

**EUROPEAN COMMISSION
DG RTD**

SEVENTH FRAMEWORK PROGRAMME
THEME 7
TRANSPORT - SST
SST.2011.RTD-1 GA No. 285095



eVADER

Electric Vehicle Alert for Detection and Emergency Response

Deliverable No.	D2.0	
Document Title	Survey on visually impaired persons' mobility strategy in an urban environment	
Dissemination	Public	Public
Written By	Françoise Dubois (RENAULT)	06.08.12
Approved by	Juan J. García (IDIADA)	05.12.12
Issue date	05.12.2012	

Report

The recent development of very quiet electric vehicles constitutes a safety hazard for visually impaired (VI) pedestrians. To this end, Renault conducted a survey in the framework of the eVADER research project, a consortium which aims at developing acoustic alert signals for pedestrians. Two of the partners of the eVADER project, Renault and EBU, have developed a questionnaire to collect general information on VI persons' pedestrian practices, on at-risk situations and on the dangers posed by very quiet electric vehicles.

The questionnaire (available at the end of this report) consisted of 35 short questions, split into 5 parts. Thirteen questions collect personal information; 14 questions gather background information on the selection of crossing locations; 2 are about the potential hazards; 5 questions are about the improvements of the audibility of electric vehicles and the last section is dedicated to additional descriptions of real experiences. This information was provided thanks to the EBU network. It is summarized here to describe the strategies used by a European sample.

When no specific instruction is provided, participants were asked to put an X next to the most appropriate option. For open questions, the answers were elaborated. Qualitative input was essential for the success of the project.

The consortium gathered information from visually impaired people in order to analyze their strategies to cross the street. The information shows the most critical situations and the acoustic cues for travel.

82 answers were collected. Most of them were given in Czech Republic (63 %), some of them in Belgium (6 %), the Netherlands (6 %), Malta (5 %), France (5 %), Bulgaria (4 %) Cyprus (2 %) and Slovenia (2 %).

In the following, results are expressed in percentage of the panel. It should be noted that, for some questions, people gave answers which were not proposed by the questionnaire, which made the analysis more difficult (and explains why, in some cases, the sum of given percentages is not 100 %). In some other cases, multiple answers were possible, so that the sum of percentages exceeds 100 %.

62 % of respondents are male, 38 % are female. The age distribution of respondents is shown on figure 1 (below).

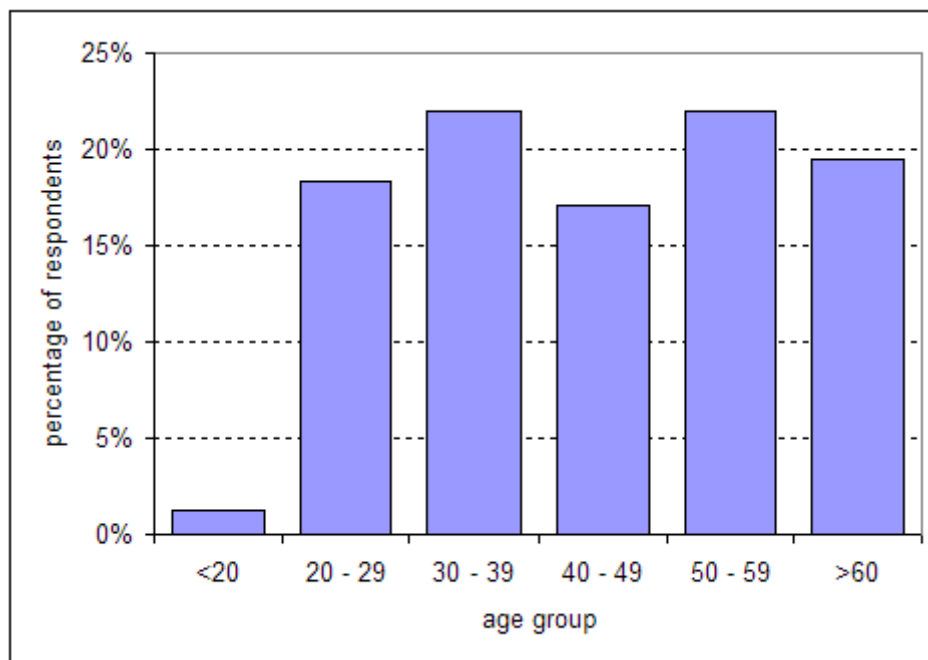


Figure 1: Age distribution of respondents

90 % of the panel are blind and 10 % are partially sighted. 19 % report an additional disability (and 10 % wear an hearing aid).

