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Guide of "best practices" for the collection, management and analysis of the road accident data in urban zones
Final

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1. Backgrounds

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 traffic accident (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) Writing and spreading go the Guide of Best Practices throughout the European Union.

Each phase feeds information to the following phases, and sets the basic guides to develop the different raised studies (Illustration 1)

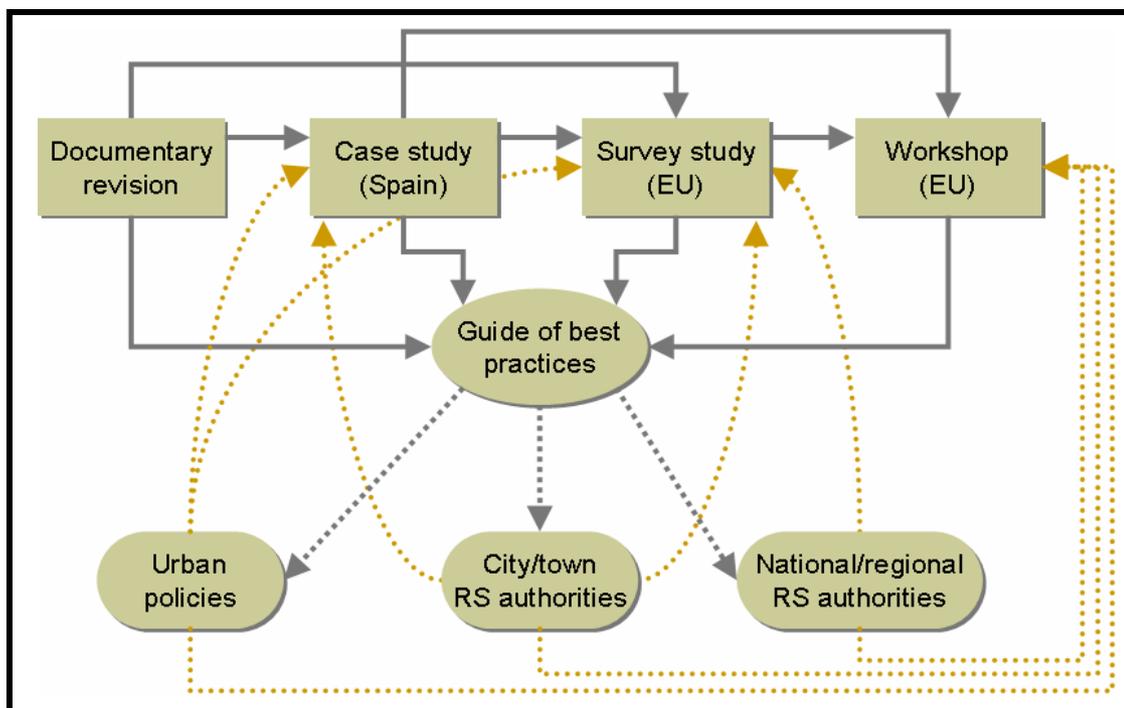


Illustration 1: Structure, phases and collaborations of the SAU project

The document that is presented hereafter corresponds to the Deliverable IV: Guide of “best practices” for the collection, management and analysis of the road accident data in urban zones.

This guide tries to serve as a technical working document to set up measures directed to the improvement of the collection procedures, data quality, and achievement and dissemination of the statistical results.

For that purpose, all the ideas and recommendations gathered in the SAU project framework, as well as the ones set in the European Statistics Code of

Practice developed by the Commission of the European Communities (COM(2005) 217 final), have been compiled.

The document is structured in two parts:

- On the one hand, a summary of the different phases of the project and the results gathered in the Deliverables I, II and III is presented.

- On the other hand, organized in several sections, there is a compilation of best practices and indicators to evaluate the procedures of the road accident data collection, storage, management and analysis. We only want to point out that many of the recommendations might affect several of the considered sections and that the differentiation obeys practical aims to consult and organize the information.

2. Best practices

The set of guidelines or possible lines of improvement are organized in the following working areas involved in the traffic accident collection, entry, management and analysis procedure in urban zones:

- Institutional context.
- Adequacy and homogenization of the collection criterions.
- Improvement in the data entry procedures.
- Improvement of the data collection questionnaire
- Improvements in the computer system for the traffic accident data management and analysis.
- Use of new technologies and introduction of the GIS.
- Integration of the information through the linkage of several data sources (hospitals, emergency departments, insurance companies...).
- Training to the technical staff in charge of the system at any stages (collection, entry, management, analysis and evaluation of the interventions).
- Data quality control.
- Analysis and statistical production processes.

