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Transport

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The current report is enrolled in the SAU project (Urban Accident Analysis System), as an intermediate report of the project co-financed by the European Commission Directorate-General Energy and Transport (TREN-03-ST-S07.30828) and developed by INTRAS (University Institute for Traffic and Road Safety of the University of Valencia).

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1. Introduction

1.1. SAU project general summary

The reduction of the number of road accident fatalities by 50 %, by the year 2010, suggested by the EU, involves the active contribution of all the agents in charge of the road safety in Europe. Even though the accidents that happened in urban areas have a relative smaller severity, it is the place where, for the moment, in absolute terms, the major number of accidents take place in the EU countries, as well as generating serious consequences on the more vulnerable users (pedestrians, cyclists, children, the elderly…).

The current action has as main objective the creation, validation, discussion and spreading, at European level, of the 'best practices' for the collection, processing and analysis of **t**raffic **a**ccident (TA) data in urban areas. The foreseen final result fundamentally consists in the disposal of a European guide of advices or of "best practices" in order to implement / improve the traffic accident collection, analysis and monitoring systems in urban areas.

For that, a compilation of the current "best practices" and on the exchange of experiences between municipalities from several EU countries will be counted on, added to the practical pilot experience that will be carried out as part of this project in several Spanish cities. With the spreading of this guide, the purpose is to contribute to the development of local tools in order to help giving answers and solutions, with more reliable and accurate knowledge, to the problematic of the accident rate in each municipality.

The concrete actions that are developed in the project are the following ones:

1) Bibliographical revision and summary of the "state of the art" on the problem of underreporting, the quality, management and analysis / exploitation of TA data in urban area.
2) Development of an in-depth "case study" and application and evaluation of the

best practices in some Spanish municipalities from different sizes.

3) Execution of a survey study with the objective of getting an approximation to the current situation and practice from a representative sample of European cities from different sizes.

4) Organization of a workshop where the results will be discussed, after the fulfilment of the previously exposed objectives.

5) From all the information obtained from the previous stages, writing and spreading of the Guide of Best Practices throughout the EU.

The current report corresponds to the activity 2: Case study.

1.2. Objective of the report

In this report, the results of the activity 2 of the SUA project are presented.

Case study: Evaluation of a set of Spanish municipalities from different sizes.

This document is based on the detailed analysis of the situation of the TA data collection and analysis police procedures in several Spanish municipalities. Likewise, it has been considered, for some municipalities, several actions of improvement of such systems carried out in the general framework of the SAU project and/or of specific agreements with the different municipalities.

The cities included are:

Barcelona (Large municipality: 1.527.000 inhabitants)
Valencia (Large municipality: 761.800 inhabitants)
Murcia (Medium-sized municipality: 377.900 inhabitants)
Elche (Medium-sized/small municipality: 207.163 inhabitants)
Castellón (Medium-sized/small municipality: 163.088 inhabitants)

At the methodological level, the work approach varies according to the particular circumstances of each municipality and of the type of collaboration that is established, in a line that goes from the implementation of works and concrete interventions in some municipalities to, at the other end, the mere obtaining of detailed information on

the situation in the municipality. Nevertheless, several fundamental elements are raised as excellent:

a. Study of the accident data system: Definitions and rules, computer support, working procedures, types of questionnaires, type of data and output exploitation, etc.

b. Analysis of the accident data quality and application and validation of procedures of data quality evaluation: Control of univariate and bivariate distributions; deterministic or logical contrasts – tests to detect impossible or incompatible data – and approximate tests (empirical or probabilistic), of which objective is to locate very little probable data. The lack of representativity will be tried to determine through "indirect" indicators like could be particular "anomalies" in the annual distributions or proportions according to the different variables (age, severity…) always compared to "typical" reference standards established at the national and international level.

c. Meetings with experts and technicians of each municipality. Evaluation of experts, in collaboration with the municipal technicians, referring the proceedings, computer tools and analysis outputs now is use.

2. Case study

The case study is organised in 4 sections: The sections 2, 3 and 4 are focussed on three delimited urban areas (Barcelona, Valencia and Murcia), referring to their specific administrations. In the study of each urban area, a positive critical aspect which pretends gathering - in a summarized way - the basic core of the "best practices" in order to study it in depth by strengthening it and drawing conclusions and important generalizations on the experience in the above-mentioned cities has been selected and emphasized.

On the contrary, the first section is focussed on the most important topics related to deficiencies and problems. In this case, the diagnoses of the three mentioned urban centres (Barcelona, Valencia and Murcia) have been compiled and synthesized, in addition to the information collected from the other smaller towns; moreover, in this section it has been possible to tale into consideration information of many other municipalities in the framework of the SIDAT project with the Servei Català de Trànsit (SCT) and the ARENA II project with the General Directorate of Traffic, both projects having the main purpose of improving the accident data records in the competences of each administration. In this section, the defective critical aspects are collected without mentioning in which municipalities the specific problems occurred, with the aim of protecting very important confidentiality aspects. In fact, in this report, in all the sections, the minimum needed information will be presented in order to describe, conceptually, the most outstanding aspects in each case, letting outside the concrete details that represent confidential information in each municipality.

2.1. Section 1. Main limitations and identified problems in the case study.

From the analysis of the situation in the municipalities included in the case study, pointed out before, a series of critical questions that are the basis of the deficiencies that usually appear in the urban accident records and that are listed hereafter emerge:

1. In the framework of the police activity, the collection of statistical accident data with the aim of carrying out studies and statistical analysis is integrated in a large process of investigation, reconstitution and legal and administrative management of the accident. In practice, the collection of this information is more **oriented to an administrative and legal resolution** of the accident, where what is critical is to determine the responsibilities, than to the study of accidents with the aim of carrying out research and statistical analysis, which inevitably affects the type of information recorded.
2. **The human and technical resources available to fill in the suitable documents** for an accident (technical, legal, administrative and statistical documents, accident report, proceedings, technical report, etc.) **are often insufficient**. This generates that, on the one hand, the quality of the accident investigation is sometimes very defective and, on the other, the record of the statistical information is relegated to a minor degree of priority.
3. To what precedes, it has to be added that sometimes the work is done on outdated database systems.
4. **Duplication of tasks**. As in most of the countries, the information on accidents at a national scale starts with the compulsory fulfilment, throughout Spain, of the information fields required in the **official statistical accident report of the DGT**. The fulfilment of this questionnaire is quite difficult due to its **large content** and because it has to be filled in for all the accidents that cause injuries, regardless of its severity. This normally ends up implying a duplication of tasks since this is a report that is added to the other documents and that repeats a lot of information. Moreover, in some particular cases, **the amount of required information uses to be excessive**, especially in the low-serious accidents for which an investigation is barely done.
5. Due to how this questionnaire and the information management procedures are designed, for the moment, **the municipal police forces do not have a direct access to the information they fill in the national accident report for its statistical exploitation**, which influences the fact that they consider this task as a useless additional work for their local area and as a potential work overload. On the other hand, the results of **the data exploitation by the official organizations** use to be presented with a huge delay and, sometimes, with such a **level of aggregation** that it means that they lose a great part of its utility for the authors of its collection at local level. This entails that the local administrations handle their own record and data entry for their own use, emphasizing in this way the

duplication of tasks and a work overload previously reviewed. In fact, in practice, a large amount of **the information included in the statistical accident report appears to be duplicated or tripled** in the other documents, such as to entail discomfort and nonconformity.

6. In many cases, **the agent that attends the accident on site is not the same as the one that fills in the statistical accident report**, being a person that has not been in the scene of the accident the one that carries out the task having as starting point the report and notes from the agent that attended the accident.
7. The official statistical accident report has been designed like a document that implies the manual introduction of the data and **it does not set filters and automatic control and reporting systems** that improve the information management and quality.
8. As for the **information contents**, a usual criticism from the municipal authorities is that the official accident report does not consider the appropriate features and the particular needs of information of the urban areas – and of each municipality in particular – (it is rather designed for the motorway accidents), and then loses its purpose. On the other hand, **it does not consider the updated information about the new components and technologies** that are now part of the traffic and road infrastructure system.
9. **To stand out the** current **impossibility of being able to link the police records with other databases** like the databases of hospital coaches, forensic surgeons, emergency services, insurance companies, occupational accidents… This would allow a more complete research on the accident rate from several points of view.
10. **Finally, it has been noticed that, locally,** some administrations and some urban police forces **have created their own data collection and analysis systems** and their own work procedures, with the aim of trying to overcome those limitations. This has produced a great **heterogeneity** of information which complicates the creation of a common database having the entire national record of accidents under standard criterions. On the other hand, there are obvious differences between the municipalities, because most of them do not have at their disposal enough economic, technical and specialized human resources to design and maintain such systems.
11. **Actions in road safety separated from accident data**. It has been noticed that the actions in urban road safety, in many cases, do not start from the accident statistical data analysis, because of, among other things, the lacks in the records and in the exploitation of these ones. Moreover, this is emphasized by the fact that

the data, as it is considered right now, is often considered as a statistical-administrative record which objective is solely to know the figures, from the frequency point of view, of the accident rate and not as a diagnostic tool that could allow us raising actions from its in-depth analysis.

12. As a consequence of what has been previously said there are the important current lacks in the accident records in urban areas, given that **a significant percentage of urban accidents are not collected, or if they are, with serious problems as for the exhaustivity and quality of the data**.

2.2. Section 2. "Best practice" (1): Urban Area of Barcelona (Servei Català de Trànsit)

This part has been focused on one of the most critical aspects of the urban accident rate monitoring and analysis procedures: the collection, coding and computerizing accident data system (also known as accident report).

The first contacts with the municipality of Barcelona were taken through the Servei Català de Trànsit, which is the organization responsible for the traffic in the Autonomous Community of Catalonia which got transferred these competences, being independent from the central administration, with the only duty of providing to the Spanish General Directorate of Traffic the eventual data of the accident rate in the Autonomous Community through a form that is, at present, quite outdated.

In 2003, a first Convention of research (SIDAT1 project) that allowed us obtaining a first approximation of the problem had been set up[1].

Later, in 2004, as a result of the extension of the SIDAT2[2] convention, the start of the SAU project and the obvious need to converge to CARE, this particular study was suggested for the City of Barcelona. The SAU project being launched and due to the needs of the Servei Català de Trànsit to continue with the ongoing work, it was decided to bring forward this phase of the project and to leave for later on the phase of the survey, as mentioned before.

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[1] INTRAS (2003) SIDAT1: New Integral System of traffic accident data collection of the Servei Català de Trànsit (Phase 1: Description and Definition of the contents)
[2] INTRAS (2004) SIDAT2: New Integral System of traffic accident data collection of the Servei Català de Trànsit (Phase 2: filling in and pilot test)

The work performed in the section 2 consisted, in a first moment, in an in-depth analysis of the procedure of accident data collection, codification and computerization from the local police agents with the aim of subsequent analysis and monitoring. It has to be stressed on that the city of Barcelona is, for the time being, one of the Spanish cities that has the best integrated and developed accident collection system. However, the system is far from being perfect and there is the possibility of introducing improvements on it. At a later stage, in this section, an action of improvement of the collected information at the level of the "contents" has been developed.

Roughly speaking, the Urban Guard of Barcelona (name of the City of Barcelona's police force) has its own computer system that is used by a specialized staff that deals with urban accidents. This system allows filling in at once the administrative information, the simplified accident reports, the technical reports of reconstitution and the statistical accident report, with no need of duplicating the information, optimizing the time and the resources used in this task. This system is integrated in a more general system of police incidents and public safety that feeds a police database (FENIX). From this database, specific road accident data is extracted and is electronically sent to the Servei Català de Trànsit to be integrated with all the data for Catalonia.

From the point of view of the "best practice", firstly some "basic principles" have to be pointed out, principles in which the development of the system has been based on and that, to a great extent, are the basis for its good performance. These principles are the ones that are listed hereafter:

1. **Two main objectives**: (1) Facilitate the work of the patrol that makes up the report, supplying tools that reduce the administrative load and allow a greater dedication to the attention of the citizen and the analysis of the causes of the accident. (2) Manage the information and transform it into "knowledge", in a way that the fast detection and solution of the safety problems could be allowed.
2. All the process, from the action of the police in site until the data entry in the statistical accident report is **done by the same police patrol**. That is to say, the same persons are the ones that act in the scene of the accident and subsequently enter the information in the database system.
3. The entry of the **statistical data is not an added task**, but it is integrated in the police management procedure of the accident information. The information

that has been entered serves to automatically generate all the documents (accident reports, reports, statistical data…)

4. **Each data is only entered once**. Any information duplication is eliminated. The entered data is recovered for all the document outputs that the system may offer.

5. All the document outputs generated by the system are **homogeneous**. Their **distribution** is **automatically** done.

6. In relation with what comes before, the entered information allows fulfilling the statistical information requirements requested by the Servei Català de Trànsit (main traffic authority in Catalonia). Moreover, such information has to be **useful for its use at the local level**.

7. **Optimization of the data entry procedure**: Speed up to the maximum the procedure by using the different possible strategies for each different field of information: Data obtained automatically, filters, calculated fields, etc.

8. From the point of view of the data exploitation, the system **must be able to detect, automatically, the risk areas or locations** (accident concentration stretches or points), generating the consequent alerts that allow a more detailed investigation in such points or areas of the urban road network. For that, the use of Geographical Information Systems (GIS) is required. It is stressed on the concept of "area" of accident concentration opposite to the "point" concept.

   This system classifies as "risk area" the area in which, in a radius of 15 meters, 10 accidents happen in one year. In 2004, it detected 52 dangerous areas in Barcelona.

9. "**Proactive immediacy**": In relation with the previous point, it makes reference to the possibility of detecting possible conflictive stretches at the same time when the accident data is entered: if the system detects an accumulation of cases in the place where the new accident has happened, the system notifies it to the agent that is entering the data. So, this allows a fast solution to the problem.

10. From the perspective of the computer support, some key aspects should be pointed out:

    a. It has been developed by the Municipal Institute of Informatics of Barcelona.

b. There are information modules shared with other municipal services, maximizing its utility (e.g. street directory, municipal mapping (GIS)…).

c. Strict application of the privacy rules (Control and monitoring of the LOPD application – LOPD: Ley Orgánica de Protección de Datos Personales: Organic Law on Personal Data Protection -). Access security (users).

d. Common infrastructure for many applications: Database server (Oracle); Shared record server; Internet application server; LAN/WAN corporate networks.

e. Client-server system. Delphi / Java for the client and Oracle for the server.

f. GPRS/UMTS server for the data entry of the point of occurrence of the accident by the acting units.

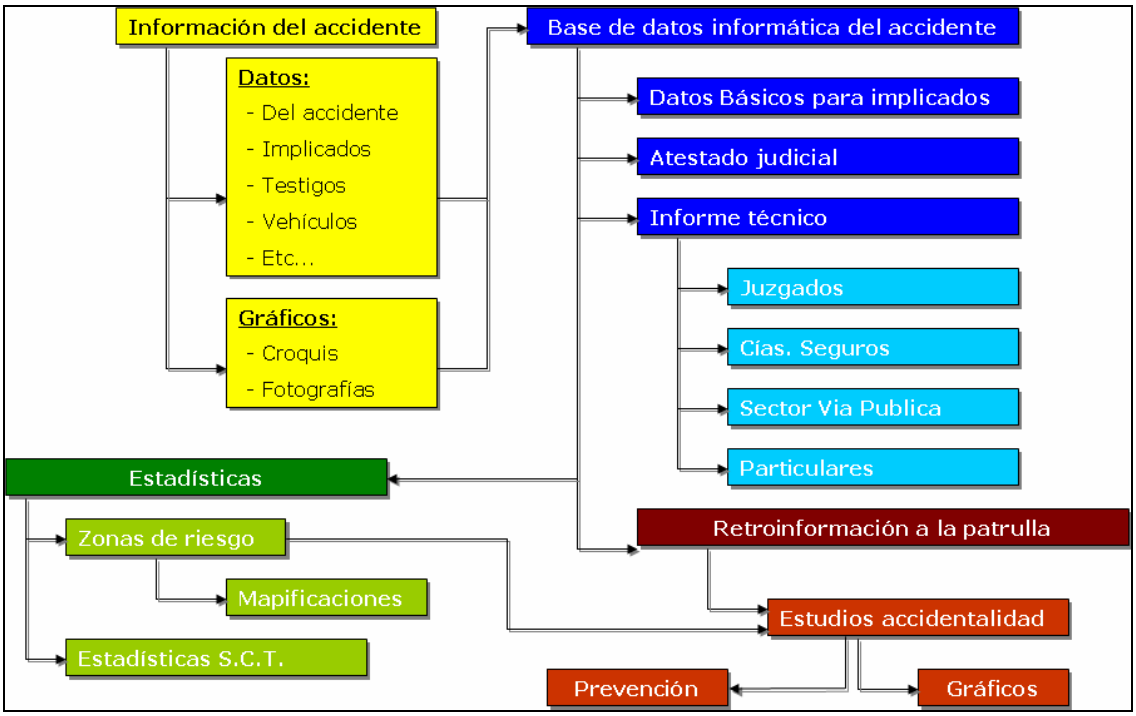


Figure 1. Diagram of the traffic accident data of the Urban Guard of Barcelona.

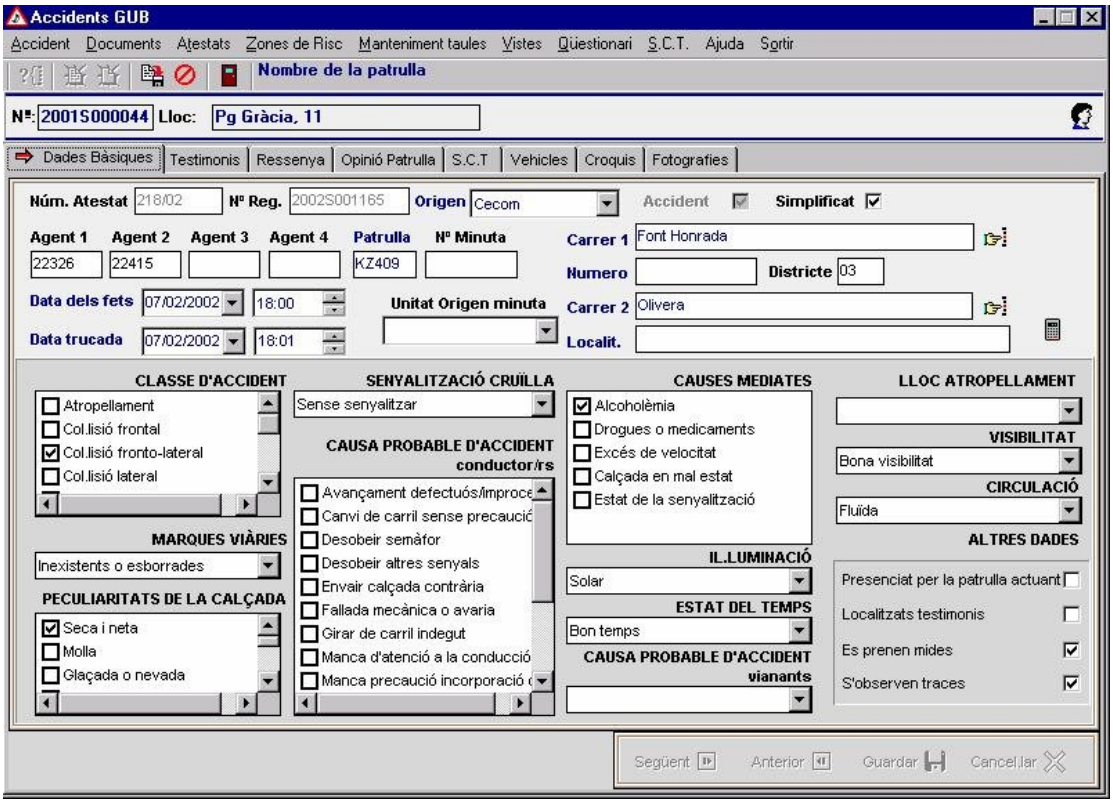


Figure 2. Data entry in the software of the Urban Guard of Barcelona.

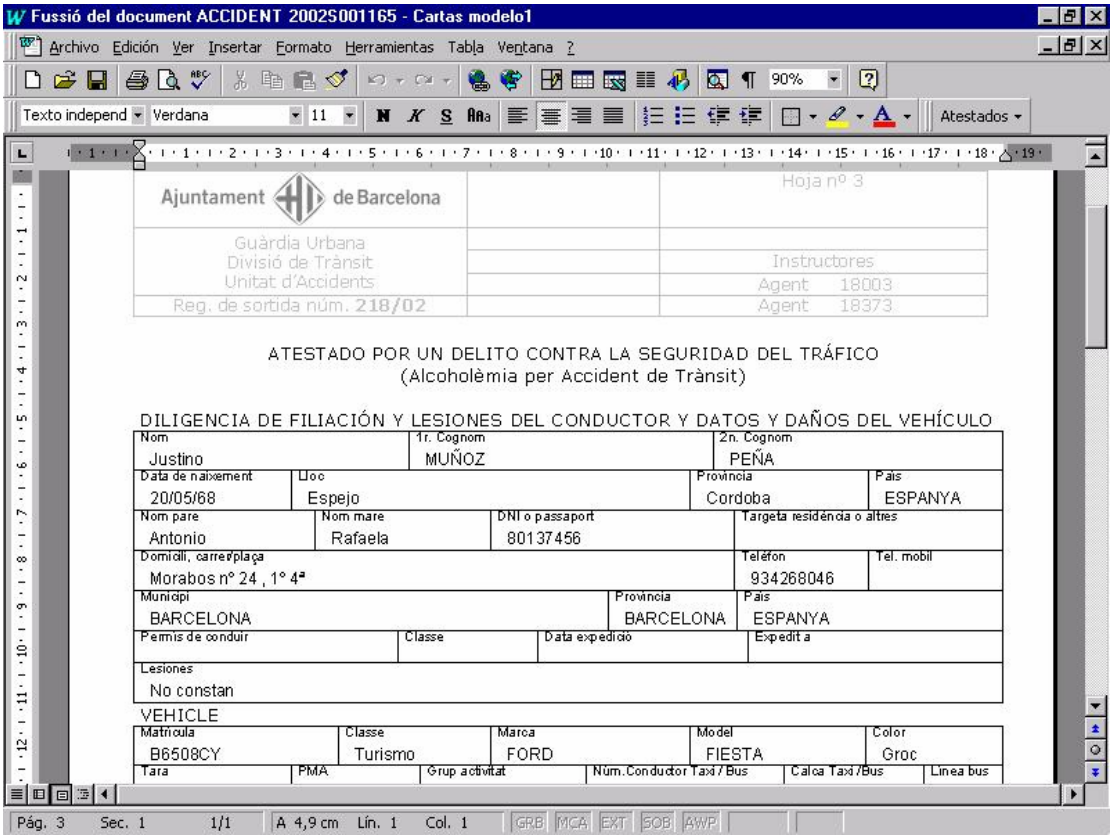


Figure 3. Automated accident report generated by the software of the Urban Guard of Barcelona.

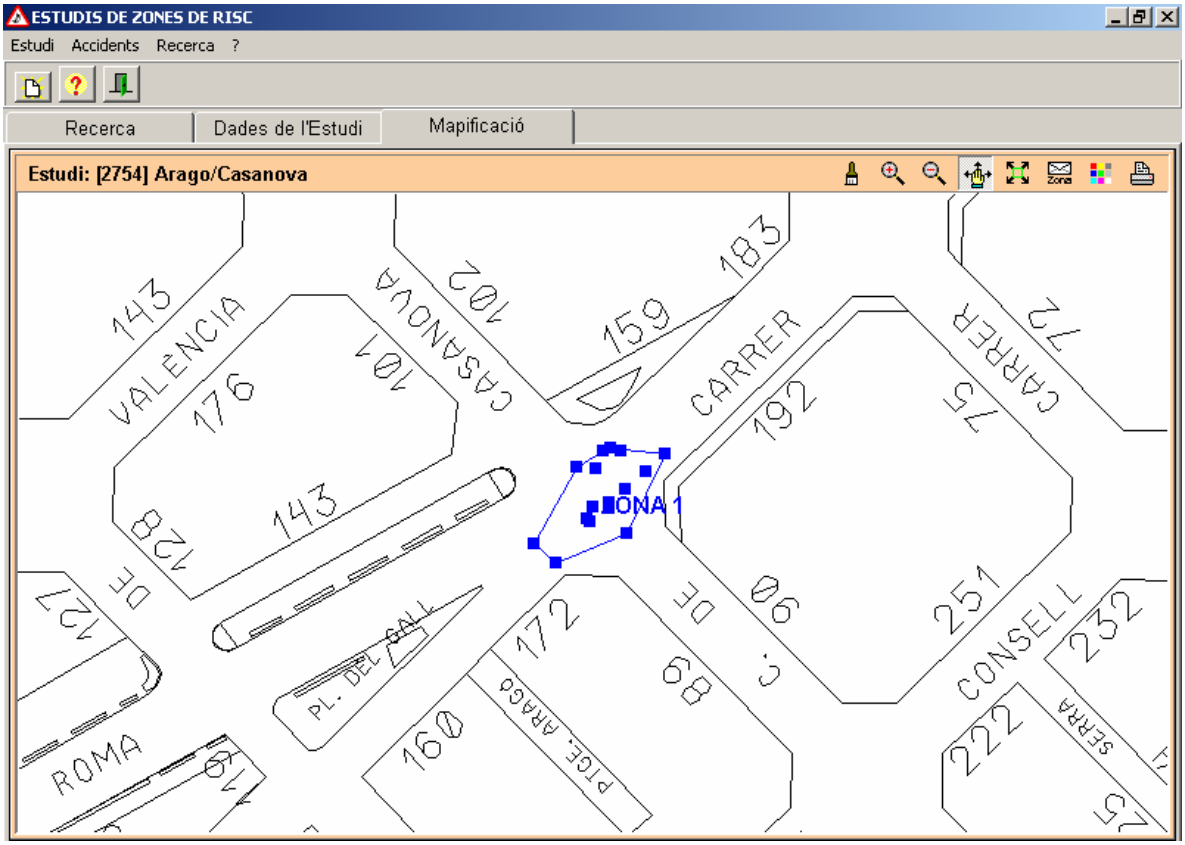


Figure 4.Identification of dangerous areas with the software of the Urban Guard of Barcelona.

About this system, in the SIDAT / SAU context, a series of improvements in the information content have been carried out. In this framework, the work carried out has been focussed on the following aspects:

1. From an **evaluative and diagnostic perspective** of the collection system, an analysis of the procedures now in use, with the aim of detecting and identifying its positive and negative aspects and to compare them with the ones that are used in motorway accidents, has been carried out. For that, the help of the agents in charge of the motorway traffic - which, in Catalonia, are the "Mossos d'Escuadra" and not the Civil Guard that is in charge for the other communities except the Basque Country – has been counted on.

2. From the perspective of the **pilot study**, new information **contents** that may imply an essential improvement of the quality of the collected data have been posed and introduced. The result has generated a new system in which all the information fields have been reviewed with respect to its information contents

and computer specifications, taking into account the real possibilities of collecting the information and the available resources when a police agent attends a TA on-site. In this sense, one of the most important aspects that had been acquired has been to create a system that differentiates a statistical accident report with two levels of information, depending on the severity of the accident.

This way, an easier questionnaire for the accidents with slight victims (similar to the old one but without some information hard to evaluate) and another one, more complete, for the accidents with serious or fatal victims (for which, as a norm during the police investigation, much more information is collected for legal reasons and therefore turns out to facilitate the completion of the questionnaire) have been proposed. For the moment, as for the city of Barcelona, the Urban Guard has already modified and adapted its computer system to follow these specifications. For the other municipalities in Catalonia, it has been suggested to create a software and an application that, included in a WEB based application platform, allows the introduction and the local exploitation of the data in order to be able to investigate, for which the computer characteristics of each field and the structure of the information have already been specified. This application is at a development stage and until the moment of its launch, a paper questionnaire that allows the completion following the new specifications is available.

3. In the pilot implementation, the adequacy of the new system to the standards posed in CARE PLUS1 and CARE PLUS2 has been taken into account. The new collection system has taken into account the development of CARE and, in this sense, important conclusions have been drawn. The first critical point is that when the TA implies slight consequences, the collected information may perfectly be adapted to CARE PLUS1 without any particular problem, but not to CARE PLUS2. When the TA is serious or fatal, not only it can adapt to CARE PLUS2, but it could even go beyond, collecting more information with appropriate quality levels. This would lead to raise the possibility, given the real experience – shared with the police agents themselves – of having problems to collect the information about the accidents, to think about two levels of accident databases depending on the severity, with the premise to keep acceptable levels of data viability and quality. The study of these possibilities is almost finalized and we are looking forward to being allowed to raise it in Spain and in the CARE forums, given its importance and the

experience acquired in this topic.

4. To be able to make the new system effective, a manual to fill in the accident questionnaires has been developed and the system has been evaluated during some conferences with representatives of the various police forces (local police and motorway police) from Catalonia, and it got a real positive evaluation. Both the manual and the description of the procedure of its development have been published as a book from the Servei Català de Trànsit.

5. Another aspect particularly innovative that has to be emphasized is the creation of a system to register and code the sequence of events that happen in a TA (opposite to the traditional categorisation of "accident type"). Traditionally, to classify the accident typology, a unique category that emphasized only one of the most important events of the accident was used (e.g. rear-end collision, head-on collision, running over…), but, in some cases (especially in accidents having a certain importance, complex or multiple collisions) it is really difficult to decide which type of accident happened, since it is usually a composition of several events. This way, depending on the criteria selected by the agent, the same accident could be identified differently: first event (e.g. "getting out of one's lane"), more critical event (e.g. "head-on collision" after getting out of one's lane), position or final condition of the vehicle (car turned over and on fire after the head-on collision), etc. The developed system (only for serious or fatal accidents) simply explains how to collect the different events that happen in a sequenced way, identifying the action of each vehicle and the event that implies the most serious injuries.

   Regarding the question of the accident sequence, and due to its novelty, an on-site pilot study has been carried out with the aim of valuing the viability, effectiveness and reliability of the information collected with the new collection system. For that, several agents have filled the accident sequence for a sample of accidents and technical report of these accidents. A series of accidents that resume the most frequent and common accident typology in Catalonia, differentiating between the occurrence area of the accident, the demarcation and the number of involved vehicles, have been selected. Likewise, the complex accident system has been tested even though with low presence. The accidents have been evaluated and codified with the new collection system (from the police reports and the technical reports done by the agents) with the aim of carrying out the codification of the accident sequence. Each one of them has been evaluated by the same agent that attended the accident, by other

agents that did not attend it and by the INTRAS researchers. Given that each accident was evaluated by several persons, having no communication between them, it has been possible to compare the levels of consistency (by psychometric methods of "agreement between judges") and then state a reliability level perfectly appropriate, even when it was evaluated by agents that did not directly attend the accident and that only rely on the available documentation.

As a conclusion, the accident sequence has been considered as viable, opening future possibilities as to other aspects that could be developed, taking advantage of the information that is compulsorily collected by the police agents in the most serious accidents. This topic has been considered as crucial to such an extent that an INTRAS researcher is now focussing his doctoral dissertation on this topic, aiming to analyse deeply the collected data.

It is also important to stress that the work has gone far beyond the objectives established in the SAU project, mainly thanks to the great collaboration of police agents and technicians involved in the numerous work sessions that took place, just as the efficient and fast accomplishment of the revision tasks and of the pilot test. A result of that is the start of the system in a record time, in spite of the multiple novelties, in Barcelona (and it is forecast for the other Catalonian municipalities). On the other hand, it was not predictable that, from the beginning, it could be possible to propose and carry out so innovative and in-depth reformulating procedures like the accident sequence or the significant increase of information for the serious and fatal accident questionnaire.

It is also convenient to emphasize on the level of consensus acquired by all the participants just as the good evaluation of the final results. These aspects are fundamental when the municipal police agents and technicians will internalize their commitment and responsibility towards the good quality of the data. Another aspect that has also been well-valued is that the system has been perceived as easier to use, despite that the amount of information collected for serious and fatal accidents is greater. In fact, one of the most frustrating problems for the agents was to provide information they could not get for slight accidents and the duplication of many fields in the required documentation for each accident.

Finally, point out that the Municipality of Barcelona has offered its accident data management system to the municipalities interested in its implementation, both in

Catalonia and in the rest of Spain. The only requirements have a technological nature, referred to the need of having an appropriate computer infrastructure in order to implement the system. For the moment, several municipalities are pending to launch the system.

2.3. Section 3. "Best practice" (2): City of Valencia.

The University of Valencia keeps a framework convention on collaboration with the Municipality of Valencia since several years and several actions have been carried out in topics related to urban accident rate by INTRAS and in collaboration with the local police[3]. A result of these actions has been an exhaustive analysis of the procedures of urban accident data collection and analysis in the city. The critical conclusions of this work are gathered in the section 3 and are integrated with the other case studies.

For the time being and partly thanks to the previous actions carried out with the local police of Valencia, its state is in a stage that could be considered as prior as the one in Barcelona. One of the conclusions that was already mentioned in the study was the redesigning of the computer collection system in order to be integrated with the general collection system of police incidents and public safety in the city. This way, the police agents did not have to fill in twice several questionnaires and reports. It was obvious that this was the solution to be able to rely on more efficient and reliable mechanisms, as it was already being demonstrated in Barcelona. This process is at a developing stage at the local police and we are waiting for a future meeting to check its development.

The specific topic, as a particular case of "best practices", that is described in this section is the one of the development of **accident data analysis system procedures** which have a special importance for the accident rate diagnosis and monitoring in urban areas. After having analysed the drawbacks of the system, it was considered particularly important to study how it could be possible to best take advantage of the obtained information and what type of analysis could be useful to monitor and diagnose the accident rate.

The most important developments obtained are focussed on three aspects:

1. The use of analysis procedures that allow the study of the cross incidence on

[3] INTRAS (2003) ANIVAL2: Analysis and research of the road accident data in the city of Valencia (2)

variables, with independence of risk exposure data. One has to bear in mind that most of the time, it is not possible to get covered kilometres data with a sufficient detailed level. An alternative that seemed to be useful was to cross variables and obtain relative comparisons on the basis of expected frequencies under hypothesis of distribution equality. By standardizing the residual frequencies, diagnostic indicators of problematic points that can easily guide the police responsible persons without having to turn to sophisticated statistic techniques are obtained. Here is an example of it.

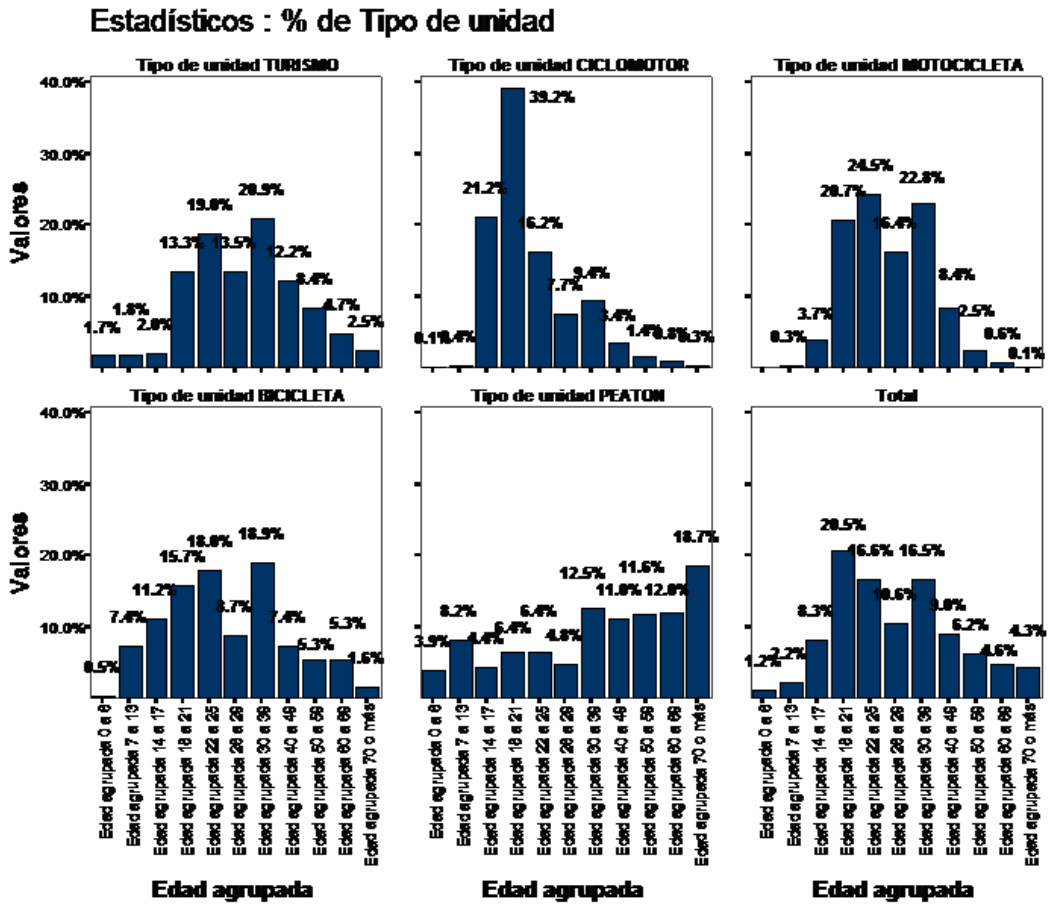
HORA DEL ACCIDENTE EN FUNCION DEL DIA DE LA SEMANA

			Dia de la semana				
			LABORABLE	VIERNES	SABADO	DOMINGO	Total
Hora del accidente	23 a 7 horas	Recuento	1945	794	1538	1441	5718
		% de Hora del dia agrupada	34,0%	13,9%	26,9%	25,2%	100,0%
		% de Dia de la semana agrupado	12,2%	17,2%	34,4%	36,2%	19,7%
		Residuos corregidos	-35,6	-4,6	26,9	28,2	
	7 a 12 horas	Recuento	3372	833	556	566	5327
		% de Hora del dia agrupada	63,3%	15,6%	10,4%	10,6%	100,0%
		% de Dia de la semana agrupado	21,1%	18,0%	12,4%	14,2%	18,3%
		Residuos corregidos	13,4	-,5	-11,1	-7,2	
	12 a 16 horas	Recuento	4141	1060	837	683	6721
		% de Hora del dia agrupada	61,6%	15,8%	12,5%	10,2%	100,0%
		% de Dia de la semana agrupado	25,9%	23,0%	18,7%	17,2%	23,1%
		Residuos corregidos	12,4	-,3	-7,6	-9,6	
	16 a 19 horas	Recuento	2833	800	641	526	4800
		% de Hora del dia agrupada	59,0%	16,7%	13,4%	11,0%	100,0%
		% de Dia de la semana agrupado	17,7%	17,3%	14,3%	13,2%	16,5%
		Residuos corregidos	6,1	1,6	-4,3	-6,0	
	19 a 22 horas	Recuento	3699	1129	902	766	6496
		% de Hora del dia agrupada	56,9%	17,4%	13,9%	11,8%	100,0%
		% de Dia de la semana agrupado	23,1%	24,5%	20,2%	19,2%	22,4%
		Residuos corregidos	3,5	3,7	-3,8	-5,1	
Total		Recuento	15990	4616	4474	3982	29062
		% de Hora del dia agrupada	55,0%	15,9%	15,4%	13,7%	100,0%
		% de Dia de la semana agrupado	100,0%	100,0%	100,0%	100,0%	100,0%

2. On the other hand, it is important to properly represent this information on a graph in order to facilitate its understanding. For that, after having studied several methods that were easily understandable for road safety agents, the utility of

using panel graphs - as the ones that are presented in the following example – was posed.

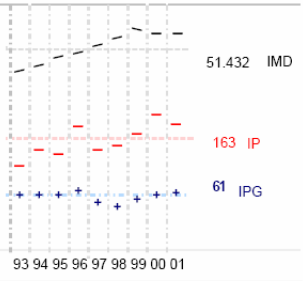
Tabla de contingencia A2-64: Víctimas por Edad agrupada * Tipo de unidad



3. In another range of things, one of the topics that quite bother at the municipal level is the accident rate monitoring by streets. This is due to the type of responsibility that hold the municipal authorities and the possibilities and priorities of intervention on the traffic management in the streets. For that, several procedures have been tested to propose a database prototype that could offer comparative graphical and statistical outputs that could allow a detailed monitoring per street. An example of it is shown hereafter.

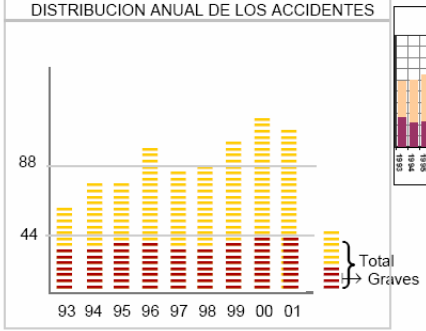
Código: 900 | Calle: | Eje viario: RESTO VIAS | Sentido: DOBLE | L(Km): 2,875

	Accidentes Con VICTIMAS	Accidentes GRAVES	MUERTOS	IMD	Km X Vehículo	IP	IPG
1993	59	30		45.777	48.036.905	122,8	62,5
1994	73	30	1	46.845	49.157.518	148,5	61,0
1995	72	32	1	48.767	51.175.199	140,7	62,5
1996	96	35	2	50.185	52.807.368	181,8	66,3
1997	80	31	1	52.255	54.835.014	145,9	56,5
1998	85	29		53.464	56.104.158	151,5	51,7
1999	101	35	2	55.656	58.403.965	172,9	59,9
2000	115	37		54.469	57.315.177	200.6	64,6
2001	110	37		55.472	58210880	189.0	63,6
TOTAL	**791**	**296**	**7**	51.432	486.046.184	162,7	60,9



IMD: Intensidad Media diaria IP: Indice de Peligrosidad (Accidentes con víctimas cada 108 Vehículos X Km)
IPG: Indice de Peligrosidad Grave (Accidentes con víctimas graves o mortales cada 108 Veh X Km)
Víctima mortal: Fallecido dentro de las 24 horas después del accidente Víctima Grave: Hospitalizada más de 24 horas

DISTRIBUCION ANUAL DE LOS ACCIDENTES



TIPO DE VEHICULO

	N	%	REF %
Turismo	909	56	53.2
Ciclomotor	241	15	17.9
Motocicleta	165	10	8.5
Bicicleta	58	4	1.6
Furgoneta	59	4	4.4
Autobus	26	2	1.9
Taxi	25	2	1.3
Camión	18	1	1.6
Peatón	130	8	9.4
OtrosVeh	2	0	.3
TotalVeh	1633		

TIPO DE ACCIDENTE

	N	%	REF %
Colisión	460	58	66.6
Obstáculo	3	0	.3
Salida Via	73	9	7.8
Atropello	99	13	17.6
Vuelco		0	0.5
Otros	45	6	7.2

N: N° de accidentes/vehículos/víctimas
%: Porcentaje que, para esta calle, supone cada categoría. Las barras son %.

REF%: Porcentaje que, para el conjunto de la ciudad, supone cada categoría (Valor comparativo de referencia)

CRUCE / SECCION

	N	%	REF%
En Cruce	488	62	55.9
En Sección	303	38	44.1

EDAD DE LAS VICTIMAS

	N	%	REF %
De 0 a 6	6	1	0.7
De 7 a 13	17	2	1.3
De 14 a 17	100	9	5.4
De 18 a 21	244	23	16.0
De 22 a 25	223	21	16.2
De 26 a 29	109	10	11.6
De 30 a 39	174	16	20.5
De 40 a 49	91	8	12.2
De 50 a 59	61	6	8.2
De 60 a 69	31	3	4.7
Más de 70	20	2	3.2
TotalVícti.	1076		

DIA DE LA SEMANA

	N	%	REF %
Lunes	118	15	13.8
Martes	95	12	14.1
Miercoles	94	12	14.7
Jueves	117	15	14.6
Viernes	119	15	16.2
Sabado	143	18	14.5
Domingo	105	13	12.1

HORA DEL ACCIDENTE

	N	%	REF%
De 23 a 7	230	29	17.4
De 7 a 12	149	19	19.5
De 12 a 16	176	22	24.2
De 16 a 19	105	13	16.5
De 19 a 23	131	17	22.3

2.4. Section 4. “Best practice” (3): Urban Agglomeration of Murcia.

The development of this section has been performed with the collaboration of the Municipality of Murcia, particularly with the mobility service[4].

This action has also included a general study of the urban accident rate collection and analysis systems in collaboration with the persons in charge in the municipality and in the local police. The results and conclusions have been integrated, as for the other cases, in the section 1.

The “best practices” specific part that appears in this section makes reference to two fundamental aspects:

1) An intensive exploitation and use of the accident rate data as a tool to carry out a local multilevel in-depth diagnostic study, which will be the starting point to develop a large urban road safety local plan.

2) Integration of the accident rate data and studies into the mobility ones in order to test its utility when used to offer recommendations on urban restructuring, especially taking into consideration the urban road safety aspects related with the mobility ones.

The diagnostic study carried out in Murcia features a structure by differentiated analysis levels in order to be able to be informed of the structural characteristics of Murcia as well as the needs, in the detail level, of results where the initial statistic analysis data shows that there might be some specific safety problems. On the other hand, several work methodologies and data sources and complementary information have been melded (statistical analysis, study of the mobility survey data, field observations, analysis of the proceedings…) and this enables to have a more global vision on the studied problem for each case. The same way, two groups of accidents have been analyzed: (1) The accidents that cause victims or injuries (those are usually taken into account in the official road accident rate statistics both national and local) and (2) the accidents without any victims or injuries that even if they are less complete, improve the study.

[4] The convention with the Municipality of Murcia *SEVAM: The factors that affect the road safety and the action proposals for the Municipality of Murcia*

As for the structure by levels of analysis, three levels, from the most general or macro to the most specific or micro, have been differentiated.

1- Macro Level. In this level, (1) a global study on the accident rate state in urban areas, taking as well into consideration the mobility data (2), is carried out. It has been tried to identify and place in the space and time the main risk factors that condition the accident rate at the macro level. The same analysis techniques as the one applied in Valencia have been applied. This first level of analysis offer relevant information that may allow the establishment, from a social, educational, normative and police supervised perspective, of main directives in the road safety policies at a global level.

From the macro analysis results, a selection of urban roads from a large sample has been done in order to undertake an individualized specific analysis.

2- Intermediate level of analysis and observational study

The intermediate level of analysis and observational study are constituted of (1) an individualized detailed statistical accident analysis of each road and (2) a field observational study – on-site – of each one of the road.

The conclusions that are drawn from the study of these roads are applicable to these ones as well as, while a representative sample of all the roads are developed, it allows to draw conclusions and advices which can be applied generally in the urban road as a whole.

3- Micro Level. It implies the analysis, at the individual level, of all the available information on fatal accidents. It provides richer information on the causes of the accidents.

As to the work methodologies and the data sources, we may distinguish:

1. Statistical data analysis. This analysis is applied in the macro and intermediate levels. As regards to the analysis types, descriptive indicators (univariate and, particularly, bivariate) are basically used aiming to identify conditions where the risk is increased. This has been carried out by means of the use of cross or contingency tables, analysing the marginal distributions of the variables that cross as well as, particularly, the conditional distributions, using as statistical contrast “chi square” tests and a “cell by cell” study of the standardized residuals values. These are the same techniques already shown in the Section 3: Valencia.
2. Qualitative in-depth specific study of the accident reports and reports about the accident reconstitution referred to fatal accidents.

3. Field observational study. Field visits are carried out in the conflictive points and roads selected for the intermediate level.

The most interesting thing of this approach is that it has allowed to work from top to down, allowing going in-depth as the concrete problems were appearing. From this approach, actions at all the levels are derived from, from educational campaigns to specific groups to concrete actions on points or stretches of the road network.