46 % lived in a city center, 45 % in a residential area and 9 % in the countryside. However, most participants walk in the street every day (88 %) or every two days (7 %). When walking in the street, 23 % need the assistance of someone else, while 17 % have a guide dog and 48% do it on their own. The rest of the answers (12 %) are complex, e.g. "no assistance need when walking in a familiar environment, otherwise a person is necessary".

Nearly all of them (93 %) regularly use public transport.

50 % of respondents always cross on pedestrian crossing points. Identifying a crossing point in a familiar environment is mainly easy (33 %) or fairly easy (49 %); in an unknown environment, most people relate it as difficult (28 %) or fairly difficult (40 %). In order to **identify a crossing**, VI people search for pavement tactile surfaces, ramps, visual clues (e.g. colors or lights) or pedestrian flow. They also try to request human aid or rely on their guide dog.

While a few respondents (6 %) find it easy to **decide when to start crossing** a street, 33 % feel it is fairly easy, 43 % fairly difficult and 13 % difficult. Audible traffic sounds (90 %) and tactile paving (60 %) are the most commonly used cues to help VI pedestrians decide when to start crossing a street. When only relying on information from the incoming vehicles, VI pedestrians mostly resort to a hearing estimation of the distance (93 %), of the vehicle speed (74 %) and of the vehicle trajectory (50 %). Visual cues can also be used, especially for estimating the distance of the car (26 %).

When the background noise level is too high, individuals prefer to ask for assistance (70 %) or wait for the background noise to stop (63 %). Much less try to look for another crossing point (28 %).

When crossing a street, quiet vehicles/bicycles (87 %), inattentive drivers (82 %), loud background noise (77 %) and traffic (71 %) and are perceived as the most dangerous situations for VI pedestrians. Junctions (39 %) and parked vehicles (29 %), even if considered as less dangerous, are still a threat for VI pedestrians.

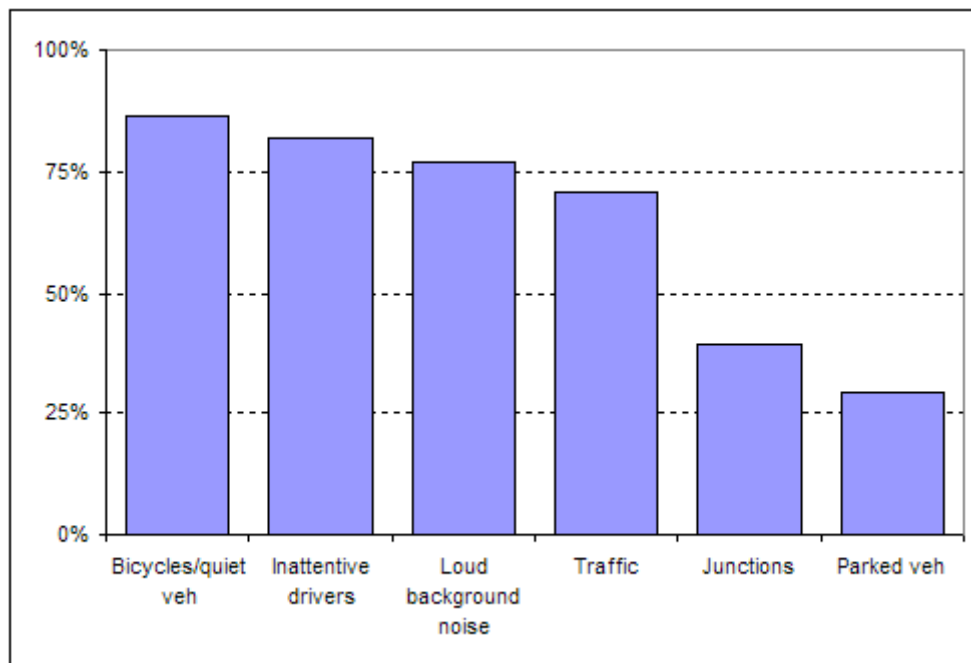


Figure 2: The perceived most dangerous situations.