These practices have been developed to be applied in urban zones. However, many of them could be applied in the road field generally.

2.1. Institutional context

The institutional and organizational factors have a significant influence on the efficiency and the credibility of the authority that develops and publishes the statistics, and many times, it can limit or favour the good functioning of the process (COM(2005) 217 final).

In this field, the following best practices are defined:

- The municipal authorities should establish agile channels of collaboration and information exchange with the traffic and the road safety. This favours the experience exchange in the field, with the consequent exploitation of the successful experiences and the avoidance of the errors.
- Together with the central administration and as far as possible, proposals to set new standardized procedures that allow optimizing and homogenising the current local practices as well as maximising the use of the great amount of accident data that are nowadays produced by the local administrations will be developed.
- It is advisable to favour the development of events where the experience exchange between the police forces of different municipalities in each country is favoured.
- Likewise, collaboration experiences and information exchange between several EU cities have to be enabled.
- There is a need to lay out the appropriate ways to increase the participation and presentation of proposals from the municipalities to the different European organizations where the recommendations referring to the traffic and road safety information management and analysis systems are set.
- The Urban Accident Analysis Systems (UAAS) have to be integrated in the Urban Safety Management (USM) systems, which are treated as an integral part of the urban mobility management.
- The road safety, and the urban accident management and analysis plans have to establish the collaboration of several specialists and

professionals (engineering, health, education, psychology, police planning, legislators...)

In addition to the ones already mentioned, we want to insert several recommendations gathered from the Code of Practice on European Statistics (COM(2005) 217 final):

- In the local legislation, the mandate to collect information for the production and dissemination of official statistics about accident rate and road safety should be specified in law. Moreover, it should be allowed to use administrative records for statistical purposes
- The local statistics departments or units have to enjoy the independence from police interferences and other external interference in producing and disseminating official statistics.
- The statistical work programmes should be published and periodic reports describe progress made, in the field of road safety and accident rate.
- The local authorities should assign appropriate human, financial and technological resources, both in size and quality, in order to fulfil the tasks programmed in the accident data collection and analysis procedures.
- The statistical confidentiality principles have to be guaranteed from the establishment of legislative and technical procedures that keep the privacy of the information supplied by the ones involved in accidents and its exclusive use for statistical purposes.
- The information on the methods and procedures used by the local statistical authority has to be available for the public and its choice has to depend on scientific considerations.

2.2. Collection criteria

This section insists on the standardization and homogenisation of the criteria used to collect, organize and process the statistical information. This standardization allows carrying out comparisons among several areas (local, regional/national, European), and favours a clarification of the minimum contents or procedures that have to be taken into account in order to manage and effectively use the information on road safety and accident rate.

In this section, the following best practices are defined:

- The actions meant for the criterion standardization (local, regional/national or European) have to consider in their implementation the assessment of the effects on the collected data quality.
- Officially, the criteria, which must be used to define the fields that the agents have to collect, have to be set so that they dispose of objective tools to detect the information and transfer it to the administrative, legal or statistical documents.
- Not only do the data content and coding criteria have to be standardized, but also the procedures through which the information is obtained, guaranteeing the homogeneous understanding for the persons in charge of its collection and processing.
- Excellent contents and collection criteria to obtain quality information should be defined without implying a cost increase for the organization (economic point of view, resources, efforts...). This choice has to be carried out from the consensus of the organizations involved in the procedure, once the benefits/costs have been valued, taking into account the recommendations of the technicians and/or specialists in the field of accident data collection and processing.
- Manuals must be written and/or training interventions for the police forces must be developed, which define the information minimums and how to obtain and codify it. These actions should be developed by taking into account the standardization recommendations that should exist at the European level.

- The accident databases have to consider in detail the differentiation of the contents to collect according to the context in which the accident happens. In this sense, it would be advisable to collect different information according to the following aspects:
 - The characteristics of the road infrastructures (differences road/urban zone).
 - Accident severity (fatal, serious or slight).
 - The types of traffic units involved.
 - The complexity of the accident (the sequence of events).

2.3. Data entry procedures

This section stresses on the actions aimed at improving the field work the police, insisting on fast, easy and especially efficient procedures (appropriate quantity of information through the smaller cost).

In this section, the following best practices are defined:

- Standardized and structured traffic accident data gathering and collection procedures have to be developed and put into practice.
- The accident data collection and management procedure carried out by the police has to be framed in a wider investigation, reconstruction and legal-administrative management procedure, being synchronised with the statistical practices in order not to lose efficiency and quality. The information gathered with this procedure should be considered as an accident investigation tool at the local/regional/national level, and not only as a legal-administrative procedure.
- The same police officer/patrol specialized in accidents must take care and follow up, as far as possible, all the information acquisition and completion procedure. This practice avoids many data quality problems, because the person in charge of the record has a complete idea of what happened and how it is reflected in the database. This

allows a greater implication of the agents and an increase of the motivation to carry out his work.

- The computerization and automation of many procedures are necessary. This achieves avoiding that the accident data collection practice affect by a work overload the agents (each data is filled in once), in addition to facilitating the information obtaining and transmission (administrative processing of the data or sending it to organizations like insurance companies, central administration, courts...).
- Actions of monitoring the evolution of the victims at 30 days should be carried out. It has been demonstrated that this monitoring is much easier if it is carried out locally, given the amount of incidents or serious accidents that are usually collected, especially in the case of the small-sized municipalities.
- Actions or procedures to increase the motivation of the staff in charge of the collection should be schedule and put into practice:
 - Insist on the importance of the statistical report and the role of the police officers in the whole procedure. Beyond an administrative procedure, the accident reports are essential investigation tool to improve road safety.
 - Make the agents in charge of the accidents take part in the design of the data collection system.
 - Give a feedback of the statistical results to the police and the way the information has been integrated in the local action programmes. It is important for the agents to notice the utility of their work, appreciating the impact of the results in the development of the improvements in the context of their own municipality.
 - Involvement of the agents not only in the information collection process but also in the process of providing intervention suggestions in order to improve road safety.

2.4. Collection questionnaires

This section shows all the interventions specifically linked with the improvement of the accident data collection protocols or questionnaires, both in the traditional format (paper) and the computerized one.

In this section, the following best practices are defined:

- There must exist a locally structured and, as far as possible, standardized collection protocol (compatible or adaptable to the systems developed at the regional/national level), specifically designed for the urban areas.

The contents of the collection questionnaire have to be adjusted to the specific characteristics and conditions of the urban context. An example is the introduction of specific fields in relation with urban elements in the definition of the possible accident types (e.g. collision against a streetlight, a container, urban infrastructures...), or the specification of road types particular to the urban context (e.g. pedestrian streets, parks, bus or bicycle lanes...).

- Systematic and periodic reviews of the accident report, and of the collected data, should be carried out with the objective of delimiting problematic information fields and types, or adding new fields derived from the modifications generated throughout time in the traffic context. From these reviews, it is possible to derive possible modifications that, in case of being implemented, have to be done by taking into account the comparability between the data before and after the modification and the difficulties of integration with the regional/national systems. The persons in charge of the data collection must actively take part in the decisions to be taken upon such modifications.
- The questionnaire has to be simple, easy, fast to fill in and integrated to the system.
- The questionnaire has to gather information on the accident conditions, causes and consequences.

- Excellently, the questionnaire information should be directly entered electronically, avoiding the task duplication that implies filling in manually at first and then passing it electronically.
- The information that is requested in the questionnaire has to be the indispensable and exclusive one of the police procedure, and could not include the one that could be obtained from other records or official documents.
- There should exist content manuals that exhaustively describe the criteria to fill in the information fields of the accident statistical report.

In these content manuals, for each information fields, each one of the categories or alternatives of reply and their meaning is defined.

- New methods – closer to the complex reality that an accident analysis implies - to define the information fields should be used. In this sense, we put as an example the use of sequencing methods to define the accident type that is being collected. In Spain, the METRAS method has been developed in this direction.
- The questionnaire should have unique identifier fields for the vehicles and the victims, which allow the linkage with external data sources (vehicle record, hospital data, insurance company data, etc.). An example of unique identifier is the vehicle registration number or the national identity card of the victims.

2.5. Computer system

In this section, the requirements that have to meet the accident collection systems to reach an appropriate balance between the needs and the available resources (by trying to avoid too sophisticated computer solutions, even though with an appropriate level of information systematization and organisation) are specified.

In this section, the following best practices are defined:

- At the urban level, any municipality (regardless of the size) must have database tools for the accident data collection, management and analysis. Such tools might have been developed locally or made available to the municipalities by the regional/national authorities. Anyway, these local systems must be compatible, or must be able to be adapted to the national information systems, so that the data transmission could be done smoothly, easily and reliably.
- The accident data collection and management system has to take into account all the procedures and the documents produced by the accident police investigation and legal procedures (accident report, reports, proceedings, technical reports, etc.), integrating the information in a unique record, in order to try to reduce the work generated by each accident, avoiding the task duplication.

The documentation produced by the police actions for the accidents should be computerized, so that it could be electronically sent to the different organizations that receive the information.

- Excellently, these systems should be an integrated tool that would consider both data entry and the execution of queries and statistical analysis, as well as the visualisation and the spatial analysis of the data on a map display.
- The collection system should be based on a relational structure. An appropriate relational data structure could be the one where three data or organization tables are considered: 1) general data of the accident, 2) data of the vehicles and 3) data of the persons.
- There must exist an official technical document where the technical and procedural characteristics of the system are described and defined: definition of the data tables, criteria of relation between the tables, information fields and coding of the different values corresponding to the fields.
- The system has to consider the possibility of importing data (e.g. if the entry is carried out in another database), as well as exporting data in order to carry out statistical analysis in a specialised software

or to transfer it to the different regional and national administrations (therefore avoiding the need to enter the data twice).

- The system must be easy to use. Usually, the final users of the system are not expert in database management and statistical analysis. This has to be taken into account in the design of the interface and of the system use procedures. Nevertheless, the training of the users is fundamental.
- The accident database system should integrate procedures optimized for the data entry. This enables reducing the time needed to fill in the information. Some examples of these procedures are the use of a multiple choice of the answers, or the auto-recovery of the information that was already available in the system (e.g. recidivists, vehicle information...).
- On the other hand, it should have automatic filter systems to detect and correct errors and to reduce the under-recording. This enables improving the quality of the collected information importantly.
- Moreover it should allow carrying out queries and statistical analysis automatically or semi automatically, being those defined according to their importance in the local study of the accident rate.
- Added to what precedes, the system should be flexible. The systems cannot be inflexible; they have to allow new queries and analysis according to the needs of the users.
- The system should be able to evolve, allowing and providing the necessary modifications to be adapted to future changes depending on the priorities of the moment or the incorporation of new important elements of the accident rate to the collection systems (e.g. modification of the formats and/or the contents of the accident questionnaires or database, as well as modifications in other linked elements, like GIS).
- The system should be able to provide technical and/or statistical information in short periods of time. Once the information has been entered in the system, the data debugging and processing procedures

should have a high level of automatization so that the availability of the information could be practically instantaneous. In the same line, if the access to the information is that fast, it would allow speeding up both the investigation and the preventive actions to be carried out in the risk zones of spots.

- The system has to be technically and economically cheap, as far as its maintenance is concerned.

2.6. New technologies and the GIS systems

In this section, the possibilities or benefits the new technologies offer in the improvement of the data collection, management and analysis are described.

In this section, the following best practices are defined:

- The accident report has to be filled in with the assistance of expert or intelligent support systems for the data entry. It would be interactive systems, through which the agent is answering the questions the computer is raising according to the information he is entering (in a conditional or hierarchical way). The system identifies the questions that need to be answered according to the accident, place, etc.

These expert systems allow:

- Reducing the amount of missing data (as it is a guided entry, it does not let the user going through the next field until the previous one has not been filled in)
 - Reducing the errors and inconsistencies (data check)
 - Reducing the time needed to enter the data (the guided entry only shows the needed items according to the answer given to the previous items).
 - Being used to collect data coming from different fields of actions and not only the accidents, with which the implementation and maintenance costs are paid off.
- The information regarding the localization and the geographical visualisation of the accidents has to be collected and managed through the use of Geographical Information Systems (GIS). These

systems need appropriate digitalized cartographies that may be integrated and adjusted to the accident data management programmes and database. The development of cartographic systems used through the Internet may favour a fast progress (e.g. Google Earth).

- The in situ accident data collection should be carried out through PDA's and laptops with a remote connection. This – in addition to make the collection easier – would allow the agent to have information on what had previously happened in the place he is analysing at the time, assisting him in his investigation.
- The accident data collection and storage system should have graphic design tools that allow creating sketches rapidly, easily and in detail.
- The system should allow the integration of information in several formats: text, pictures, videos, sketches, maps, etc.

