forced to cancel assessment with PSP on 18th December 2012 (Section 2.3.2);

[3] the radar used has a measurement range between 10 and 250 km/h and an error of ±5%.

b) the need to schedule in advance with PSP the day in which would take place measurements, so PSP could coordinate ADYSE partnership with the normal course of its enforcement actions and;
c) the fact that the intervention was completed just before Christmas (Friday, 21st December 2012) and PSP would only have operational availability from the second week of January.

Thus, there were two speed measurements: one before the implementation of chicane (and before the repaving of the street) and another about three weeks after the implementation of chicane:

1. Pre-intervention assessment: Tuesday, 30th October 2012;
2. Post-intervention assessment: Friday, 11th January 2013.

Below, are identified some conditions for the days when measurements were carried out:

1. **Pre intervention conditions:**
    a. Weather - rainy day;
    b. Pavement - in need of rehabilitation (Figure 13); wet;
    c. Traffic - traffic jam in the afternoon period due to streets closures near the intervention site because of a protest in the Portuguese parliament; and
    d. Number of vehicles monitored: 1735.
2. **Post-intervention conditions:**
    a. Weather – dry cloudy day;
    b. Pavement - pavement had been recently upgraded (Figure 26); dry;
    c. Traffic - normal traffic conditions;
    d. Number of vehicles monitored: 1784.

Figure 30 presents the location of the speed control section, before and after the intervention.

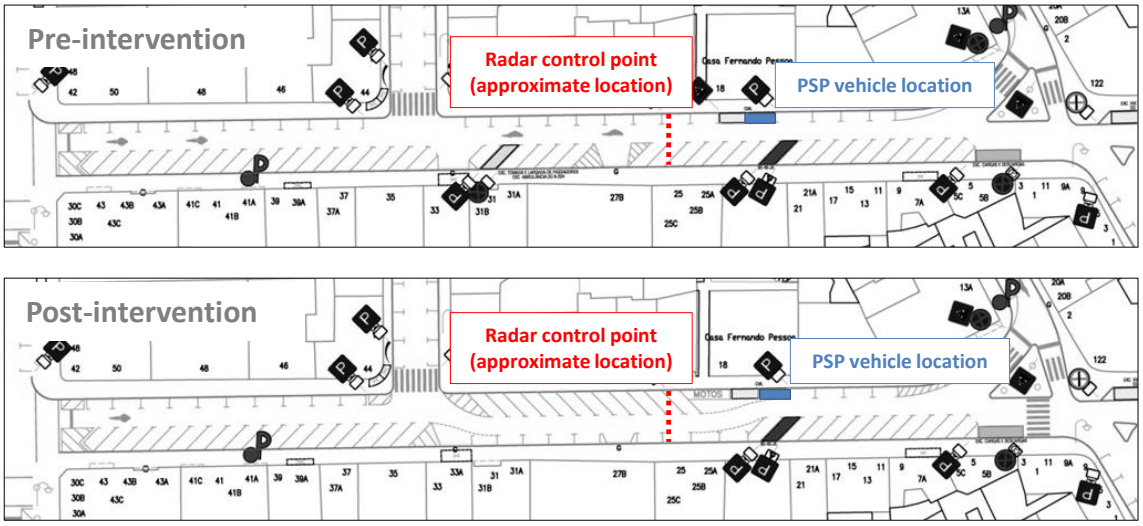

Figure 30 – Speed measurement location.

As can be seen in Table 5, comparing the measurements before and after the intervention, there was a decrease of 6.4% (-3.0 km/h) in maximum measured speed, a 9.4% (-3.0 km/h) decrease in V_{85} and a decrease of 3.8% in average speed (-0.9km/h).

Speed (km/h)	Pre intervention	Post intervention	Differences	
			%	abs.
Max	47	44	-6.4%	-3.0
Min	10	10	0.0%	0.0
Ave	23.5	22.6	-3.8%	-0.9
V_{85}	32	29	-9.4%	-3.0

Table 5 - Summary of speed measurements (maximum, minimum, average and V_{85}).

Furthermore, Figure 31 and Table 6 shows that the frequency of drivers driving above 30km/h has decreased. Indeed, there are statistically significant differences ($\chi^2(1) = 104.93, p<0.05$) between the number of drivers driving below and above 30km/h, before and after the chicanes implementation, which increases after its implementation.

Although it is not possible to demonstrate, it is suggested that the reason for the higher frequency of drivers in classes below 15km/h on pre-intervention results is related to the traffic conditions on that day - traffic jam in the afternoon period due to streets closures near the intervention site.

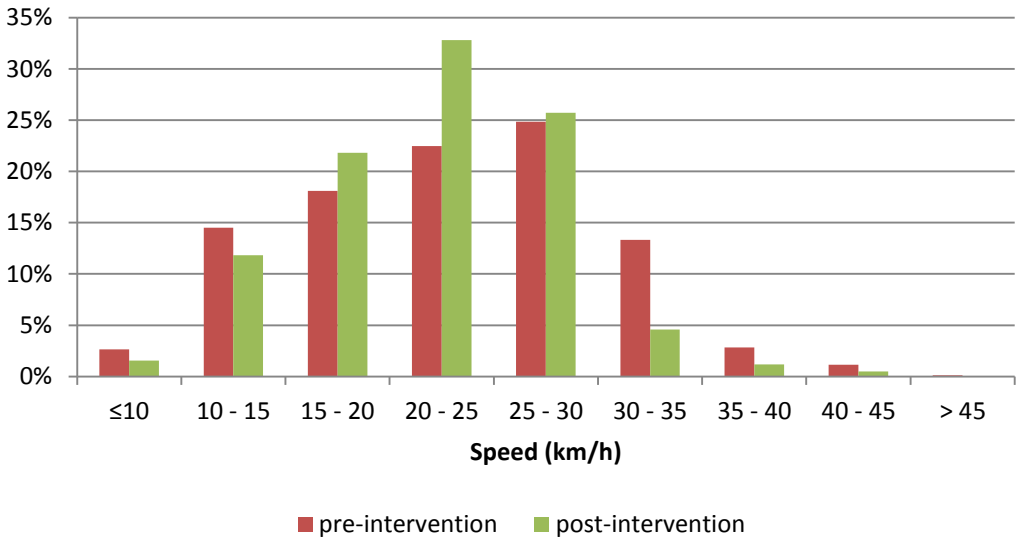

Figure 31 - Percentage of drivers *per* speed ranges.

Speed (km/h)	Pre-intervention	Post-intervention
≤10	2.7%	1.6%
10 - 15	14.5%	11.8%
15 - 20	18.1%	21.8%
20 - 25	22.5%	32.8%
25 - 30	24.8%	25.7%
30 - 35	13.3%	4.6%
35 - 40	2.8%	1.2%
40 - 45	1.2%	0.5%
> 45	0.1%	0.0%

Table 6 - Percentage of drivers *per* speed ranges.

The chart on Figure 32 presents the cumulative frequency of driving speeds before and after implementation and the findings of its analysis are similar to the findings on the previous chart.

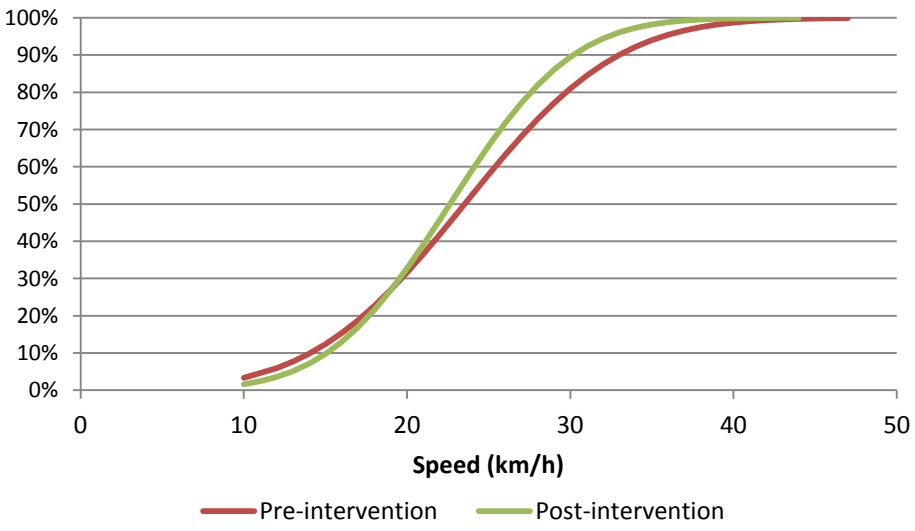

Figure 32 - Cumulative frequency of driving speeds.

Table 7 presents the average speed and traffic demand *per* time periods on both assessment days.

Time period	Pre-intervention		Post-intervention		Pre and post-intervention differences			
					Average speed		Traffic demand	
	Average speed (km/h)	Traffic demand (vehicles)	Average speed (km/h)	Traffic demand (vehicles)	abs.	%	abs.	%
09:30-10:00	25.3	144	23.9	140	-1.4	-5.6%	-4	-2.8%
10:00-10:30	25.4	129	23.4	130	-1.9	-7.6%	1	0.8%
10:30-11:00	23.3	130	23.6	105	0.3	1.5%	-25	-19.2%
11:00-11:30	22.9	123	23.1	145	0.2	1.0%	22	17.9%
11:30-12:00	24.6	126	22.8	111	-1.7	-7.1%	-15	-11.9%
12:00-12:30	21.7	126	23.6	140	1.8	8.5%	14	11.1%
09:30-12:30	**23.9**	**778**	**23.4**	**771**	**-0.5**	**-2.0%**	**-7**	**-0.9%**
14:30-15:00	24.7	96	23.3	134	-1.4	-5.5%	38	39.6%
15:00-15:30	24.0	160	19.7	146	-4.3	-17.9%	-14	-8.8%
15:30-16:00	23.0	185	22.8	128	-0.2	-0.8%	-57	-30.8%
16:00-16:30	22.0	159	21.8	188	-0.2	-1.0%	29	18.2%
16:30-17:00	22.0	174	23.3	202	1.3	5.9%	28	16.1%
17:00-17:30	24.2	183	21.3	215	-2.9	-12.0%	32	17.5%
14:30-17:30	**23.2**	**957**	**22.0**	**1013**	**-1.2**	**-5.2%**	**56**	**5.9%**
Total	**23.5**	**1735**	**22.6**	**1784**	**-0.9**	**-3.8%**	**49**	**2.8%**

Table 7 – Average speed and traffic demand per time periods.

Although the duration of speed measurements (6 hours) was not as long as required to perform more reliable analysis, there are statistically significant differences in the speed reduction after the implementation of chicanes. Moreover, the authors believe that the impact of the implementation of the chicanes in the speed reduction was greater than the analyses above shows. The reason for this statement is because there were different conditions (weather, pavement and traffic), besides the implementation of the chicane, between before and after situation, and all of these conditions may have contributed to lower speeds in the assessment of the situation before the intervention.

Furthermore, the implemented measure has contributed to reduce pedestrians and cyclists' fatality risk, as Figure 33 shows, once the frequency of drivers driving above 30km/h has decreased in 63%, representing only 6.3% of the driving speeds in the post-implementation assessment (Table 6).

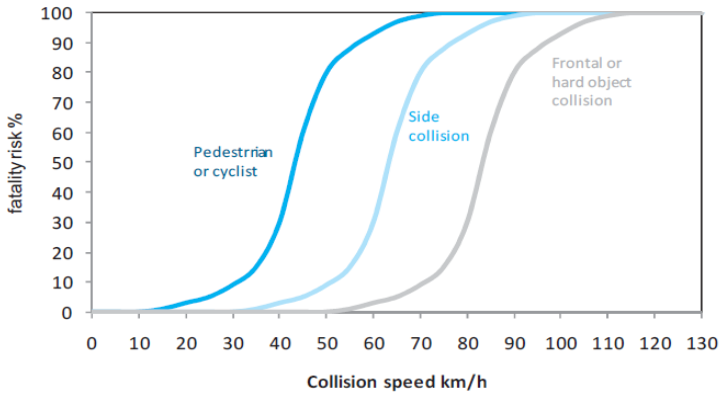

Figure 33 – Fatality risk.
(OECD and ITF, 2008)

3.1.2 Risk Perceptions

One key reason to introduce the risk perceptions' analysis in the ADYSE project assessment methodology was because it is considered the dominant method to understand road users' behaviour is self-reported (Wahlberg, 2009).

The work developed by Wilde (1994) indicates that people are able to subjectively accept an estimated degree of risk for their health and safety that drift from three different sources: (1) past experiences, (2) the estimated potential of the possibility of an accident and (3) their self-confidence on the ability of making decisions and controlling the vehicle in order to face the situation.

It has long been established in the road safety community, that the process of driving is determined by a multitude of variable options that surface associated with three elements of road traffic: the vehicle, the driver and the environment (Elvik, 2005). Various studies in different countries indicate that even though all of the above factors contribute in an overwhelming way to a safe driving, the human element presents itself as the most important risk factor in driving. Different peer reviewed journals have shown that road users behaviours is not homogenously represented across age, gender, experience and culture (Musselwhite, et al., 2010) (Holland & Hill, 2007).

The data collection to monitor the effectiveness of the intervention regarding risk and speed perception was done by questionnaires. The questionnaires were designed based on existing studies (Thielmen, et al., 2008) and on specifies of ADYSE project. *Coelho da Rocha* Street, where the chicanes were implemented, is mixed residential and commerce street (Section 2.1), so questionnaires targeted three types street users: drivers, pedestrians and traders. This option was taken in order to evaluate different perception angles and thus increase analysis accuracy: it was related to the fact that pedestrians are the most vulnerable users; drivers are the ones controlling the driving speed and; traders are the ones who have a historical perspective of events and behaviours of other users.

Risk and speed perception assessments were also performed at two different moments: before and after the intervention. Lessons learned from pre-intervention questionnaires' led to changes into the post-intervention questionnaire in following issues:

- Length, *i.e.*, the questionnaire was too long and it was difficult to obtain a representative sample; and
- Aim, specifically, the aim of first assessment was to characterize the population and in the second one it was to understand how people compare their risk perception between the previous and current situation on that specific street.

The questionnaires were applied on the following dates:

- Pre-intervention: 30th and 31st October 2012;
- Post-intervention: 10th, 11thand 15th January 2013.

Annex A presents the questionnaires, pre and post-implementation for drivers, pedestrians and traders. Below there are some analysis of the surveys' results.

On both assessments, a total of 143 surveys were done (average road user age: 43.9 years old; 62% male; 38% female):

1. Pre-evaluation - 73 subjects (average age: 43.3 years old;62% male; 38% female)
    a. Drivers: 29 (average age: 41.1 years old; 66% male; 34% female; average driving license time: 19.6 years);
    b. Pedestrians: 34 (average age: 45.2 years old;62% male; 38% female);
    c. Traders: 10 (average age: 43.0 years old;50% male; 50% female);
2. Post-evaluation - 70 subjects (average age: 44.6 years old; 63% male; 37% female)
    a. Drivers: 30 (average age: 40.8 years old;67% male; 37% female; average driving license time: 20.5 years);
    b. Pedestrians: 30 (average age: 50.1 years old;60% male; 40% female);
    c. Traders: 10 (average age: 39.6 years old;60% male; 40% female);

Figure 34 presents street users answers about their perception of *Coelho da Rocha* Street safety (pre-intervention evaluation). Only 30% of traders considered this street to be safe while a majority of them considered the opposite. Drivers' answers show the same trend, 38% considered it safe and 72% did not, whilst amongst pedestrians the perception seems to be more optimistic as 53% considered the street to be safe. Although, there are no statistically significant differences between the three street users types ($\chi^2(2) = 2.33, p<0.05$). Overall, the majority of street users (56%) considered the street as unsafe while the rest (44%) regards the street as a safe one.

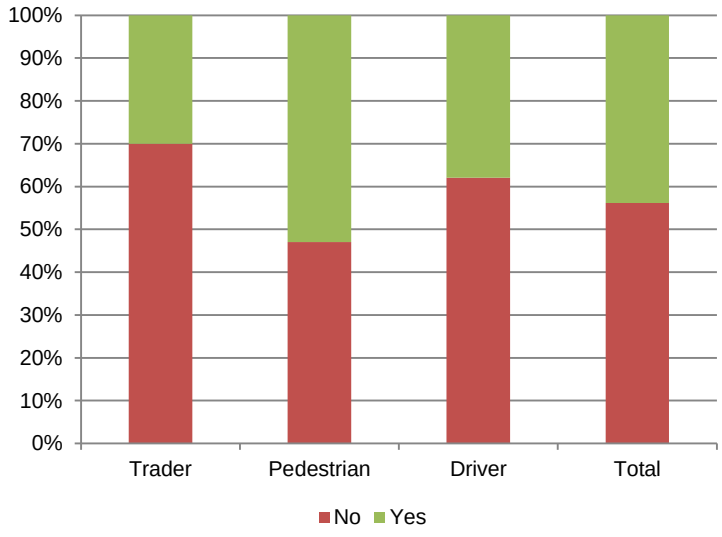

Figure 34 – Pre-intervention: "Do you regard this street as a safe one? (In a road safety point of view)".

Concerning to which speed limit the street users consider appropriate for that kind of street (Figure 35):

- all the traders believed that the speed limit for this street should be 30 km/h;
- 15% of the pedestrians considered that the speed limit should be 20km/h, 56% 30 km/h, 15% 40 km/h and remain 14% considered that the actual speed limit (50 km/h) is appropriate;

- 3% of the drivers considered that the speed limit should be 20km/h, 59% 30 km/h and remain 38% considered that the actual speed limit is appropriated;

Overall 71% of the street users believed that the speed limit should be below 30 km/h and none of them considered that it should be above 50 km/h. Regarding whether speed limit should be below or above 30 km/h there are statistically significant differences amongst the three street users types ($\chi^2(2) = 76.39$, $p<0.05$).