The most **disturbing background noise** is not a weather one but noise caused by building works (88 %) or street cleaning machines (60 %). Then, strong wind (60 %) and heavy rain

(51 %) are also very annoying background noise preventing VI pedestrians from crossing a street.

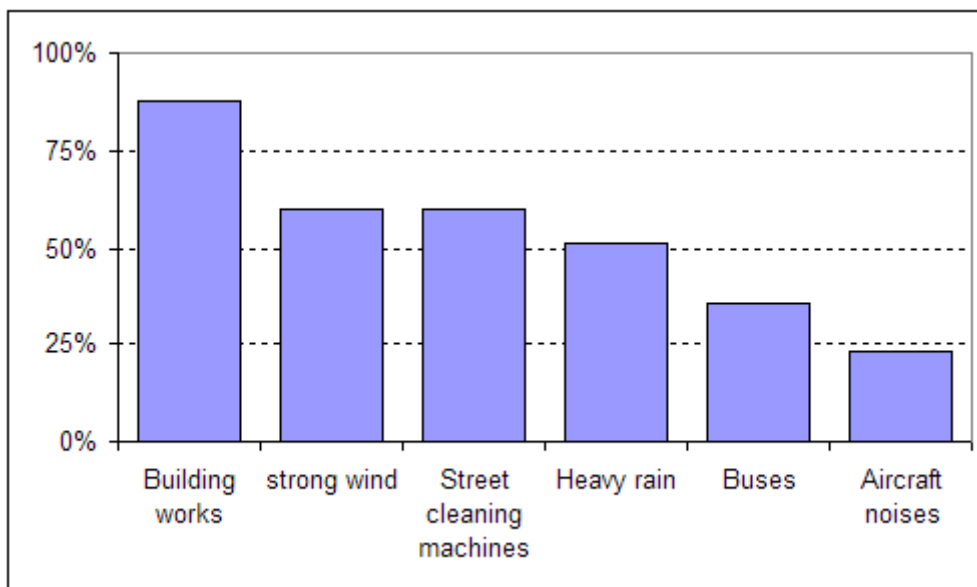


Figure 3: The perceived most annoying background noise.

91% of the respondents consider that quiet vehicles should be considered as a problem. According to them, a sound that is alike the motor noise would most easily enable them to identify electric vehicles.

According to them, it is not necessary to make a sound distinction between electric and conventional powered vehicles. A separate sound for electrically powered vehicles would even be confusing. A common sound for all vehicles is the easiest way for them to detect whether or not there is a vehicle approaching. They often suggested an engine like sound.

**EUROPEAN COMMISSION
DG RTD**

SEVENTH FRAMEWORK PROGRAMME
THEME 7
TRANSPORT - SST
SST.2011.RTD-1 GA No. 285095



eVADER

Electric Vehicle Alert for Detection and Emergency Response

Document title	Survey on visually impaired persons' mobility strategy in an urban environment - Questionnaire	
Dissemination level	Public	
Written By	Françoise Dubois (Renault) Romain Ferretti (EBU)	
Issue date	26.03.12	-

Aim of the questionnaire

The recent development of silent vehicles constitutes a safety hazard for visually impaired pedestrians. To this end, Renault is conducting a survey in the framework of the eVADER research project, a consortium which aims at developing acoustic warning signals to equip electric cars.

Both partners of the eVADER project, Renault and EBU have developed a questionnaire to collect general information on VI persons' pedestrian practices, on at-risk situations and on the dangers posed by electric vehicles in an urban environment.

Your participation in this survey is therefore very important and we would like to ask you to fill in the questionnaire below and return it no later than 20/04/2012 to Françoise Dubois (Renault) at francoise.dubois@renault.com with copy to Romain Ferretti (EBU) at ebuprojects@euroblind.org.

General instructions

The questionnaire consists of 39 short questions, split into 5 parts.

When no specific instruction is provided, please put an X next to the most appropriate option.

For open questions, please elaborate. Qualitative input is essential for the success of the project.