2.7. Integration of the information: Networks of data sources

This section tries to focus on the importance and usefulness of creating an integrated network of data sources. This integration may be done in a centralized way (in a unique database that collects all the information supplied by the different sources) or in a radial way (each source has its own database but there are unique identifier mechanisms in order to be able to link the databases).

In both cases, the objective is to reduce the amount of information that each organization has to collect, in addition to the improvement of the quality of the obtained data (the specialists in each field do have more reliable criterions as for the information fields they have to fill in).

In this section, the following best practices are defined:

- The accident database should have internal linkage mechanisms with other databases available in the police information system (only for statistical purposes): data on traffic (density, volume...), on the

infrastructures (characteristics, signs...), on the vehicles (vehicle records), on the involved persons (offence or complaint records, driving licence records...), etc.

- Furthermore it should have unique identifier fields that allow the linkage with the external databases of the health system (hospitals, emergency departments, forensics...) or of the insurance companies. This type of sources is the one with the most reliable information on the severity of the victims and on the conditions in which the accident happened.
- Another option of which results could be very beneficial would be the development of an accident collection and management system that would centralised the information coming from several data sources.

In addition to the mentioned ones, we want to present, because of its relevance, several recommendations taken from the European Statistics Code of Practice (COM(2005) 217 final):

- The urban accident statistics should be compiled on the basis of common standards with respect to scope, definitions, units and classifications in the different available information sources.
- Statistics from the different information sources are compared and reconciled in order to obtain coherent results.

2.8. Training

The lack of specific training on the traffic accident collection systems is a generalised deficiency in many police associations, mainly at the urban level.

An organizational system well trained in the requirements needed by his professional task is generally a motivated system which results are not only more efficient but they also have a greater quality.

In this section, the following best practices are defined:

- In the police action programmes, the organization of courses or training interventions to give to the units in charge of the accident

data collection the necessary knowledge to efficiently (rapidly and smoothly) carry out their work must be specified. This training has to start from how to investigate an accident up to how to obtain the information and to codify it in the database. This training must also insist on motivational and psychological aspects that enable triggering the appropriate behavioural mechanisms faced with an emergency situation like an accident (there might have serious victims, there is confusion, the danger of new accidents, etc.), this may affect the quality of the collected data.

- In the police action programmes, the organization of courses or training interventions to give to the units in charge of the accident data collection the necessary knowledge to efficiently and scientifically carry out their work must be specified. This entails the specific training in particular methodological and scientific procedures adjusted to the statistical needs of the municipality. As the investigation level is more detailed, the techniques to be used will be more complex.
- The police should receive a basic training in result interpretation and statistical report creation, being allowed to actively take part in the establishment of intervention or prevention measures regarding particular risk spots or areas derived for the analyses. This type of action increases the motivation of the agents regarding the usefulness of his work and regarding the need that the data collection procedure has to be done exhaustively and properly.
- The police training programmes should be continuously carry out and be adapted to the new conditions, technologies, methods and procedures, in line with the changing and dynamic nature of the traffic situations.
- The phases involved in the accident collection system (data collection, entry, management and analysis) should have their manuals and/or material/technical resources to solve any doubt or problem that might rise during the fulfilment of his work. Likewise, it could be advisable

to have an internal or external technical consulting department to the police unit in case it could be needed.

2.9. Quality control

All the sections implicitly show different questions that affect the quality data. In this section, we treat more directly and in detail specific recommendations for the improvement and the control of the quality.

- The databases must integrate optimized procedures for the data entry and management with the objective of increasing the data quality: it increases the coherence and the homogeneity of the entered information, it reduces the missing data, it allows the use of the same data for several administrative-legal procedures, and it reduces the time needed to fill in the information.
- For a correct manual data entry, filters and automatic checks have to be set in the database. The objective is to detect errors, incoherent and/or impossible data during the data entry process.
- Officially, standard mechanisms of quality monitoring and control of the data collection, processing and the spreading of the statistics have to be defined.
- Quality control studies have to be carried out – or specific quality systems have to be implemented – that evaluate the functioning of the current systems regarding the work procedure and the quality of the resulting data, and with regard to the exploitation of the data collected locally. From these diagnoses, it is possible to start establishing which could be the general lines of the possible improvements, concretely adapted to each municipality.
- Training and incentive programmes should be developed for the agents in order to improve the quality of the data collected on accidents. This should be accompanied with an appropriate feedback in the task they usually carry out.

- Periodical statistical analyses have to be carried out and focused on the missing data and the errors, with the objective of diagnosing the problem sources to be able to carry out the needed corrections.
- Facing situations in which it is impossible to obtain all the required information, the agents must prioritize the reliability in front of the exhaustivity. It is preferable to have less information but reliable and that is correctly adjusted to reality. This aspect is important especially for its statistical consequences (missing data can be dealt with in a relatively good manner, but the error treatment is far more complex).
- Periodically and from the studies carried out on the data quality, a review of the contents of the reports should be carried out, reconsidering the information possibly available by ensuring minimum levels of accuracy.

2.10. Analysis and production of statistics

Quality statistics must be leant on a strong methodology and on appropriate statistical procedures, applied from the data collection until their validation.

In this section, the following best practices are defined:

- The municipality must have specialized tools, procedures and knowledge to be able to manage and analyze its own accident rate, with a sufficient level of detail to direct road safety programmes adapted to its characteristics. This passes by (1) the exploitation of the national systems and procedures, avoiding entry data task duplications and transcriptions, as well as the delay in the availability of the data, and (2) the development and implantation of “expert” systems and computer tools that enable and facilitate the accident data management and analysis to the local authorities.
- The persons in charge of the analyses and the creation of the statistics must have received enough training on the tools, techniques, analysis methods and interpretation of the results.

- Official documents where the basic level of depth that the statistical analyses to be carried out in the municipalities must reach have to be created. The achievement of in depth studies should be internally set according to the needs and characteristics of each area.
- Risk exposure indicators (population, vehicles, covered km, etc.) should be used to relativize the information on accident rate, allowing comparisons between areas/municipalities.
- When exposure data are not available, other mechanisms of analysis of the accident rate patterns should be explored in order to allow making comparisons between the municipalities: mobility parameters, size, type of activities (services, industry, tourism...), etc.
- Methods specialized in spatial analysis should be used: exploration of routes opposite to streets, or definition of the intersection analysis procedures, identification of black spots at the urban level, use of GIS...

The accident rate analysis systems in which GIS has been introduced complement the more traditional approach of evaluating stretches or spots of accident concentration with the new developments coming from the accident data spatial analysis. This type of approaches gives a greater importance to the concept of accident rate "areas" (opposite to the concept of spot) with a wider and dynamic character, where many other elements linked with the mobility intervene, elements that are not easily detectable with simple and punctual approximations.

- The criteria, especially for the urban areas, for the detection and assessment of the risk zones (accident concentration zones) or the black spots should officially be established. This type of criteria has traditionally been specified for the roads but not to be evaluated at the urban level.
- Studies to evaluate the interventions should be carried out: before-after or prospective studies.

- The municipal organizations have to create and spread public reports or statistical documents about the local accident rate, setting the action guidelines to improve the figures and preventive recommendations for the whole population. The reports should state the methodology and the procedure to obtain the data in order to ease the interpretation of the results.
- The local statistical/administrative production should be carried out through automated outputs from the information entered in the system: basic data for the involved persons, technical reports or accident reports (for the insurance companies or the courts), information from other administrations or police units and local statistics (diagnosis of the risk zones and improvement proposals).
- The statistical production must be carried out periodically and as less delayed as possible (relatively updated data).

In addition to the ones already mentioned, we want to insert several recommendations gathered from the Code of Practice on European Statistics (COM(2005) 217 final) that we adapted:

- Co-operation with the scientific community to improve methodology should be organised and external reviews should assess the quality and effectiveness of the methods implemented and promote better tools, when feasible.
- Procedures that guarantee the coherent application of concepts, definitions and standard classifications should exist.
- The moments when the statistical production will be spread have to be officially specified.
- The statistics carried out at the urban level should be consistent internally.
- The statistics carried out at the urban level have to be presented in a form that facilitates proper interpretation and meaningful comparisons
- The spreading of the urban statistical production should be carried out through modern technologies of information and communication (web, blogs...), in addition to the corresponding traditional printed copies.

- Access to microdata must be allowed for research purposes (whenever this access is subject to strict protocols of treatment and spreading, observing the confidentiality principles).

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More information on the SAU project at:

<http://www.uv.es/sau/>