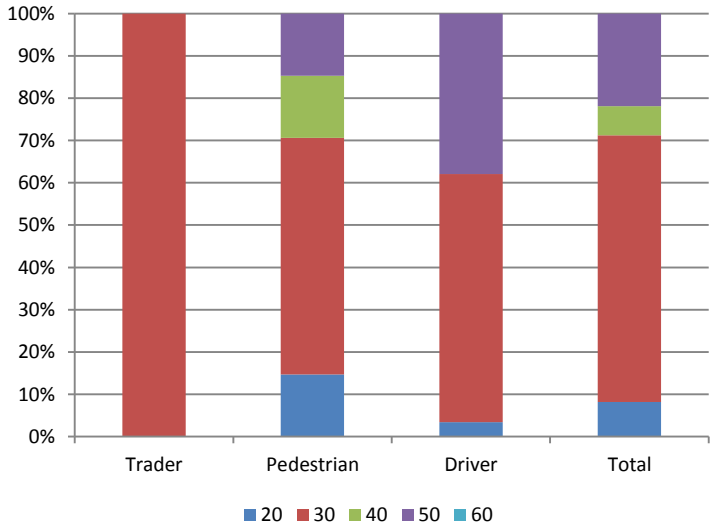

Figure 35 – Pre-intervention: "Which do you believe to be the appropriated speed limit for this street?".

An in depth analysis on drivers responses according to their driving experience (license for 10 years or less *vs.* license for more than 10 years) shows that (Figure 36):

- from those who have been driving for less time (28% of the drivers), 13% considered 20 km/h as the appropriated speed limit, 25% agrees it should be 30km/h, and remain 63% considered 50 km/h as the appropriated speed limit;
- from those who have been driving for longer time (72% of the drivers), 71% considered 30 km/h as the appropriated speed limit while the remain 29% considered 50 km/h as the appropriated speed limit.

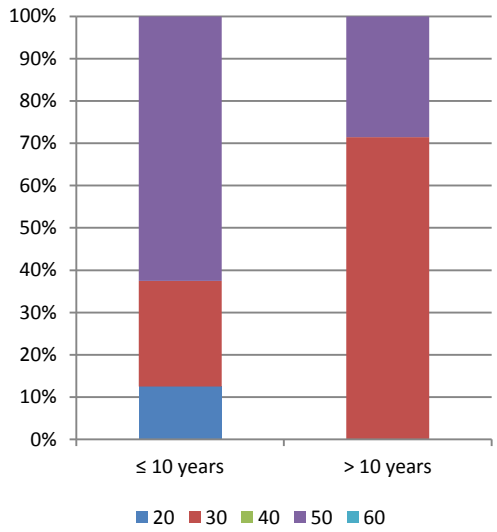

Figure 36 – Pre-intervention: "appropriated speed limit" *vs.* "years of driving license".

Although the sample size did not allow an accurate chi-square analysis, it seems that drivers with less experience might be more inclined to participate in driving competitions, take more risks while driving and test the limits which will make them less keen to assessing this street's risks (Bird & Tapp, 2008). Moreover, this could also be related to the fact that male and young individuals have a predisposition to underestimate the risk (Clark, et al., 2006), indeed 75% of the drivers with license for less time were male and their average age was 26 years old. On the other hand more experience drivers are more aware of the risks they take while driving and they might assess more carefully the risks of speeding in this street (Gormeley & Fuller, 2006). Additionally, these drivers may also be more inclined to give the answers they think to be socially desirable.

Research carried out elsewhere indicates that 85% of drivers exceed the speed limits occasionally, while realise that speeding is an infraction. Furthermore, the perceived speed limit is subjectively above the limit set by traffic rules, but drivers argue that exceeding the speed limit moderately does not represent risk (Silcock, et al., 1999). Following this, an assessment of the type of drivers on this street was carried out. For that it was considered four classes of drivers (Fylan, et al., 2006):

1. **Unintentional speeders** which includes the drivers who speed because they have limited knowledge of traffic rules; the ones who are not aware of the correct speed limit; experience a lapse of attention or temporarily underestimate their speed.
2. **Moderate occasional speeders** are the type that consider themselves as safe and skilful drivers, and exceed the limit by an amount that they believe to be relatively small. This group do not identify themselves as speeders, and usually do not experience pleasure from speeding.
3. **Frequent high speeders** are aware that they drive faster than average and may acknowledge that this represents an increased risk. This kind of drivers nevertheless believes that they personally are safe drivers. This group also has a higher intention to speed and a more positive attitude to speeding than "unintentional speeders" and "moderate occasional speeders", and they tend to speed more often and experience

more pleasure and emotional outlet from driving. “Frequent high speeders” are usually more experienced drivers and are more likely to be men.

4. **Socially deviant drivers** acknowledge that their speeding is dangerous. This group enjoys taking risks and breaking rules and may engage in more general law breaking. “Socially deviant drivers” score higher than other groups on the personality measures of psychoticism, thrill, adventure seeking and boredom. These drivers are more likely to be young, and drivers who grow out of this behaviour pattern are most likely to do so by the age of 26 years.

Aiming to meet what type of drivers is passing in the street, traders were surveyed about which type they believed to be more common as well as the drivers about what type of drivers they considered to be (Figure 37; on this analysis only drivers who reported to pass on the street at least 2 times *per* week were considered, which represents 69% of total drivers surveyed). From data analysis there are indications of statistically significant differences between both road users’ responses types ($\chi^2(3) = 9.44$, $p<0.05$):

- according to traders, only 10% of the drivers passing that street were “unintentional speeders”, 30% were “moderate occasional speeders”; 30% were “frequent high speeders” and 40% were “socially deviant drivers”;
- according to the drivers, 25% considered themselves as “unintentional speeders”, 50% as “moderate occasional speeders”, 25% as “frequent high speeders” and none of them considered to be “socially deviant drivers”.

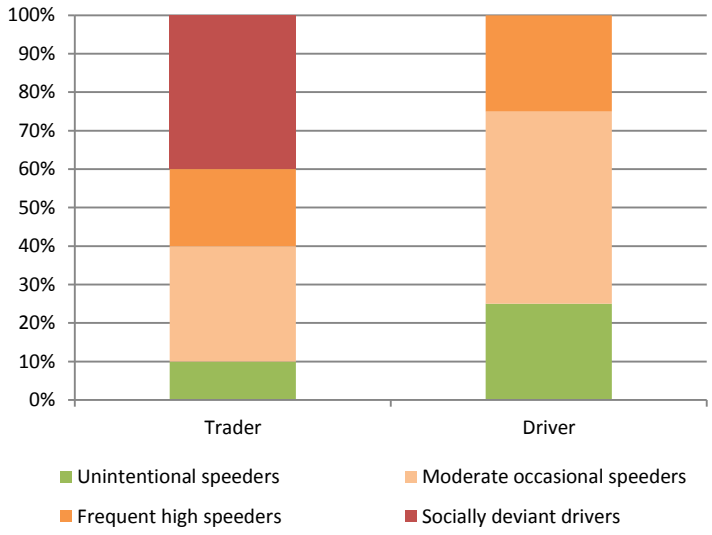

Figure 37 – Pre-intervention: type of drivers according to traders and drivers themselves.

As previously was done regarding drivers response about the appropriated speed limit, also on this question an in depth analysis on drivers’ responses according to their driving experience was done (Figure 38), showing that:

- from those with less driving experience, 25% considered themselves as “unintentional speeders”, 25% as “moderate occasional speeders” and 50% as “frequent high speeders”;

- from those with more driving experience, 29% considered themselves as "unintentional speeders", 57% as "moderate occasional speeders" and 14% as "frequent high speeders".

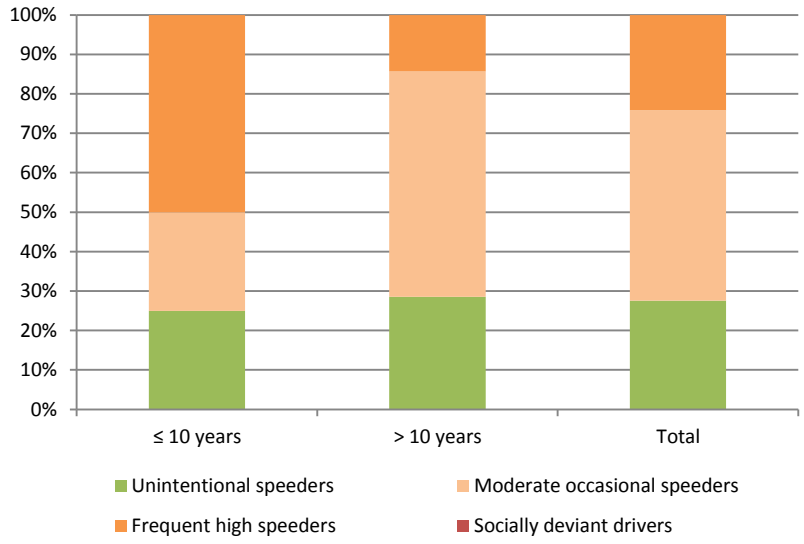

Figure 38 – Pre-intervention: "type of drivers" *vs.* "years of driving license".

Once again, although the sample size did not allow an accurate chi-square analysis, there seems to be differences amongst drivers with less experience and those more experienced and over again the same assumptions made regarding "appropriated speed limit" and "years of driving license" are valid: drivers with less experience seems to be inclined to take more risks and more experienced drivers report to be more careful while driving.

Moreover, the type of risk being taken by men and women is different as the findings suggest (Figure 39). The first ones present a bigger predisposition to express their conflicts throughout the course taking action, by addressing their driving with a strong level of affection. The latter, on the other hand, see the vehicle more as a means of transportation, as something more functional which is not seen as a compensation of their self-image (Schultze, 1995). Indeed, 10% of men considered themselves as "unintentional speeders" whilst 53% as "moderate occasional speeders" and 37% as "frequent high speeders", while 60% of women considered themselves as "unintentional speeders" and remain 40% as "moderate occasional speeders". Furthermore, data analysis show that there are statistically significant differences between both genders ($\chi^2(2) = 9.71$, $p<0.05$).

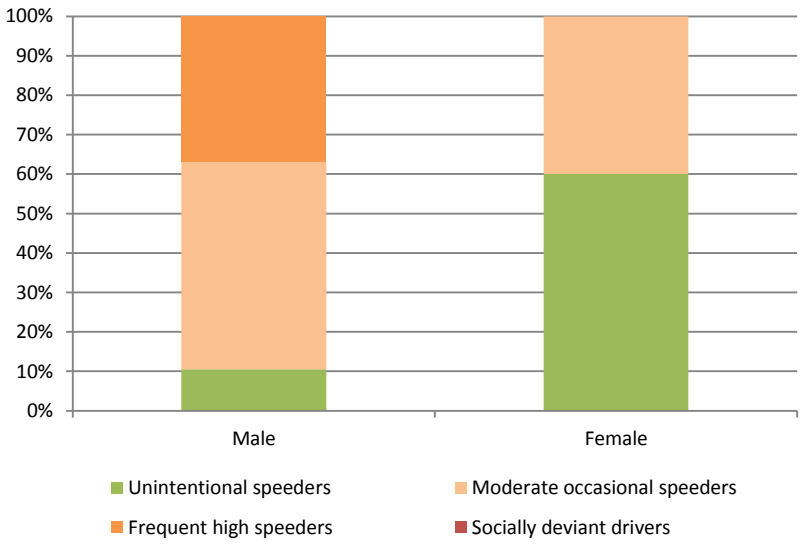

Figure 39 – Pre-intervention: "type of drivers" *vs.* gender.

Regarding that in Coelho da Rocha Street there were no pedestrian crossings along the street section (Figure 9) nor in the beginning of the street (Figure 9 and

Figure 10), and therefore pedestrians often cross the street without any protection, on the pre-intervention assessment pedestrians were surveyed whether they usually cross the street in the crosswalk:

- 32% answered they always use it;
- 50% answered they use it only when it is close by; and
- 18% answered that they only use it when there was traffic.

As was already mentioned, post-intervention questionnaires aimed to understand how people compare their risk perception between the previous and current situation on that specific street. Regarding the perception of speed now compared with the previous situation (Figure 35):

- 80% of the traders believed that vehicle's speed lower as a consequence of the implemented measure;
- 80% of the pedestrians also agreed that vehicle's speed is lower afterwards; and
- 67% of the driver considered that they have slowed their speed on this street (on post-intervention assessment, all of the surveyed drivers use this street frequently).

In overall 74% of the street users had the perception that vehicles decreased their speed with no statistically significant differences amongst the three street users types ($\chi^2(2) = 1.60, p<0.05$).

Figure 40 – Post-intervention: "Do you consider that drivers are driving on a lower speed now?"/"Do you consider that your driving speed is lower now?".

Both types of street users were also surveyed about how they perceived the speed reduction through chicanes - a traffic calming measure rarely implemented in Portugal - comparing to the well-known other traffic calming measure: speed humps. Data collected shows that most street users considered chicanes as a more effective solution (Figure 41):

- Both traders and drivers have the same response rate: 80% considered it more effective, 10% considered it so effective as speed humps and 10% less effective than speed humps;
- According to pedestrians, 64% considered it more effective, 13% considered it so effective as speed humps and 23% less effective than speed humps.

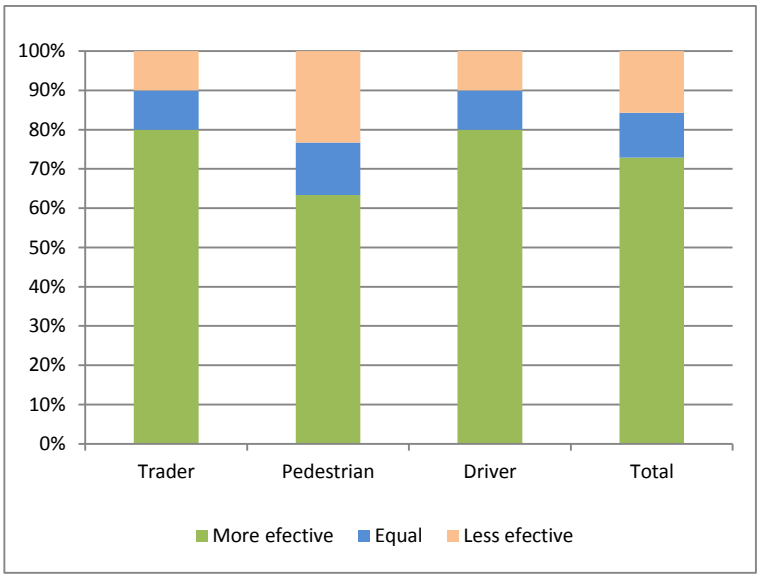

Figure 41 – Post-intervention: "Concerning to speed humps how do you regard chicanes' effectiveness (in terms of speed reduction)?".

Globally, 84% of the street users considered chicanes equally or more effective than speed humps against 16% who believed that speed humps are more effective.

These results demonstrate that for all of the street users' classes the performed intervention had a direct and positive effect on their risk perception. Thus, it can also be stated that people in general considered this street safer after the implementation of the chicanes.

The above analysis presented some recognised limitations, including its sample size and the inexistence of a control group. However, their results were actually more positive than the authors' expectations. It is accepted that there might be an element of novelty that the road users liked and led to the so positive outcome on the survey. Nevertheless, the presented study is a rare analysis in Portugal which will contribute to the change on the culture both in practice and knowledge, contributing slowly but surely for more informed policies.

3.2 Project dissemination

One of the aims of STARS/ADYSE project is to contribute to increase awareness towards speed in road accident consequences. Thus, the dissemination strategy of ADYSE project was, an equally key part of the project, developed to reach different types of public: academic, local authorities, the industry and road users. Moreover, the implementation of ADYSE project itself was, as expected, a way of dissemination and increasing awareness towards speed in road collisions consequences, particularly amongst local authorities and citizens who experienced the implementation process. Objectively, five main actions of dissemination were conducted:

1. creation of a page about ADYSE project on a road safety research blog: http://consideratesafety.wordpress.com/research-projects-2/adysestars/;
2. distribution of about 300 leaflets to all the interviewed road users, in all the commercial establishments of *Coelho da Rocha* Street and to local authorities. This leaflet aimed to give present the project, its scope and goals to the road users (Annex B - ADYSE Project Leaflet);

3. in the framework of other project, Frederico Henriques presented a research project about Children Road Safety at a National Conference (Association to the Promotion of Child Safety Conference, on 20th November) and briefly mentioned ADYSE Project as an example of implementation of a traffic calming measure near schools, amongst other measures;
4. the authors and some of the project partners were interviewed by a Portuguese national newspaper - *Público* – and an article about ADYSE project and its findings will be published during next week. This article will be shared with the ETSC as soon as possible;
5. the authors were invited by AFESP to write a paper which will be published on April 2013 in the Portuguese Journal of Signalization (*Revista Portuguesa de Sinalização*).

Moreover, authors aim to keep disclosing their research in order to increase awareness to the importance of road safety actions.

4 CONCLUSIONS

Clearly, road safety practice in Portugal can benefit from actions that adjust road users' behaviours to the road environment, particularly in urban areas. This project represents an effort in that direction. Within its context a site was identified a site and a road safety measure implemented to decrease speed and increase awareness amongst road users. The implemented measure was assessed for its impact in both criteria. As importantly, the project implementation required the establishment of a working group involving public and private sectors. It was implemented in a record time (for Portuguese standards), involved no public money and occurred in adverse circumstances, such as the Portuguese current economic situation and related unavailability for innovation and near future local elections.

The general aim of the work was to contribute to increase awareness towards speed in road collisions consequences. ADYSE main objectives included: (1) the reduction of the speed in one particular street (*Coelho da Rocha* Street, in Lisbon) through the implementation of chicanes and; (2) to contribute to increase awareness to road safety issue in Portugal by a set of communication actions.

More specific objectives also defined, such as contributing to a change in organisational cultures and the establishment of potentially long term partnerships, were also satisfactorily met. Indeed partnership with AFESP proved prolific beyond initial expectations, with a requested publication and the intention to create a working group to promote the presentation of (low-cost) road safety measures to local authorities in Portugal.

Speed assessment shows that the V_{85}-speed has decreased from 32 to 29 km/h and the overall number of drivers driving above 30km/h has decreased 11%, between pre and post-evaluation periods. Also, risk perceptions' analysis indicates that the performed intervention had a direct and positive effect on road users' risk perception and that people in general considered this street safer after the implementation of the chicanes.

Limited assessment of both indicators (speed and risk perceptions) suggest that the implemented measure has increased real and perceived safety. At least, the actual implementation of this safety measure and its assessment constitutes evidence that the general goals were achieved. However, there are some recognizable limitations, mainly related to time schedules problems and resources, did not allowed more accurate analysis neither bold conclusions about the real average speed changes associated with the chicanes or on road users´ increased awareness towards the importance of reducing speed in streets, such as: lack of control site, speed measurements of limited time and reduced questionnaires' sample size.

In the medium-term, the authors expect that the intervention measure has an effective impact which highlights the need to implement further speed management actions in other streets of Lisbon. Thus, the team is planning to create monitoring plan to the intervention site, including speed, risk perceptions and casualties' assessment.

The potential of this project lies not only in its outcome - implementation of the measure - but also in its potential to contribute to further work despite adverse circumstance, it can be a source of inspiration.

Indeed, ADYSE clearly succeeded in demonstrating that few resources combined with serious commitment will secure success of well design projects. It is authors' conviction that demonstrated required dedication to early road safety practical projects might benefit from their careful ranking and selection, *i.e.*, choosing to have fewer good projects. The authors believed that the ADYSE aim has been fully achieved within the recognised existing resources limitations.

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ANNEX A - QUESTIONNAIRES

This annex presents the two sets of questionnaires applied to drivers, pedestrians and traders before and after the implementation of the speed measures, as explained in Section 3.1. Results of the collected data are discussed in 3.1.2 and led to what is considered a successful measure.

Drivers Questionnaire

1 Age _____
2 Gender _____
3 How long do you have driving license? ____

4 How often do you cross this street?
- ☐ everyday
- ☐ 2 to 3 times a week
- ☐ once a week
- ☐ once a month
- ☐ occasionally

5 I feel I take good care crossing the street
- ☐ always
- ☐ often
- ☐ sometimes
- ☐ rarely
- ☐ never

6 Do you regard this street as a safe one?
- ☐ Yes
- ☐ No

7 I feel I need to be more careful than i have been
- ☐ Yes
- ☐ sometimes
- ☐ No

8 Which do you believe to be the appropriate speed limit for this street
- ☐ 20
- ☐ 30
- ☐ 40
- ☐ 50
- ☐ 60

9 What kind of driver do you think you are?
- ☐ generally meets the speed limit
- ☐ occasionally slightly exceeds the speed limit
- ☐ drives above the speed limit but safely
- ☐ usually drives above the speed limit and enjoy the thrill

Pedestrians Questionnaire

1 Age _____
2 Gender _____

3 How often do you cross this street?
- ☐ everyday
- ☐ 2 to 3 times a week
- ☐ once a week
- ☐ once a month
- ☐ occasionally

4 I feel I take good care crossing the street
- ☐ always
- ☐ often
- ☐ sometimes
- ☐ rarely
- ☐ never

5 Do you regard this street as a safe one?
- ☐ Yes
- ☐ No

6 I feel I need to be more careful than i have been
- ☐ Yes
- ☐ sometimes
- ☐ No

7 Which do you believe to be the appropriate speed limit for this street
- ☐ 20
- ☐ 30
- ☐ 40
- ☐ 50
- ☐ 60

8 Do you usually cross the street in the crosswalk?
- ☐ always
- ☐ When it's close
- ☐ When there is much traffic

Trader's Questionnaire

1 Age _____
2 Gender _____

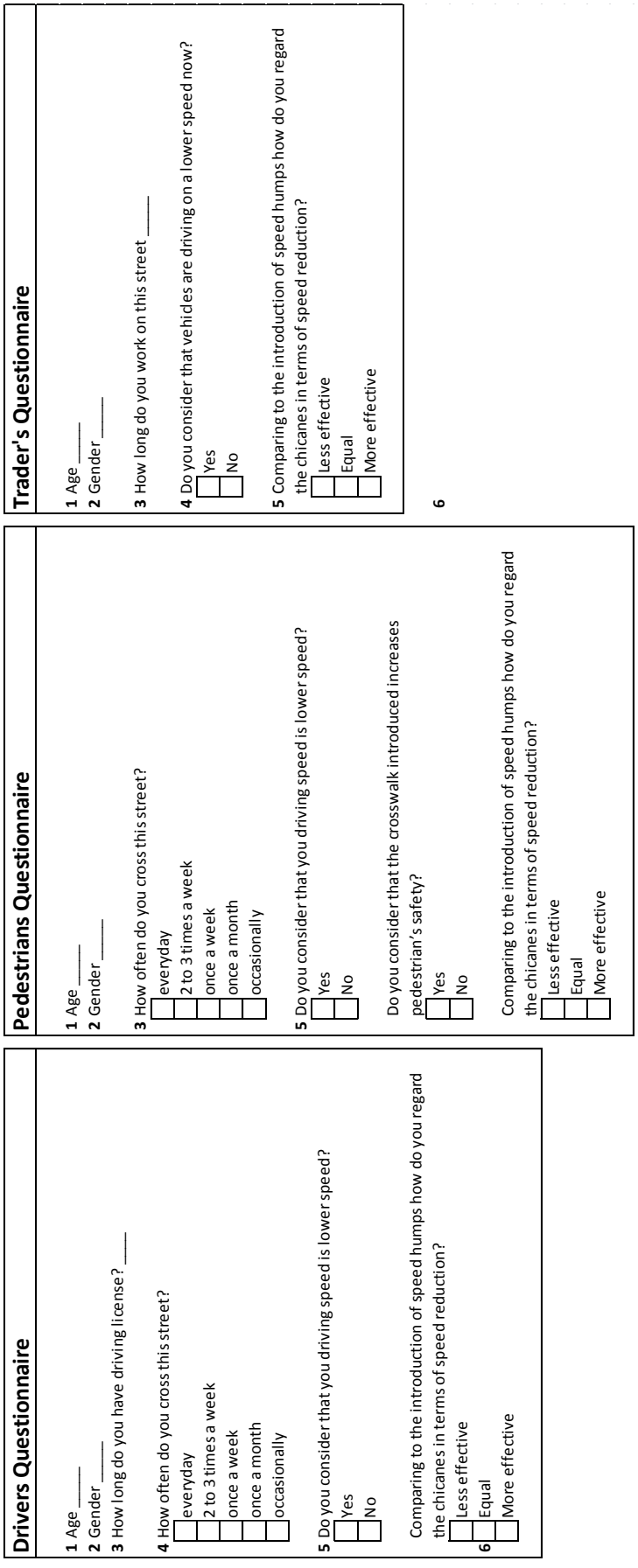
3 How long do you work on this street _____

4 Do you regard this street as a safe one?
- ☐ Yes
- ☐ No

5 Which do you believe to be the appropriate speed limit for this street
- ☐ 20
- ☐ 30
- ☐ 40
- ☐ 50
- ☐ 60

6 What kind of driver do you believe that is more common in this street?
- ☐ generally meets the speed limit
- ☐ occasionally slightly exceeds the speed limit
- ☐ drives above the speed limit but safely
- ☐ usually drives above the speed limit and enjoy the thrill

Post-intervention



ANNEX B - ADYSE PROJECT LEAFLET

The leaflet of the ADYSE was distributed by the authors, as described in Section 3.2. This was one of the dissemination actions of the project which in the end impacted several actors: road users, local authorities officials, staff from the private sector and academics.

Portuguese Version

PROJECTO ADYSE

ADapt Your Speed to the urban Environment

O projecto ADYSE ("adapte a sua velocidade ao meio urbano") é um projecto europeu inserido no projecto STARS, coordenado pelo *Euopean Transport Safety Council* (ETSC).

O principal objectivo do projecto STARS é, através da implementação de medidas de engenharia e divulgação, contribuir para o aumento da consciencialização do impacto da velocidade na sinistralidade rodoviária.

A Rua Coelho da Rocha, troço entre a Rua Silva Carvalho e a Rua Ferreira Borges, foi identificado como um local onde, por vezes, a velocidade de circulação é excessiva. Neste local têm ocorrido colisões entre veículos e peões com vítimas.

As gincanas, implementadas no âmbito do projecto ADYSE, são medidas de acalmia de tráfego que têm como objectivo alterar a percepção que os condutores têm do ambiente em que circulam. Desta forma adequam, naturalmente, a sua velocidade e aumentam a segurança rodoviária para todos os utilizadores, em especial dos peões.

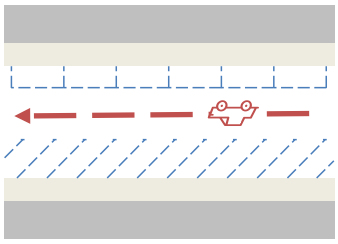
Mais informações:
http://www.etsc.eu/stars.php

Coordenação: TÉCNICO LISBOA, ISPA

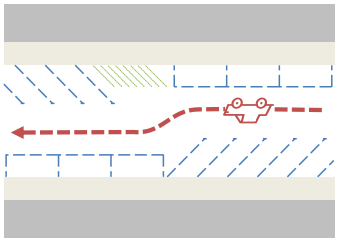
Patrocinado por: AFESP, TRAFIURBE

Com apoio: ETSC European Transport Safety Council, Lisboa

ESQUEMA DE CIRCULAÇÃO SEM GINCANA

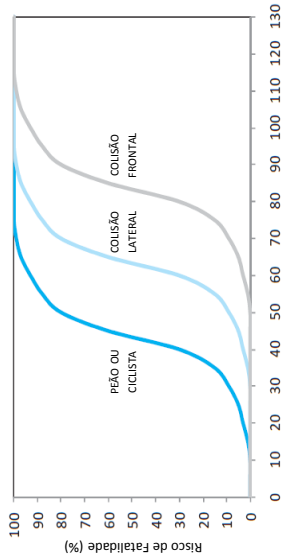


ESQUEMA DE CIRCULAÇÃO COM GINCANA



A distância necessária à paragem de uma viatura a circular a 50 km/h é cerca de 30 metros, enquanto que **a 30 km/h é de apenas 15 metros**.

Numa colisão de um veículo com um peão à velocidade de 50 km/h a probabilidade do peão sobreviver é de apenas 20%, enquanto que a **30 km/h a probabilidade de sobrevivência é de 90%.**



English Version

ADYSE PROJECT

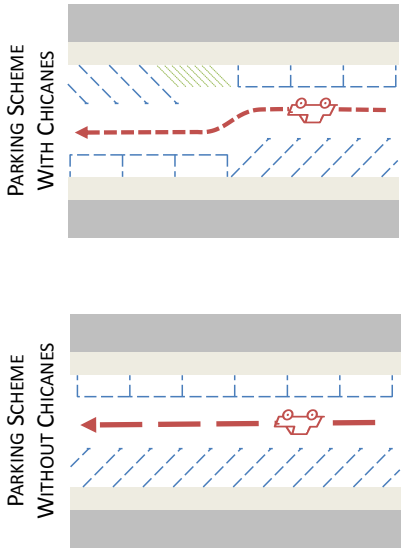
ADapt Your Speed to the urban Environment

ADYSE project is an European Project developed under the STARS project coordinated by the European Transport Safety Council (ETSC).

The main aim of STARS is to increase the awareness of speed's consequences on collisions through the implementation of engineering measures or communication campaigns.

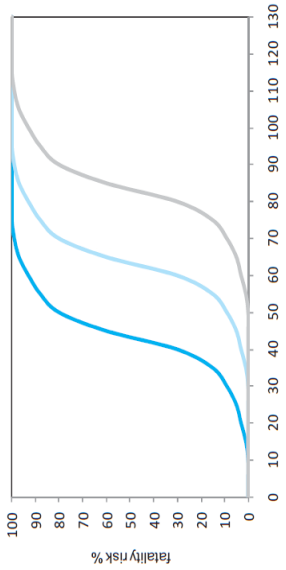
Coelho da Rocha Street, section between *Silva Carvalho* Street and *Ferreira Borges* Street, was identified as a site where drivers speeding. At this location there have been collisions between vehicles and pedestrians.

The chicanes implemented in the scope of the ADYSE project are a traffic calming measure which aim to change the perception that drivers have of the road environment. Thus drivers naturally suited their speed, increasing road safety for all users, in particular for the pedestrians.



The **distance required to stop a vehicle** that drives at 50 Km/h is about 30 meters, while **30 Km/h is only 15 meters.**

In a **collision between a vehicle and a pedestrian** at 50 Km/h, the probability of its survival is only 20%, whereas if driving **at 30 Km/h the chances of pedestrian's survival increase to 90%.**



More information:
http://www.etsc.eu/stars.php

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