1. General information

1.1. First name, last name:

1.2. Age:

1.3. Gender:

1.4. Country:

1.5. Are you blind or partially sighted?

- Yes

- No

1.6. Have you always been visually impaired?

- Yes

- No

1.7. Do you suffer from any additional disabilities?

- Yes

- No

1.8. If you answered "Yes" to the previous question, please specify?

This is an open question - please list and comment below.

1.9. Which kind of environment are you living in?

- City center

- Residential area

- Countryside

- Other: *Please specify...*

1.10. Do you wear a hearing aid?

- Yes

- No

1.11. How often do you walk on the street?

- Every day

- Every two days

- Once a week

- Less than once a week

1.12. When walking in the street, do you need the assistance of:

- A person

- A guide dog

- No assistance needed

1.13. Do you use public transport?

- Yes

- No

2. Selection of crossing locations

2.1. Identifying the crossing point

2.1.1. Do you always cross on pedestrian crossing points?

- Yes
- No

2.1.2. If you answered “No” to the previous question, what prevents you from crossing on pedestrian crossing points?

This is an open question - please list and comment below.

2.1.3. How difficult it is for you to identify a crossing point in a familiar environment?

- Easy
- Fairly easy
- Fairly difficult
- Difficult

2.1.4. How difficult it is for you to identify a crossing point in an unknown environment?

- Easy
- Fairly easy
- Fairly difficult
- Difficult

2.1.5. What strategies do you use to identify a crossing point in a familiar environment?

This is an open question - please list and comment below.

2.1.6. What strategies do you use to identify a crossing point in an unknown environment?

This is an open question - please list and comment below.

2.2. Decide when to start crossing

2.2.1. How difficult it is for you to decide when to start crossing?

- Easy
- Fairly easy
- Fairly difficult
- Difficult

2.2.2. What are the problems you usually encounter before starting to cross?

This is an open question - please list and comment below.

2.2.3. What are the strategies you usually use to decide when to start crossing?
Please put an X next to one or several of the following options.

- Hearing estimation of the vehicle distance
- Visual estimation of the vehicle distance
- Hearing estimation of the vehicle speed
- Visual estimation of the vehicle speed
- Hearing estimation of the vehicle trajectory
- Visual estimation of the vehicle trajectory
- Other: *Please specify...*

2.3. When crossing the street

2.3.1. Which cues do you use to cross the street?

- Tactile paving
- Audible beeping at crossings
- Other environmental audio cues: *Please specify...*
- Other: *Please specify...*

2.3.2. What type of information do audio cues give you?

- Volume of traffic
- Engine sounds of stopped vehicles
- Deceleration of vehicles
- Pass-by noise

2.3.3. How do you judge speed of incoming vehicles?

This is an open question - please list and comment below.

2.3.4. How do you judge distance of incoming vehicles?

This is an open question - please list and comment below.

2.3.5. How do you deal with a situation when there is too much extraneous noise which prevents you from identifying approaching traffic?

- Wait for the background noise to stop
- Ask for assistance
- Look for another crossing point
- Other: *Please specify...*

3. Potential hazards

3.1.1. What are the most dangerous situations for you when crossing a street?

Please put an X next to one or several of the following options.

- Traffic
- Junctions
- Inattentive drivers
- Bicycles, motorcycles or other quiet vehicles
- Parked vehicles
- Loud background noise sources
- Other: *Please specify...*

3.1.2. In case of loud background noise masking vehicle noises, what are the most disturbing noise sources?

Please put an X next to one or several of the following options.

- Building works
- Aircraft noises
- Strong wind
- Heavy rain
- Buses
- Street cleaning machines
- Other: *Please specify...*

4. Improving the audibility of electric vehicles

4.1.1. Do you think that quiet vehicles should be considered as a problem?

- Yes
- No

The following questions are open.

4.1.2. How do you deal with silent trolley buses/ tramways?

4.1.3. Have you already experienced difficulties with electric vehicles?

4.1.4. What sort of sound would most easily enable you to identify electric vehicles?

5. Real experience

5.1.1. Please, describe your last positive experience when crossing a street:

- Circumstances:
- Environment:
- Feeling:

5.1.2. Please, describe your last negative experience (when crossing a street was difficult for you):

- Circumstances:
- Environment:
- Feeling:
- Difficulties:
- Actions taken to overcome the difficulties: