PROJECT

VRUITS

Improving the Safety and Mobility of Vulnerable Road Users through ITS applications

Funding: European (7th RTD Framework Programme)
Duration: Apr 2013 - Mar 2016
Status: Complete with results
Total project cost: €4,143,667
EU contribution: €2,930,947

Call for proposal: FP7-TRANSPORT-2012-MOVE-1
CORDIS RCN : 186986

Background & policy context:

During the last years, major steps have been made to increase road safety and the number of fatalities in the EU has decreased overall. The use of Intelligent Transport Systems (ITS) has largely facilitated this decrease. However, Vulnerable Road Users (VRUs), such as pedestrians, cyclists, motorcyclists, moped riders, have not enjoyed the decrease in fatalities experienced by other traffic participants.

Objectives:

The VRUITS has the following main objectives:

1. Assess societal impacts of selected ITS, and provide recommendations for policy and industry regarding ITS in order to improve the safety and mobility of VRUs;

2. Provide evidence-based recommended practices on how VRU can be integrated in Intelligent Transport Systems and on how HMI designs can be adapted to meet the needs of VRUs, and test these recommendations in field trials.

Methodology:

Starting from accident data, the most critical scenarios for road users and the needs of the different stakeholders are identified. Methods, which have been developed for vehicle safety applications assessment, are adapted to take the specific characteristics of vulnerable road users.

The most potential applications for improving VRU safety and mobility are selected, and a qualitative and quantitative safety and mobility & comfort assessment is performed, as well as a cost-benefit assessment.

Research is performed on how VRUs can be integrated in cooperative traffic systems, and how the user interaction for Vulnerable Road users can be improved.

Trials of selected applications are performed in the Netherlands, with the emphasis on cyclists, and in Spain, with the emphasis on pedestrians.

Based on the results of the assessment and the evaluation results of the trials, recommendations are made for actions at policy level to improve VRUs’ safety and mobility.

Parent Programmes:
FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)

Institute type: Public institution
Institute name: The European Commission
Funding type: Public (EU)
**Lead Organisation:**

Teknologian Tutkimuskeskus VTT

**Address:**
TEKNIIKANTIE 4 A  
02044 VTT ESPOO  
Finland

**Organisation Website:**
http://www.vtt.fi

**EU Contribution:** €0

**Partner Organisations:**

Lulea Tekniska Universitet

**Address:**
Universitetsomradet Porson  
971 87 Lulea  
Sweden

**Organisation Website:**
http://www.luth.se

**EU Contribution:** €0

Kite

**Address:**
Contrada Costa 9  
21034 COCQUIO TREVISAGIO  
Italy

**Organisation Website:**
http://www.kitesolutions.it

**EU Contribution:** €0

Factum Chaloupka & Risser Og

**Address:**
Danhausergasse  
1040 Wien  
Austria

**Organisation Website:**
http://www.factum.at

**EU Contribution:** €0

Ecorys Nederland B.v.

**Address:**
Watermanweg 44NL-3067 GG  
3000 AD ROTTERDAM  
Netherlands

**Organisation Website:**
http://www.ecorys.com

**EU Contribution:** €0
<table>
<thead>
<tr>
<th>Organisation Name</th>
<th>Address</th>
<th>Organisation Website</th>
<th>EU Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundacion Cidaut</td>
<td>PLAZA VICENTE ALEIXANDRE CAMPOS 2 PQ TECNOLOGICO DE BOECILLO 209 47151 VALLADOLID Spain</td>
<td><a href="http://www.cidaut.es">http://www.cidaut.es</a></td>
<td>€0</td>
</tr>
<tr>
<td>Nederlands Organisation For Applied Scientific Research</td>
<td>Schoemakerstraat 97 6060 DELFT Netherlands</td>
<td><a href="http://www.tno.nl">http://www.tno.nl</a></td>
<td>€0</td>
</tr>
<tr>
<td>Polis - Promotion Of Operational Links With Integrated Services, Association Internationale</td>
<td>rue du Trône 98 1050 BRUXELLES Belgium</td>
<td><a href="http://www.polis-online.org">http://www.polis-online.org</a></td>
<td>€0</td>
</tr>
<tr>
<td>Nxp Semiconductors Netherlands Bv</td>
<td>High Tech Campus 5656 Eindhoven Netherlands</td>
<td><a href="http://www.nxp.com">http://www.nxp.com</a></td>
<td>€0</td>
</tr>
<tr>
<td>Loughborough University</td>
<td>Ashby Road Loughborough LE11 3TU United Kingdom</td>
<td><a href="http://www.lboro.ac.uk">http://www.lboro.ac.uk</a></td>
<td>€0</td>
</tr>
<tr>
<td>Sociedad Iberica De Construcciones Electricas Sa</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Technologies:

- Connected and automated vehicles
- Standards for ITS and cooperative car systems

Development phase: Validation

Key Results:

Moving in the right direction for the protection of vulnerable road users

After assessing 10 road safety innovations, the EU-funded VRUITS project identified what works best to increase the safety, mobility and comfort of vulnerable road users.

Efforts to reduce road accidents, such as the implementation of Intelligent Transport Systems (ITS), typically focus on vehicle and infrastructure design, as their starting point. But in the pursuit of success for transport systems that are cleaner, safer and more efficient, the needs of Vulnerable Road Users (VRU) – such as cyclists and pedestrians - have often been overlooked. With VRUs constituting 68% of road fatalities in urban areas, alongside the EU’s commitment to halving road fatalities by 2020, there is a clear imperative to redress the balance.

The EU-funded VRUITS project set out to more fully integrate VRUs into the equation by looking at actual human behaviour encountered across varied ITS set-ups.

Testing human-centred approaches to road safety

A comprehensive cost-benefits analysis of the various ITS approaches was undertaken with the objective of assessing the societal impacts of selected ITS, As Dr. Scholliers elaborates, ‘The impact assessment was made in two phases: a qualitative phase, during which 23 systems were analysed, and a quantitative phase, where a more detailed analysis was performed for 10 systems. The quantitative assessment is based on estimates of the quantitative effect for each of the mechanisms, accident trends and penetration rates.’ The accident trends were extracted from the EU’s CARE database, an initiative of its Road Safety Programme.

In view of providing evidence-based recommended practices on how VRU can be integrated in Intelligent Transport Systems and on how HMI designs can be adapted to meet the needs of VRUs, VRUITS piloted ITS systems in the Netherlands and Spain. As the project coordinator Dr. Johan Scholliers explains, ‘The method for assessing the safety impact is based on the approach developed by the eIMPACT project, also funded by the EU. In this approach, the impact of ITS systems is assessed for nine mechanisms, which can affect road user behaviour, including indirect and long term effects.’

System tests were conducted in the Netherlands intended to increase intersection safety. Researchers piloted an ITS which was able to alert cyclists and car drivers to the risk of potential collision and additionally incorporated automatic car braking. During the tests, the system worked as expected with the Road Side Unit detecting about 80% of the oncoming cyclists. The volunteer cyclists also reported safety benefits from the system.

In the Spanish city of Alcalá de Henares, pedestrian detectors and notification systems were tested to determine how they could enhance intersection safety. They found that while the technology offered potential, this was somewhat offset by the costs involved for integration into current infrastructure. Another Spanish study looked at how sensor controlled traffic lights could improve pedestrian mobility,
finding that modifications resulted in pedestrian waiting time being reduced by 20%. Additionally, a test to improve zebra crossing visibility increased safety by reducing by 5% the number of pedestrians crossing the road on a red light.

**Delivering evidence based recommendations**

After analysing the 10 systems, VRUITS found that all evidenced an improvement in the safety and/or mobility and comfort of VRUs, with seven of them meriting the cost of implementation. Based on the accumulated evidence, the project was able to recommend clear actions to be taken by policy makers and industry. Those recommendations were ranked factoring in mitigating external factors such as likely societal impact, the legal framework, prevailing infrastructure, market readiness and data privacy.

However, successful long-term implementation is only likely after further research is undertaken. As Dr. Scholliers explains, ‘Further research is needed to make the systems with a high potential benefit, better performing. For example, we need improved detection accuracy and better understanding of road user behavior, for systems such as pedestrian detection systems with emergency braking. We will also need further large scale testing to demonstrate benefits for the different stakeholders.’

For now, researchers in Spain and The Netherlands, as well as industry, are building on the research results. Indeed, one of the Spanish pilots conducted by the technology integration company, SICE, has resulted in the creation of the SafeCross product which helps pedestrians with reduced mobility safely cross the road.

**STRIA Roadmaps:** Smart mobility and services  
**Transport mode:** Road transport  
**Transport sectors:** Passenger transport  
**Transport policies:** Safety/Security, Digitalisation  
**Geo-spatial type:** Other