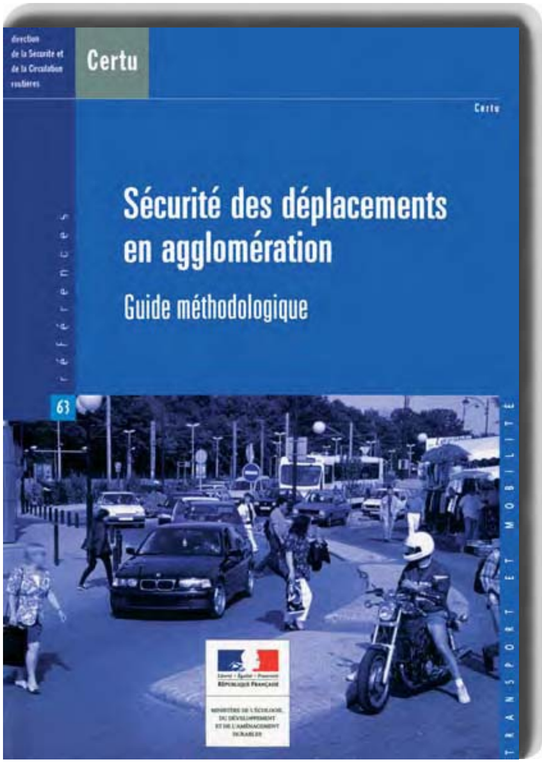
Certu

Transport and mobility

Transportation safety in urban areas

Methodological guide

English version



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RÉPUBLIQUE FRANÇAISE

Ministère
de l'Écologie, de l'Énergie,
du Développement durable
et de l'Aménagement
du Territoire

Transportation safety in urban areas

Methodological guide

Certu

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The purpose of translated documents and publications is to pass on to non-French speaking readers the French know-how set out in the original publication, whether this concerns methodologies, tools or best practices.

Original publications in French are subject to a checking process, which enables CERTU to guarantee their content. English versions do not undergo the same process, and consequently CERTU cannot be held liable for their content.

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Reference collection

This collection includes the technical guides, methodological guides and other works that present in an educational way what the ordinary professional needs to know within a relatively broad given field. Certu guarantees the content in the French version.

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Note on illustrations

The photos used in this document are used to illustrate the text and do not necessarily represent the example to be followed.

Contents

Before roads and paths disappear from the landscape, they disappear from the human soul : man no longer has the desire to journey and to enjoy it.

What's more, he no longer sees his own life as a road, but as a highway : a line that leads from one point to another, from the rank of captain to the rank of general, from the role of wife to the role of widow. Time becomes a mere obstacle to life, an obstacle that has to be overcome at an ever increasing speed.

***Immortality* – Milan Kundera**

Introduction

Travelling safely in urban areas

Two in every three accidents occur in urban areas and often involve vulnerable road users (such as pedestrians and motorcyclists). Provided traffic management schemes take into account all aspects of urban life, they constitute an efficient means of increasing safety[1]. In general, as they also affect factors other than safety, it is often difficult to consider this issue in isolation during a project. This is why the objectives in terms of safety – one element of traffic management – need to be linked with other objectives relating to urban, economic or "sustainable" development : accessibility, attractiveness, high-quality public spaces, good quality of life, social equity, heritage values, reducing noise and air pollution, reducing the share of motor vehicle traffic, developing other modes of transport, etc. However, these objectives do not always converge, nor do they always ensure safety. Put simply, as any action concerning urban spaces very often concerns all these aspects, compromise is essential.

The city of yesterday : built around the car

Between 1950 and 1980, in France as in other developed countries, most schools of thought in engineering were essentially centred on car travel. The aim : to allow motor traffic to flow with ever more ease, often to the detriment of other road users. A concern for "transport safety" was certainly present, but it was based on the separation of modes and flows, often the source of physical breaks in the urban fabric.

The context of sustainable development : rebalancing usage

Today, action that promotes safety forms part of a context of sustainable development (among other things) in which other objectives are also pursued.
"Change in urban policy is a necessity. One of the objectives to be achieved concerns sustainable development. This implies that cities areno longer only built around and for motor vehicles, but give new priority to other modes of transport (bicycles, pedestrians, urban public transport,etc.)." During the major debate on urban life and transport, *Habiter, se déplacer... vivre la ville*, in 1999, the position of the minister for infrastructure was clear : the car certainly has a place in the city, but the priority is to reconsider this place by redressing the balance between all modes of transport. Today, all conurbations and agglomerations are facing the same challenge : managing their urban transport system in a way which combines good traffic flow with environmental quality.

In urban transport plans, two priorities come to the fore : increasing the proportion of public transport and non-motor transport, such as walking and cycling,by making them more attractive ; and reducing motor traffic in city centres while increasing mobility on the outskirts of the city. All conurbations must tackle the double issue of developing roads for better traffic flow on the one hand, and preserving residents' quality of life (ensuring a quieter, safer and more pleasant daily living environment) on the other. The difficulty comes in achieving a balance between different uses and sharing the available space, so that everyone in the city can live together in harmony.

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[1] *Ville plus sûre, quartiers sans accidents, réalisations, évaluations*, Certu, 1994.

Traffic moderation

In France as abroad, experience shows the efficiency of speed reduction policies through schemes that benefit travel safety and the environment. This is why shared roadways must be developed, as these contribute to reducing vehicle speed and promote a better redistribution of public space between users while ensuring safety for all. By associating regulatory measures with the redesign of public space, 20 mph zones play a fundamental role in this approach as they provide a new concept of urban life that favours slower motor traffic.

Acting together in the fields of urban planning, traffic development and transport

Today, transport safety has its place in the ongoing debate on the quality of urban life. It is, in fact, linked to other problems, such as reorganising mobility, reducing noise and pollution, organising public space, etc., as the lack of safe travel cannot be resolved through the successive and uncoordinated treatment of geographically irregular problems. Any action concerning the urban environment should raise new questions (how does the conurbation work ? How should it be reorganised ? What are the issues at stake ?) while integrating "transport safety" issues.

Obviously, any work concerning transport safety in conurbations should first take account of the urban dimension of the location, whatever the scale concerned : an intersection, a street, a neighbourhood, even a town or city. This also presupposes that the three dimensions for work in urban spaces (urban planning, mobility, and development) have been integrated. These three dimensions may be considered in isolation, but it is often more effective to consider them together. The urban space brings together a multitude of conflicting actors that create uncertainty through their unpredictable behaviour. This gives rise to behaviour that is difficult to control and competitivity phenomena in terms of traffic space, activities,use of space, transport modes, highway organisation methods, etc.

Safety action in an urban environment requires, in most cases, an integrated approach, as in general it cannot be dissociated from fundamental choices in terms of urban planning and transport policy. This need for integration is present throughout this guide. Backed up by accident analysis, it applies to planning processes at all levels, whether it concerns one street or a whole city.

Before taking action : safety studies

Before action can be taken, it is necessary to carry out safety studies, which may be more or less in-depth, in order to be familiar with and understand the accidents observed in a given territory. Safety issue studies and analyses of the problems concerned enable the development of safety objectives and action priorities that offer – depending on the context – the maximum potential gains in terms of transport safety (highway development or redesign programmes, information activities, traffic regulation enforcement actions, awareness campaigns, etc.).

In what is a complex field, this guide constitutes an indispensable ally to help all parties concerned (highway managers and engineers, technicians, etc.) adopt an appropriate approach for studies. Full of current knowledge and practices, it uses much of the methodology developed since 1990, while complementing and illustrating it with concrete examples and case studies. These examples are presented in Chapter 2 ("Different types of safety studies") in summary form, and in a more detailed form on the attached CD-ROM.

How should this guide be used ?

Whether responding to an urgent situation, such as an accident in front of a school, or carrying out more general studies in the context of a local safety policy, this guide will enable you to familiarise yourself with the appropriate working methods and organise procedures for studies without impacting on daily workloads.

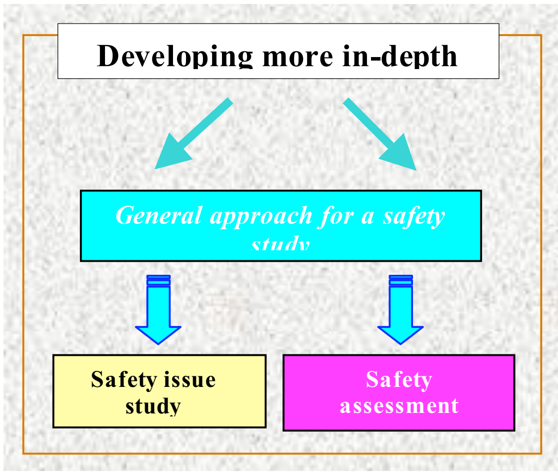
First, it details the general approach to be adopted for a safety study, by examining the different phases involved, and then presents the different types of safety study using examples.

You can read it from start to finish, for a detailed understanding of all aspects of the approach, or simply dip into the relevant section, e.g. in order to respond to particular questions posed by councillors or road users. Accordingly, the guide proposes two main entry points.

> Entry point 1 : more in-depth knowledge

Go to Chapter 1 to find out about the general approach for a safety study, in particular the safety issue study and safety diagnosis phases.

Each phase is presented in terms of a working method, complete with identity sheets which summarise the approach, information sheets which describe a particular procedure and example sheets which illustrate the approach. These sheets can be identified by following pictograms :



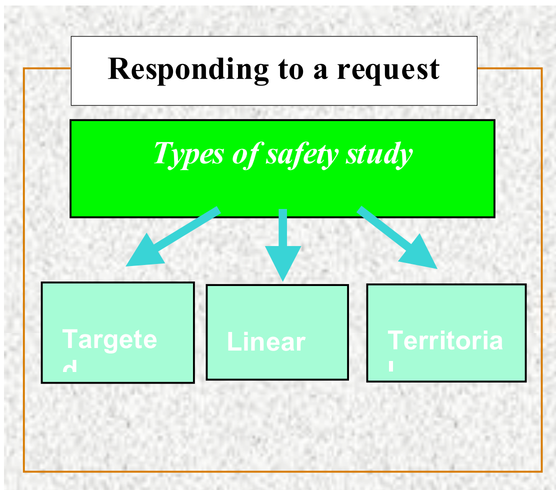
Identity sheet : the approach 

Information sheet : procedures 

Example sheet : illustration 

> Entry point 2 : responding to a request

Go to Chapter 2 to find out about the three types of safety study, their strengths and their specificities. Examples are provided to illustrate the advantages of each.



To ensure action is coherent and appropriate, you must take the time to analyse the situation before reacting.

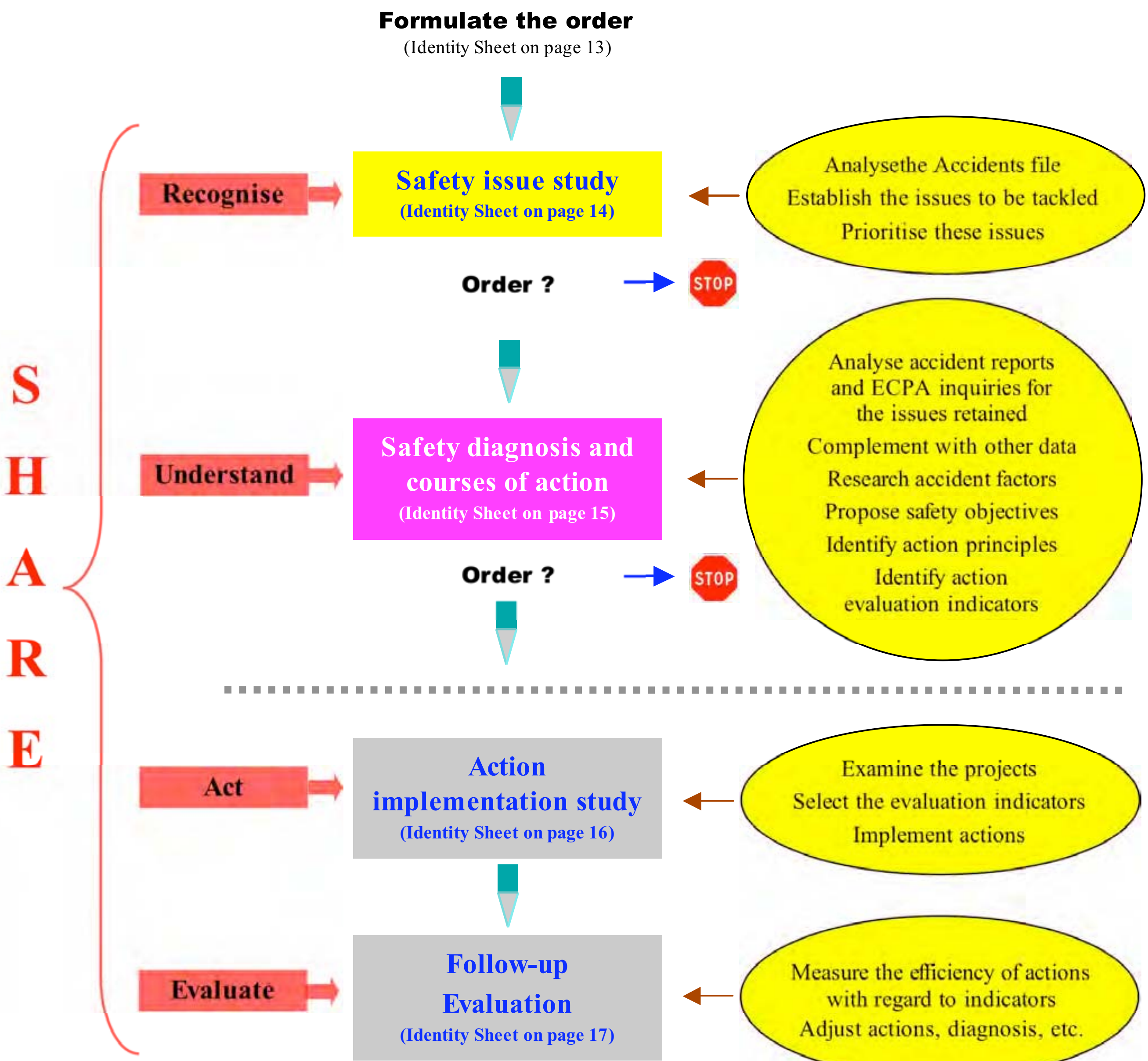
Chapter 1 : Recognising and understanding safety problems : Which method ?

General Approach

Based onaccident analysis, the general approach for an urban transport safety study starts with an initial order and ends with an evaluation.
Only the safety issue study and the safety diagnosis are examined in detail here. Other methodological documents may of use to the reader in the other phases (please refer to the bibliography in the appendix).

Carrying out a safety study : 4 phases

The overall diagram below describes the sequence and content of each study phase, from the order through to the evaluation.



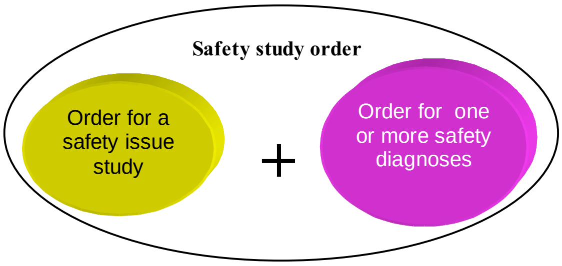
general approach

This division into study phases responds to two concerns : clarifying the order and implementing an applicable method over a wide territory.

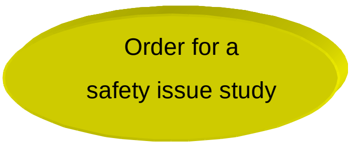
Clarifying the order – The safety study, based on accident analyses, may concern the whole approach or just one phase, the safety issue study, or the safety diagnosis.

Three types of order are possible :

a complete safety study with safety issue study and diagnosis (or diagnoses),



a safety issue study only,



a safety diagnosis only.

For orders made directly at safety diagnosis level for a precise target, a safety issue study may sometimes prove necessary in order to redraft the safety diagnosis order.

3 key conditions for a successful study approach

1) Knowing how to draft the order

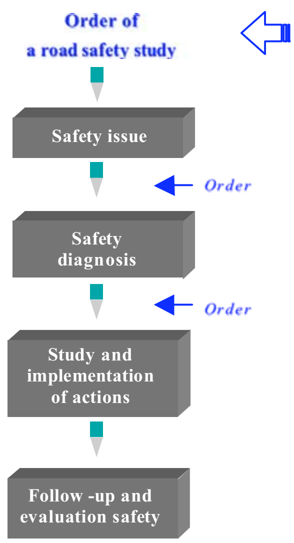
Drawing up the order must allow project backers to express their expectations and remove all uncertainties before starting any studies. The objectives of the order must be clear and must take account of limits and constraints. It is the study coordinator's responsibility to submit a complete, in-depth document to the project backer for validation. The main advantages are that this saves time in the long term, management are more closely involved, and a clearer, less ambiguitybetween the project backer and the study coordinator with regard to expected outcomes. Furthermore, the issuing of an order allows for the validation of results at the end of the study**.** The validation of a study phase is a condition for the issuing of theorder and the start of the next phase.

2) Involving as many actors concerned as possible

A safety study consists not only of reports between the project backer and the study coordinator. It also involves a wide range of actors of greater or lesser importance – in particular, those with the relevant knowledge and information (technical departments, etc.), those likely to be passing on information (elected representatives, associations, etc.) and those in a position to implement (or facilitate the implementation of) the safety study. The success of any safety study is reliant on continuous dialogue between these different actors, hence the need for information-sharing.

3) Sharing information

Sharing knowledge and information is a vital condition for the smooth running and completion of the study. At the end of each major step (safety issue study, safety diagnosis, etc.), the results must be presented to the different actors concerned in order to ensure they become fully involved in this approach. Technicians provide technical elements based on their analyses, experience and knowledge, which are then complemented by the points of view of decision-makers, users and associations. Good communication is essential, in order to ensure that the different actors understand the situation and become involved more effectively.



Drafting the order – Whatever the origin of the request, it is always important to obtain a clear and precise order from the project backer. Redrafting the study request enables the definition or clarification of an initial safety issue. Certain requests express a safety concern that requires verification.

Redrafting the request is also an opportunity to involve decision-makers. This involvement upstream makes it easier to implement a transport safety policy across a territory.

Different requests at the origin of an order – The initial request for a safety study may be very precise and oriented towards, for example, providing solutions to particular safety problems linked to infrastructure, or may be oriented towards improving transport safety in more general terms.

There are a number of different types of order :

- orders drawn up where there is no proven danger, but wherethere is an impression that a safety problem exists, e.g. speeding in a particular street ;
- orders drawn up as part of a particular local or national context. This is the case for orders issued "as a matter of urgency" following strong external pressure at decision-making level resulting from an emotional, spectacular or dramatic event ;
- orders issued as a result of accident analyses. Performance indicatorsand evaluations are regularly published. Analysis of such data may lead to a comprehensive study being commissioned. This type of approach is effective in promoting awareness-raising among decision-makers based on objective factors ;
- orders associated with a particular budget dedicated exclusively to transport safety action, e.g. in the context of DGOs (general orientation documents) ;
- orders resulting from an urban development project originally unconnected with safety issues ;
- orders issued as an integral part of planning projects (e.g. PDU, SCoT).

Depending on the type of order, the different safety study phases are not developed in the same way. The methodology, however, remains identical. Differences arise essentially from the extent of the field of investigation and the detail involved (urban data, behaviour, etc.).

Identity Sheet

DRAFTING THE ORDER

Definition

Expressing the initial request as precisely as possible, using the appropriate technical terms, in accordance with the initial objectives and constraints. Where appropriate, redrafts of orders must be validated by the project backer.

Objective

To ensure investigations are well targeted by adopting a suitable study method for the problem in hand.

Procedure

Taking account of isolated requests on a day-to-day basis does not preclude defining the order content.

1. Define the order's objectives

Objectives must be clearly stated, in agreement with the project backer, in order to avoid any ambiguity and help identify a suitable approach.

2. Put the order in context and identify all constraints:

- geographical and thematic limits ;
- availability and accessibility of data ;
- ensuring the approach has suitable resources (human resources, material resources, skills, data, etc.).

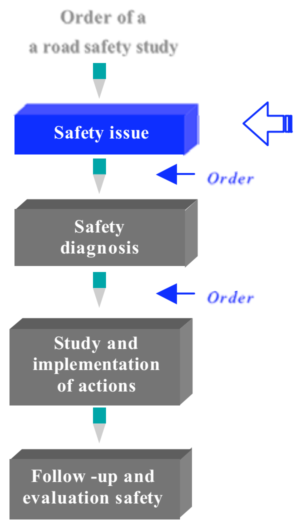
3. Check that the content of the order is compatible with the initial objectives

4. Identify the actors

This involves listing, as exhaustively as possible, the partners (resources or actors) concerned by the study (other city council departments, local infrastructure office, local technical departments, elected representatives, associations, etc.) and identify when their services should be called upon.

5. Establish the provisional schedule and budget

Phase 1 –
Safety issue study : recognition



Once the order has been issued, the safety issue study often constitutes the first phase of the study. It usually requires the involvement of other actors or departments not directly associated with the safety study (elected representatives, road-user associations, etc.).

What constitutes an "issue" in a safety study ?

A safety issue refers to the mortality or morbidity levels[2] (absolute or relative) of a particular target (a place, a type of user, etc.). This generally takes the form of numbers of accidents and victims.

In what cases should a safety issue study be carried out ?

Ideally, a safety issue study, based on accident data, should be scheduled for each safety study.

In practice, safety studies often result from very localised orders, in response to the concerns of councillors, MPs or residents, or from street enhancement work that requires safety to be taken into account. In both of these cases, the safety issue studies are less useful, although knowing the levels of safety issues at a given location (intersection, etc.) or with regard to a particular theme may nonetheless be of relevance.

Identity Sheet

SAFETY ISSUE STUDY

Definition

This study comprises an analysis of the accident situationin order to determine and prioritise the safety issues at stake.

Objectives

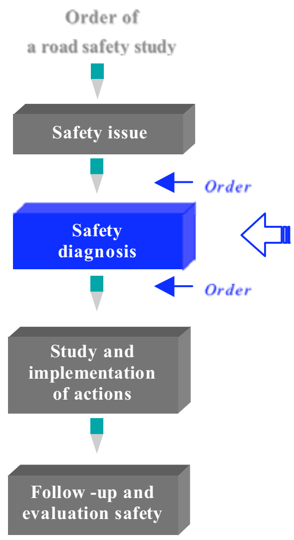
- Determine relative weightings for different targets in terms of safety.
- Identify accident locations, victims or periods that have an abnormally high weighting.
- Prioritise the safety issues.

Procedure

1. Establish the accident status reportwithin the studyscope , based on spatial, temporal and typological data resulting essentially from accident files (BAAC), and using appropriate software such as Concerto.
2. Analyse this evaluation in spatial, temporal and typological terms, particularly through comparisons based on reference indicators (statistical tests), and identify the safety issues.
3. Futher examine certain major safety issues by obtaining supplementary information from the BAAC file or by complementing the analysis with data other than accident data.
4. Prioritise the safety issues using a multi-criteria analysis.

[2] Morbidity concerns persons with health problems, diseases, disabilities and impairments.

Phase 2 –
Safety diagnosis : understanding



By the end of the safety issue study, priorities should have been established, which will then be the subject of the order for one or more safety diagnoses. The orientations and objectives of such diagnoses are defined by the project backer.

What constitutes a "diagnosis" in a safety study ?

General definition : diagnosis (or troubleshooting) means recognising a malfunction in order to identify its root causes. This in turn makes it possible to understand the mechanism of the malfunction and find a suitable remedy.

In accident research, safety diagnoses aim to understand the accident mechanism through accident data analysis (analysis of accidentreports), complemented by external data relating to the urban environment, public spaces and the transport network, and transport users.

In what cases should a diagnosis be carried out ?

Whatever the nature of the order, a diagnosis is essential before proceeding to the action phase.

Identity Sheet

SAFETY DIAGNOSIS

Definition

Diagnosis (troubleshooting) means recognising a malfunction sufficiently in order to :

- on the one hand, identify and understand the way it works and the conditions under which it arises ;
- on the other hand, remedy it.

Understanding malfunctions goes beyond simply defining safety issues (just because we know something does not mean we are able to understand it or take action). If a safety issue study has been carried out, its conclusions will be used in the order for a safety analysis.

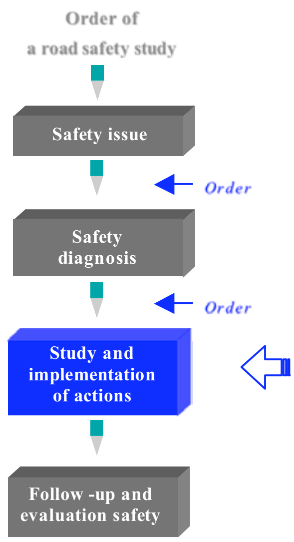
Objective : understand to act

We need to be able to understand the phenomena that give rise to unsafe transport situations so that we can identify courses of action – using a well-constructed, rigorous method – in order to prevent accidents.

Procedure

1. If necessary, redraft the order and then resubmit it for validation after examining the potential need for other safety issue studies or diagnoses on other themes than safety, e.g. traffic flow, public transport, quality of public spaces. For major studies, it may be necessary to decide the composition of the study team (project manager, departments concerned, experts, subcontractors, etc.).
2. Carry out the safety analysis by first analysing accidents using accident reportsand other information that helps to understand them, and then by extending observations, still from a safety perspective. The analysis of how each accident occurred, in particular by using accidentreports, is an essential part of this approach.
3. Draw up a summary of safety problems highlighted and then list the objectives to be pursued in order to improve safety (what functional modifications are necessary to improve safety at a given location ?).
4. Where necessary, carry out or commission diagnoses/analyses on areas other than safety and merge the objectives resulting from the analyses with those resulting from the diagnoses.
5. **Define objectives and identify courses of action that are tailored to the problem in hand.** Propose and prioritise action principles and identify action evaluation indicators according to the objectives defined.

Phase 3 – Action implementation studies
(phase not dealt with in this guide)



Action priorities established in Phase 2 areprioritisedand lead to more detailed feasibility and scheduling studies. These action priorities can take different forms, such as a highway improvement and redevelopment programme, incorporating drafts for safety improvements[3]. An order for the preparation of such a project would then be issued to an engineering office (either internally or contracted out). They could also take the form of information and communication actions, traffic regulation enforcement actions, awareness-raising activities, training, or other events, or even regulatory measures.

Identity Sheet

STUDY AND IMPLEMENTATION OF ACTIONS

Definition

Defining and implementing appropriate actions that respond to the safety objectives resulting from the safety diagnosis, in order to improve safety and sustain these improvements in the long term.

Objectives

- Carry out the studies necessary for the implementation of actions.
- Describe each action precisely.
- Evaluate the potential safety gains.
- Establishindicators for the evaluation of these actions.
- List the partners associated with each action.
- Define support actions.
- Implement the actions.

Procedure for each action

1. Determine the beneficiary of the action.
2. Set objectives ; clearly define its outcomes and the results anticipated.
3. Research and associate relays and partners – bodies or structures that can act as supports, along with those that will be directly involved in implementing actions.
4. Describe the action precisely, along with its nature and the resources implemented.
5. Define, where necessary, support actions : planning, transport policies, parking, etc.
6. Establishevaluation indicators: data, tools and resources to follow up actions and determine their effectiveness.
7. Evaluate the cost and plan the implementation of each action : financialestimate, phasing for each action and coordination, if necessary.

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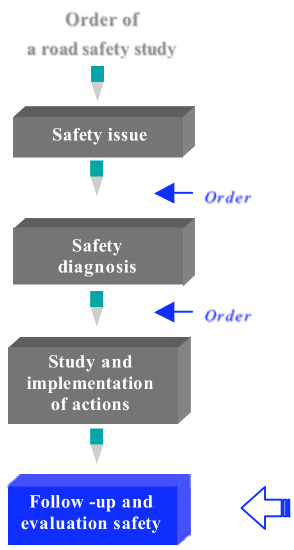
3 In a wide variety of areas : highways, landscaping, parking, traffic signal control, taking account of vulnerable users in general, mobilityplans, even medium- and long-term planning in terms of urbanisation and organisation of the road network, etc.

Phase 4 – Follow-up and evaluation
(phase not dealt with in this guide)



Evaluation – the enemy of routine – plays a stimulating role in the development of good practices. And yet it is often perceived as a disruptive practice, making it difficult to put in place. It is often dismissed out of hand or shunned through a lack of vision, time, resources or even skills. It is often absent, as no reference was made to it in the initial order.

When should an evaluation be carried out ?

In terms of transport safety, the evaluation may concern :

- a policy : general document, etc. ;
- a programme : Safety of Powered Two-Wheelers, etc. ;
- an action : communication campaign targeted at 14- to 18-year-olds, intersection enhancement, etc.

Evaluate an action – The evaluation is more than just a summary report or an observation. It involves an objective analysis that seeks to understand the root causes of the results. The following essential question must be asked : why have we obtained the results measured and analysed ?

The aim of evaluating a safety action is to measure its effectiveness by comparing the results obtained with set objectives. This makes it possible to check that the chosen action is appropriate with regards tothe malfunction to be remedied. It also means it is possible to assess its efficiency by comparing the results obtained with the resources used.

The evaluation of an action may concern itsdrafting, its implementation or its effects. As a minimum, the results of a specific action from the safety diagnosis should be evaluated. Ideally, such an evaluation should consist of more than just the variations in the accident evaluations for a given target population.

Evaluating the effects: using indicators

The evaluation of an action's effects relies on the collection of specific data in order to measure "before/after" changes. Indicators make it easier to measure the difference between the initial situation and the real effects of the action. Indicators can be divided into two categories:

- **Simple evaluation indicators**

These simple indicators correspond to counts or simple calculations based on counts (percentages, means, etc.). They are always linked to a given space and timescale: annual number of accidents, annual change in accident numbers, annual mean traffic speed, etc.

- **Detailed evaluation indicators**

These complex indicators involve more elaborate statistical calculations based on simple evaluation indicators: percentage accident rate change given as a percentage, probability of accidents for a given population, etc.

Aside from these quantitative indicators, the evaluation also uses qualitative approaches, which are particularly useful for assessing user behaviours and attitudes following, the implementation of a new road layout, for example. On-site observations or investigations would make it possible to understand the perception of this new layout and determine any changes in behaviour that it has caused (e.g. reduced traffic speeds).

Evaluations need to be planned at an early stage– In order to make a dynamic approach such as this work, the evaluation must be carefully planned and involve all the actors concerned. Once the initial order for the study has been issued, an evaluation plan must be drawn up, as the evaluation constitutes one of the action's objectives. This plan must specify the objectives of the actions to be evaluated, the indicators that will be used to check that these objectives are achieved, the investigation methods, tools, skills necessary, etc.

Identity Sheet

FOLLOW-UP AND EVALUATION

Definition

Assessing the effectiveness of a specific action with a view to implementing changes (evaluating in order to do better in future).

Measuring the action's impact with regard to the initial concerns, particularly the objectives laid down by the order.

Objectives

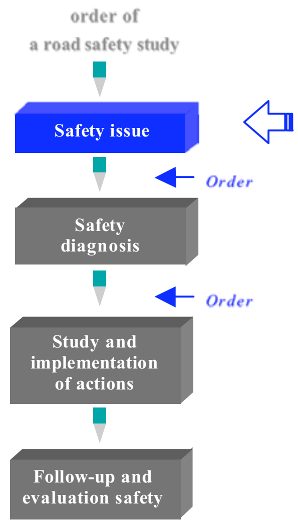
- Todraw on lessons learnt: technical justification, decisional aid, etc.
- To take corrective action, either immediately or at a later date, in order to improve the quality of work performed.
- To drawing up a safety strategy: post-action reference for comparison, user satisfaction index, local actors, political choices, etc.

Procedure

1. Establishan evaluation plan from the start of the study : choice of quantitative and qualitative evaluation indicators, investigation methods, scheduling of evaluation measures, etc.
2. Prepare the data sets concerned by the evaluation indicators.
3. Compare and analyse the results with regard to the objectives.
4. Monitor and, if necessary, make alterations to the action established.
5. Communicate theconclusions from the evaluation to the project backer so that strategies and actions can be adapted if necessary.
6. Draw on lessons learnt from errors or inadequaciesin order to improve future procedures.

the safety issue

The safety issue study : using knowledge to determine major safety issues



Following the example of descriptive epidemiology[4], the basis of medical research, the field of transport safety relies on an initial knowledge-gathering phase. This is essential : before we are able to understand accident-related malfunctions, we need to identify those categories of users that are particularly involved in accidents (using BAAC files), locations most prone to accidents, local specificities, etc.

BAAC accident files are a precious source of information for acquiring this knowledge, provided that data is of a high enough quality and that accident reportsare correctly completed. The use of the statistical tests, methods and indicators presented in this guide make it easier to adopt a pragmatic study procedure.

The safety issue study represents an analysis of the accidentstatus report, which helps to determine and prioritise the major safety issues. This study relies heavily on the accidents file, which must therefore be as reliable as possible (see Appendix A). Although it enables the identification of targets upon which safety diagnoses will be conducted, it does not enable us to understand the malfunctions that led to the accident.

From the accident status reportto prioritised safety issues : 4 key steps : establish the accident status report ; analyse this status reportand determine the safety issues ; study the safety issues in greater detail ; prioritise the safety issues – these 4 main steps structure the creation of a safety issue study.

Establishing the accident status report (step 1) is an indispensable first stage, but is not enough. We need to go further than producing digital dashboardsby conducting spatial, chronological and thematic analyses, which provide essential information, particularly in terms of comparisons and prioritisation.

Data analysis over a period of five years enables safety issues to be determined (step 2).

Complementary analyses help us to become more familiar with the phenomena concerned and study the safety issues in greater detail (step 3).

What constitutes a safety issue ?

Apart from providing statistics, the accidentstatus report reveals overrepresented accident categories (elderly pedestrians, motorcycles, intersections at the end of motorway slip roads, etc.). Following analysis of thestatus report, certain categories may become safety issues.

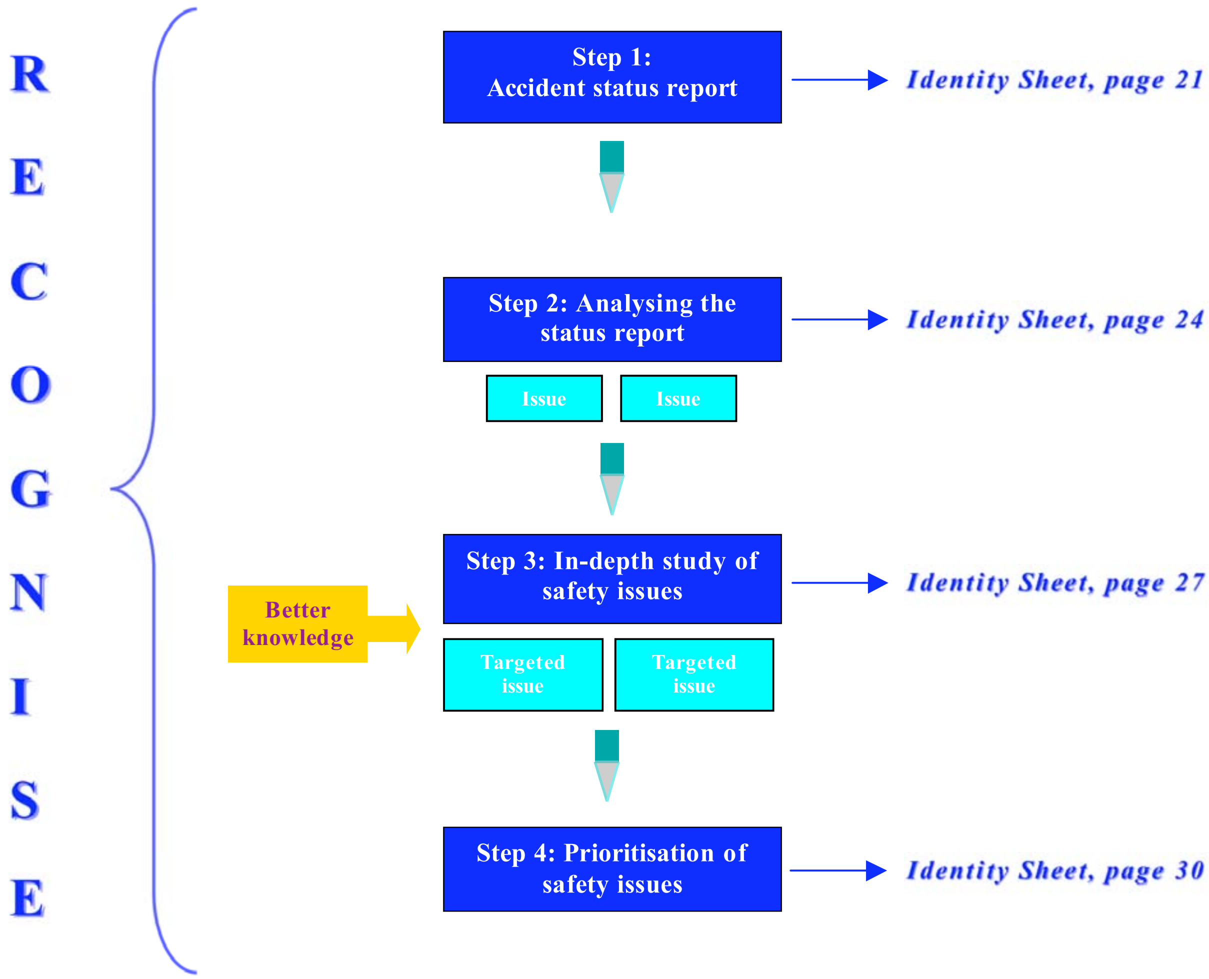
For each safety issue, there are absolute or relative values for the mortality or morbidity of a target population (location, type of users, etc.). It is therefore a number of accidents or victims, weighted according to severity and associated with a target. The target may concern a place (e.g. an intersection, a street), a group of users (e.g. young people), a period (e.g. night-time) or a means of transport (e.g. motorcycle). The number of accidents or victims may be given as an absolute value (number of accidents involving a motorcycle, for example) and/or a relative value (deviation from a number or reference figure for a particular aspect such as distribution by age of population). It is necessary to evaluate the weighting of the accidents for the target identified in the overallstatus report.

4 "Descriptive epidemiology studies the distribution of morbidity phenomena in human populations and their variation over time by quantifying them using statistical methods (presenting numbers of cases in tables, histograms and graphs)" – Encyclopaedia Universalis.

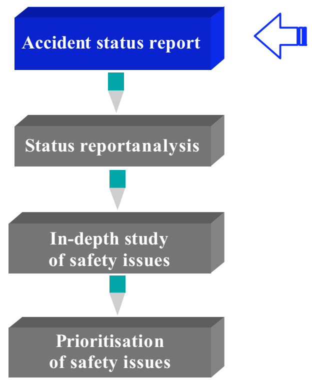
During steps 2 and 3, which call upon quantitative methods, it is important to retain a knowledge-gathering mindset at all times, without trying to understand how the accidents came about. This precaution avoids "slipping" towards a diagnosis-type approach.

Particular attention should be paid to cartography, as maps can provide an instant and attractive overview of the phenomena at play in the territory concerned. Most of the time, they are able to play an important educational role, which is very useful when explaining the analysis of accident status reportsand seeking to validate this step.

Conducting a safety issue study : 4 main steps



Step 1 - The accident status report



Producing an accident status reportmakes it possible to determine the frequency and distribution of accidents in a given territory. It helps to identify risk factors in terms of time, people and places. It is the first step before embarking on a more analytic study procedure.

Identity Sheet

ACCIDENT STATUS REPORT

Outcomes

- Present the data used in the form of maps, graphs and statistics.
- Answer questions about accidents : who is involved ? How many parties ? Where ? When ? How ?

Content

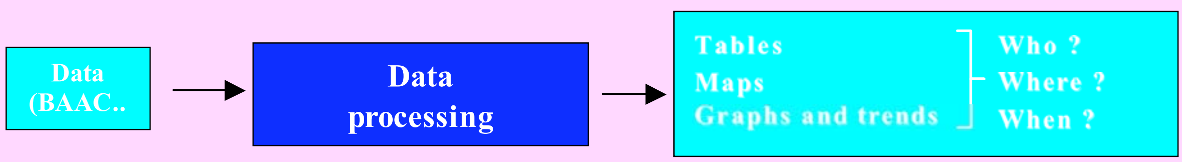
Compilation of operational results from BAAC file data, in the form of tables, maps, charts and graphs.

Implementation

As accident files are information-rich, software such as Concerto makes it easier to process data automatically and producedigital dashboards. To complement the accidentstatus report, it is possible – using the three dimensions of accidents shown in the table below – to produce figures by theme (tables), showtheir spatial distribution in map form, and monitor their progression over time in graph form, since each accident involves users, characterised by age, number, etc., in a given location (street, intersection, etc.) at a given moment (time, day, month, etc.).

Users and vehicles	Spatial	Temporal
Types of user, Age, sex, Light vehicles, two-wheelers, etc.	Intersection, Street, Obstacle, etc.	Day/Night, Month, Time, etc.

Precautions: where possible, the data analysis period should be five years (see Appendix : Chronological Analysis). Statistical validity must also be ensured and the limits of the analysis sample determined.



INFORMATION SHEET : Producingan accident status report

Questions to ask oneself – traps to avoid

- *How reliable is the data ? What aspects are likely to be less reliable ? Has the location been checked (street name, address, etc.) ?*
- *Is the time period stated correct ?*

  In the field of descriptive statistics, it is advisableto focus on a period of five years in order to take account of the random and variable nature of accidents, and obtain a "true" average. It is also important to identify recent changes in the urban fabric : new urbanisation, new roads, improved infrastructure and, in particular, recent layout changes implemented to improve safety.

- *Is the accident status reporteasy to follow ?*

  Avoid interminable lists of tables. Maps (preferably thematic) are useful alternatives. Remember to include legends for maps and tables, mentioning the accident group to which they refer (time period, section of road, types of accident, etc.).

How do I start theaccident status report ?

With the Concerto software, certain output is automatic, such as the "technican digital dashboard". This covers most themes. Concerto users can request other tables if necessary.

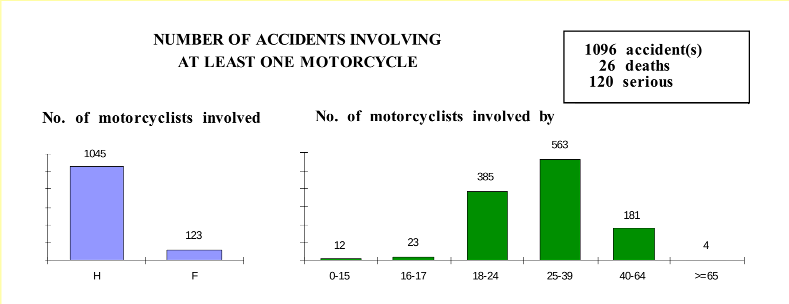
In general, automatic output makes it possible first of all to cover a host of accident characteristics. It is able, for example, to produce location maps for accidents according to severity, digital dashboards(for decision-makers and technicians), and accident maps by road section and by intersection. Obviously, the initial order determines the content of thestatus report, by restricting or extending it to other elements.

What if I don't have Concerto ?

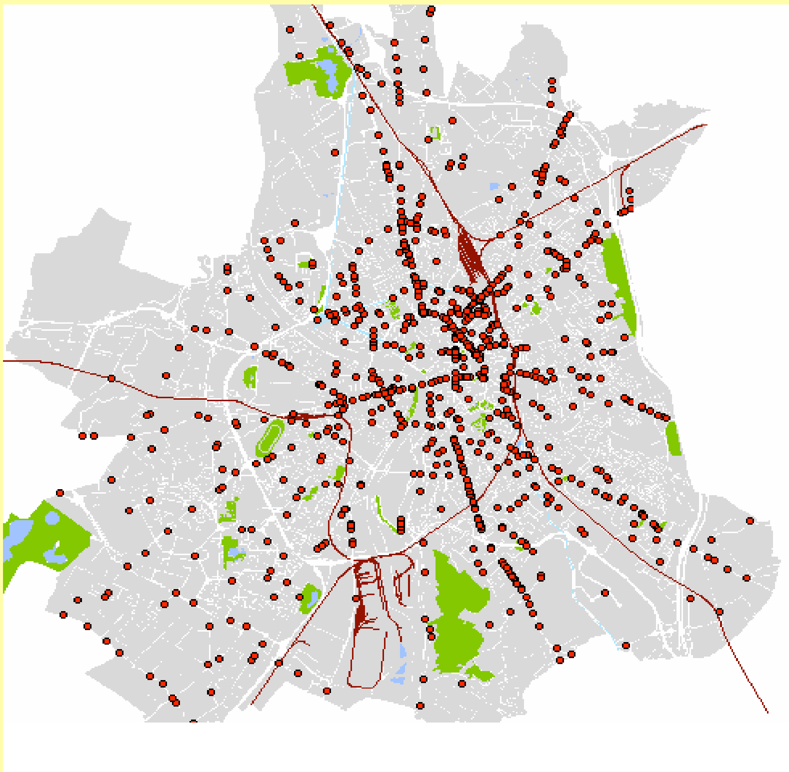
In the absence of Concerto, the Accidents database can be processed by a database manager (e.g. Access). Spatial analyses and cartographic representations are possible using a geographical information system (GIS), particularly if accident locations are recorded on a regular basis. For charts and graphs showing trends, Excel offers a range of representation methods (and analyses) that are easy to use.

EXAMPLE SHEET : Elements of an overall status report

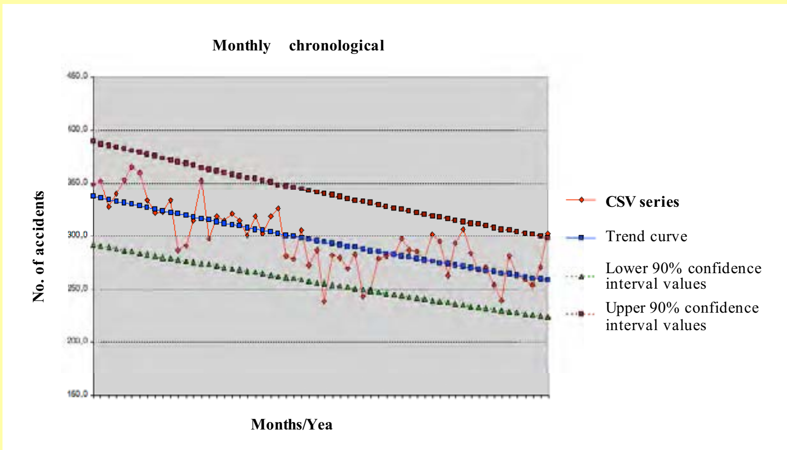
Excerpt from digital dashboard



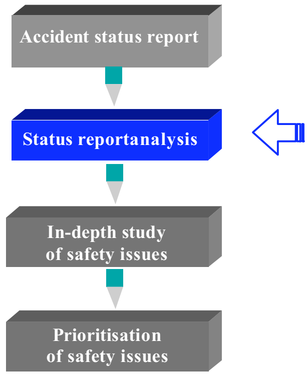
Geographical distribution



Change over time



Step 2 – Analysing the accident status report



This step is both vitally important and delicate, in that one must be wary of starting the diagnosis prematurely. We must remain in a mindset of spatial, chronological and thematic knowledge of accidents, without attempting to understand how they happen.

The status reporthelps to assess and determine the scaleof a safety issue, bearing in mind that a safety issue concerns a number of accidents or victims, characterised by severity and linked to the theme in question, such as accidents involving motorcycles.

Identity Sheet — STATUS REPORTANALYSIS

Outcomes

To Ddetermine the importance of the safety issues associated with each target.

To Mmeasure the extent to which they are over-representedation compared withrto a reference figure.

Content

Analysis of temporal and spatial characteristics of accidents.

Comparison of evaluation resultsstatus report figures with reference figuress.

Implementation

The analysis concerns all accidents associated with the study territory.

1. From thestatus report, take the number of accidents (by severity), the number of victims (by severity) and severity statistics (see definition in Appendix – CD-ROM enclosed with guide).
2. Define one or more references (see Appendix – CD-ROM enclosed with guide).
3. Analyse the figures in the status report(see Appendix – CD-ROM enclosed with guide) :
   - analyse the location of this theme : street, neighbourhood, road network (spatial analysis) ;
   - analyse the temporal progression of this theme, in order to determine a trend (chronological analysis) ;
   - analyse the distribution of theme items: comparison with references with a statistical significance test (thematic analysis).
4. Cross-reference the thematic, chronological and spatial analyses.

INFORMATION SHEET : Accident status report analysis

Thematic analysis

Thematic analyses make it possible to :

- highlight predominant proportions, sorted by major themes ;
- find local specificities (compared with reference values) using statistical tests.

The themes analysed may concern users (sex, age, etc.), environmental characteristics (urban characteristics, density, obstacles, etc.) and conditions (e.g. weather, lighting), etc. For each accident characteristic, the same question applies : is the percentage of accidents for a particular theme studied significantly different from the reference value (see Appendix A) ?

Example questions : is the proportion of accidents at night on the main road network significantly higher than across the whole urban network ? Is it significantly higher in particular neighbourhoods than across the whole city or compared with the average for French cities of a comparable size[5] ?

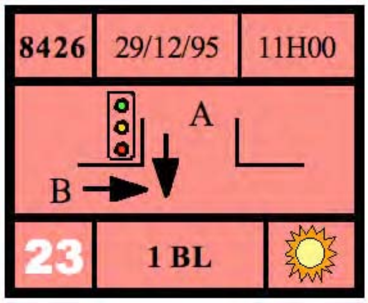
Chronological analysis

Chronological analyses make it possible to :

- understand structural trends by varying the time period and studying the subsequent changes ;
- understand conjectural trends (trend reversals, recent trends, etc.) ;
- compare chronological series for different themes ;
- work on accident numbers by theme in order to study whether they are recurring or occasional.

This type of analysis monitors temporal changes in accident numbers, either in overall terms or in terms of a theme or a particular zone. This analysis may be conducted on an annual or monthly basis.

Example questions : how have accident numbers on the study site changed with regard to reference figures ? Are accident numbers generally on the increase or on the decrease ?



Diagrammatic representation of an accident with, in this case, a jumped red light and a lateral collision between two light vehicles, in the daytime, together with the time, date and severity ("1 BL" = 1 person slightly injured).

Large numbers of accidents may limit this type of representation.

Spatial analysis

Spatial analyses make it possible to :

- localise a theme based on the analysis ;
- analyse the distribution of certain themes.

The spatial analysis concerns the spatial distribution of accidents at different levels (city, neighbourhood, etc.). It takes account of all accidents or certain types of accident. It may also concern the spatial distribution of accidents for specific themes.

Obviously, the quality of the spatial analysis depends on the reliability of the accident locations. Although it is not generally possible at the safety issue study stage to obtain geographical positioning data of the same accuracy as during the diagnosis phase, it is nonetheless essential to work with the file supplied by the police, which contains urban location information (street name and building number).

Example questions : where are accident black spots located ? Where do accidents involving pedestrians occur ?

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[5] *"Catalogue des indicateurs nationaux en milieu urbain"* distributed by Certu.

EXAMPLE SHEET : Thematic analysis of accidents involving motorcyclists in Toulouse[6]

Study period : 1994–1998

Chosen reference : same transport mode involved in cities of a comparable size in 1996 (Certu indicators).

A "theoretical" safety issue

Between 1994 and 1998 in Toulouse, a 16% reduction in the number of accidents and a 16% reduction in the number of accidents involving moped riders were recorded, while the number of accidents involving motorcyclists remained stable.

In 1996, the reference year, 490 accidents involved a two-wheeled vehicle out of the 1,265 accidents recorded in the city, or more than 1 in every 3 accidents. These accidents concerned an annual average of 90 cyclists, 180 moped riders and 200 motorcyclists.

Overall, accidents involving two-wheeled motor vehicles appeared as a theoretical safety issue that warranted confirmation by analysing the accidents.

Continuing the analysis : using the significance test

Significance test calculations reveal that the percentage of accidents involving moped riders is very significantly lower than the reference, whereas the percentage of accidents involving motorcyclists was very significantly higher than this reference.

Conclusion

With an average of 200 accidents per year, the initial hypothesis is confirmed. Accidents involving motorcyclists constitute a major safety issue, as this number is very significantly different from the reference value. Moreover, according to the home interview survey carried out in 1996, motorcycle journeys represent just 0.6 % of all journeys.

	Number of accidents	***Proportion of which motorcycle accidents***	***Proportion of which moped accidents***
Study zone	**1,265**	**16,4 %**	**22,8 %**
National reference		**12,9 %**	**27,5 %**
Statistical test		**ST +**	**ST -**

ST + : Test very significantly higher
ST – : Test very significantly lower

The national references taken into account for the period in question date from 1996.

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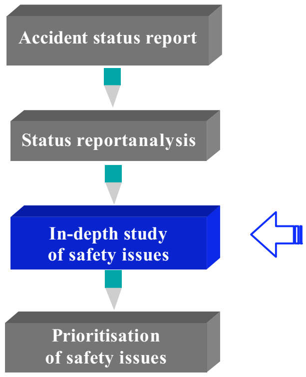
6 *Apport des statistiques en sécurité routière au niveau local*, Sétra, 2001.

Step 3 – In-depth study of safety issues



Conducting an in-depth safety issue study consists of analysing additional headings from the Accidents file, such as night-time motorcycle accidents, and then carrying out cross-analyses with other data (urban data, transport data, etc.). The results of this status reportanalysis and the in-depth safety issue study will form a basis for prioritising the safety issues.

Identity Sheet

IN-DEPTH STUDY OF SAFETY ISSUES

Outcomes

To Ggain more detailed knowledge of each safety issue.

Content

Cross-analysis with other headings from the BAAC file and other data.

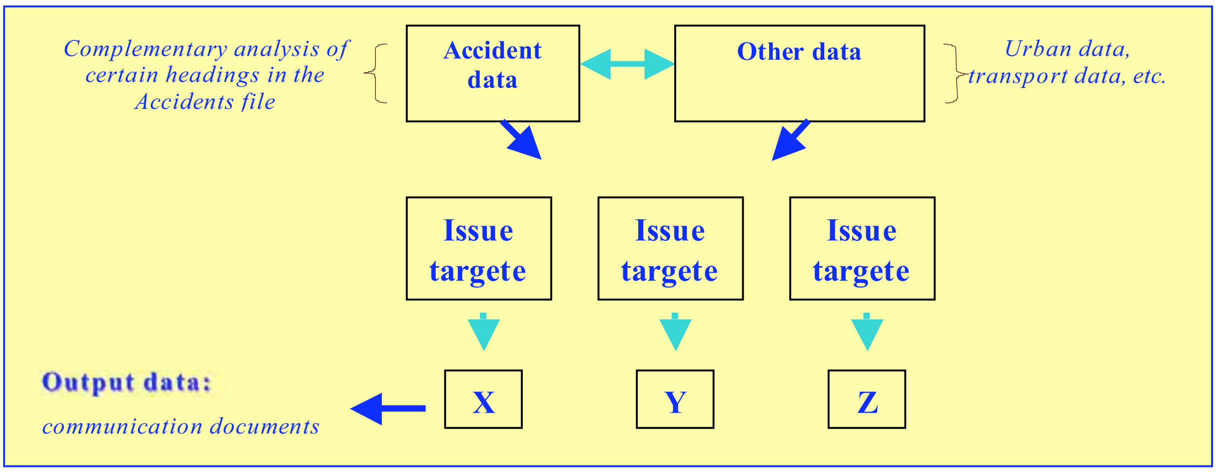
Implementation

The analysis may concern all accidents within the study territory or some of the accidents linked to the theme(s) selected following the accident status reportanalysis (user types, transport types, etc.) or a particular space (intersection, street, route, neighbourhood, municipality, etc.).

Step 1: **We can restart the status reportand its analysis on one of the themes seclected according to the diagram below.**

Step 2: **Usage and complementary analysis of certain headings from the accidents file.**

Step 3: **Cross-analysis of accident data with other data.**



INFORMATION SHEET : Study by age range

This involves producing an evaluation with, for each age category, the number of accidents and victims according to severity and location. Figures may be taken by five-year period or by year.

One preliminary step is necessary : the splitting of series into homogeneous categories.

Step 1 : Calculation of indicators

For each age category, figures from the accident status reportare crossed with population data (other data sourced from INSEE (national statistics agency).

Step 2 : Choice of references

For each age category, national references (in raw data form) are selected to be crossed with the population data.

Step 3 : For each age category :

- spatial distribution maps are produced ;
- temporal changes are calculated ;
- cross-analyses are performed with other themes, time of day, mode of transport, etc.

Step 4 : Comparisons with references and significance test

INFORMATION SHEET : Study according to network categorization

Using roadcategorization :

Step 1

For each network, identify the number of accidents and victims according to severity and identify their distribution according to transport mode.

Step 2

Choose the reference : severity, transport modes, light levels, etc. (generally those of the territory being analysed).

Step 3

Identify particular routes according to the functions and characteristics of the roads concerned, based on the spatial analysis and distribution.

Step 4

Compare the numbers of accidents.

EXAMPLE SHEET : In-depth study of accidents involving motorcyclists

In-depth analysis based on data from the accidents file

Severity of injuries by transport mode

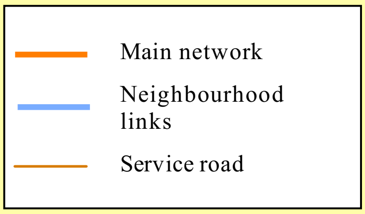
In accidents involving at least one motorcycle, 86 % of serious casualties(killed or injured) are motorcyclists. In accidents involving at least one car, 42 % of serious casualties(killed or injured) are motorists. Over a given five-year period, accidents involving at least one motorcycle account for 22 % of all serious casualties.

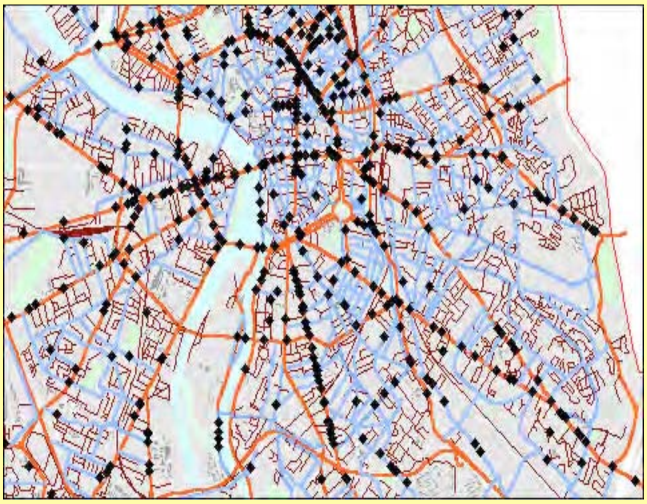
Comparison between accidents involving motorcycles and accidents involving cars

In total, 15 % of accidents involve motorcycles, compared with 10 % for light vehicles ; motorcycles are therefore concerned by accidents more than cars. Furthermore, young motorcyclists (ages 18–24) are involved in accidents considerably more than young motorists : 35 % of motorcyclists are aged between 18 and 24, compared with 25 % of motorists.

In-depth study based on other data : distribution by network category

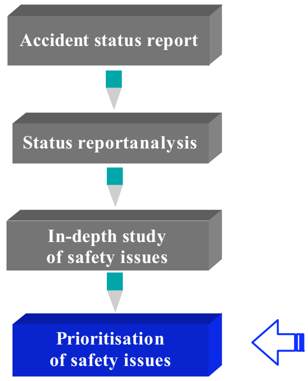
74 % of motorcycle accidents occur on the main road network and represent 20 % of the total urban network.





 the safety issue

Step 4 – Prioritisation of safety issues



Technical and political prioritisation – This step is the culmination of the safety issue study. Safety issues are prioritised using a multi-criteria analysis (technical process). However, the definitive ranking of the safety issues will be determined through discussions between the parties concerned (political process).

Multi-criteria analysis – prioritisation assistance – The multi-criteria analysis constitutes a summary of the previous steps. Multiple criteria are often taken into account : accident research indicators, deviation from the reference figure, national and/or local policy, financial opportunities, social acceptability, pressure from civil society, etc.

Identity Sheet

PRIORITISATION OF SAFETY ISSUES

Outcomes

- Produce a summary of the preceding analyses.
- Obtain a priority list of safety issues that takes account of the different actors and which is validated by decision-makers.
- Produce something that constitutes an essential part of the diagnosis order.

Content

- Technical summary (multi-criteria analysis with indicators).
- Consultation and information-sharing with partners and users in order to end up with a priority list of safety issues that can be validated by the project backer.

Precautions

The choice of criteria must be backed up with technical arguments or arguments that incorporate the decision-maker's precise motives.

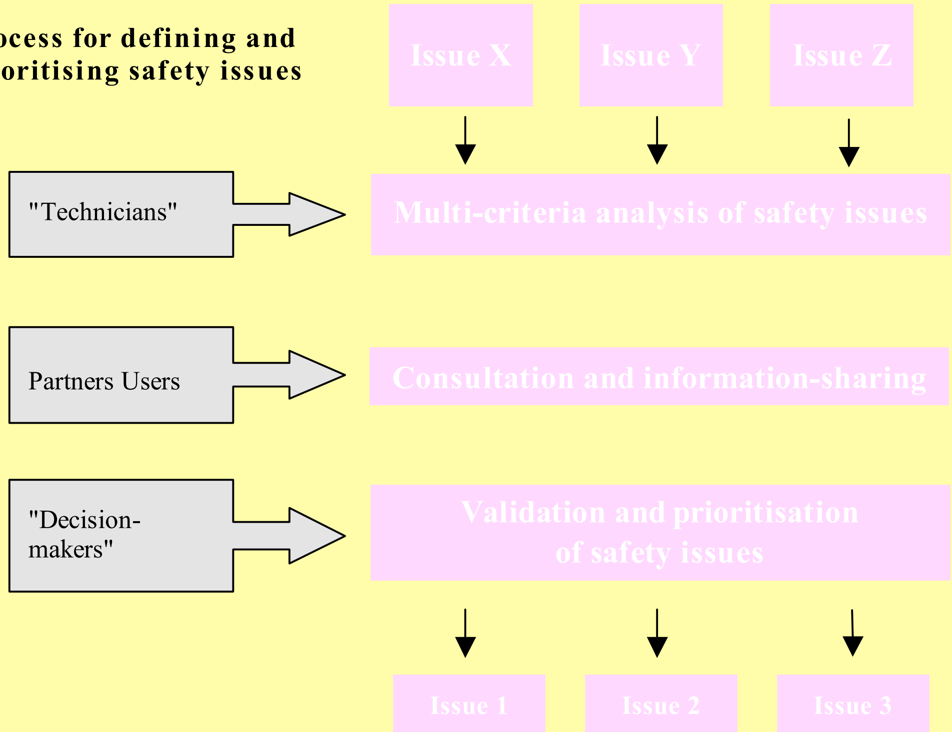
As data tables are not generally conducive to information-sharing, priority should be given to maps, charts and graphs, all of which communicate information more effectively.

INFORMATION SHEET : Study by road network category

An educational approach is essential for sharing and validating the safety issue study.

The technician should invite the project backer to validate the proposed criteria for safety issue prioritisation. Often, decision-makers' constraints do not concern the field of safety in its strictest sense (opportunities in the context of other operations, "social" acceptance by users, available funding, etc.).

Process for defining and prioritising safety issues



EXAMPLE SHEET : Defining and prioritising safety issues in Toulouse

Toulouse City Council, in its constant battle against road safety problems, has human and material resources that are adapted to the issues in hand. The city council has also invested in a methodological approach in order to improve transport safety.

This means that, instead of rushing to tackle road safety problems straight away (and in order to ensure a coherent response), the city council committed itself to an analytical approach to the road safety problems within its territory, including two studies to determine and prioritise the safety issues present in the city. The first study, covering the period from 1997 to 2001, consisted of a thematic analysis to identify the transport safety issues in Toulouse ; the second comprised a spatial analysis of streets and intersections in order to identify those sites most susceptible to accidents.

Results of the thematic analysis

The comparative study of accidents in Toulouse with national indicators (comparison with Bordeaux, Douai, Lens, Grenoble, Nantes, Nice, Strasbourg, Rouen and Toulon) highlighted significant facts :

- accidents (particularly serious accidents) involving the 18–24 age group are very significantly higher than the national indicators ;
- the severity of the accidents (deaths and seriousinjuries) involving light vehicles is very significantly higher than the national indicators.

Results of the spatial analysis

Based on the categorizationof the Toulouse road network, the accident study highlighted :

- the intersections most susceptible to accidents ;
- the roads most susceptible to accidents, according to the road network categoryand the number of accidents per kilometre.

The results of these two analyses could have been the subject of a **chronological analysis**.

The safety diagnosis : understanding in order to act

Diagnosis (troubleshooting) means recognising a malfunction sufficiently in order to :

- on the one hand, identify and understand the way it works and the conditions under which it arises ;
- on the other hand, remedy it.

Understanding malfunctions goes beyond simply defining safety issues (just because we know something does not mean we are able to understand it or take action). If a safety issue study has been carried out, its conclusions will be used whenordering a safety analysis (see "Safety Diagnosis Orders", page 35).

Objectives and outcomes of the safety diagnosis

Safety diagnoses are used to improve transport safety in cities, reduce the number and severity of accidents, increase perceptions of safety, particularly through speed reduction schemes. However, in many situations, it is difficult to isolate safety issues, as certain actions also contribute towards other objectives. Complementary analyses and diagnoses are therefore necessary to understand issues such as urban matters, travel comfort for pedestrians and cyclists, parking, shops and businesses, access to public facilities, etc. In these cases, the study may be far more extensive than a safety diagnosis and may start to resemble an urban redevelopment study...

In the context of these "extended" studies, diagnoses are also used to take account of those constraints affecting the most vulnerable users (e.g. difficulty crossing roads, waiting time too long at pedestrian crossings, fear of cycling because risks poorly taken into account) or of deteriorations in the local quality of life (speeding, delicate overtaking or parking manoeuvres, etc.).

Although diagnoses are useful for highlighting the "objective" or "real" level of safety problems, they above all help to identify all malfunctions and explanatory factors. The relation between the perception and the comprehension of the environment, as well as user behaviour (speed, traffic, waiting time, etc.), is at the heart of most analyses.

However, the diagnosis must also tackle the levels of safety problems "felt" by users or residents, without seeking to dismiss or play down these feelings. Often considered – wrongly – as a false problem, the feeling of a lack of safety helps to understand certain behaviours or practices at local level.

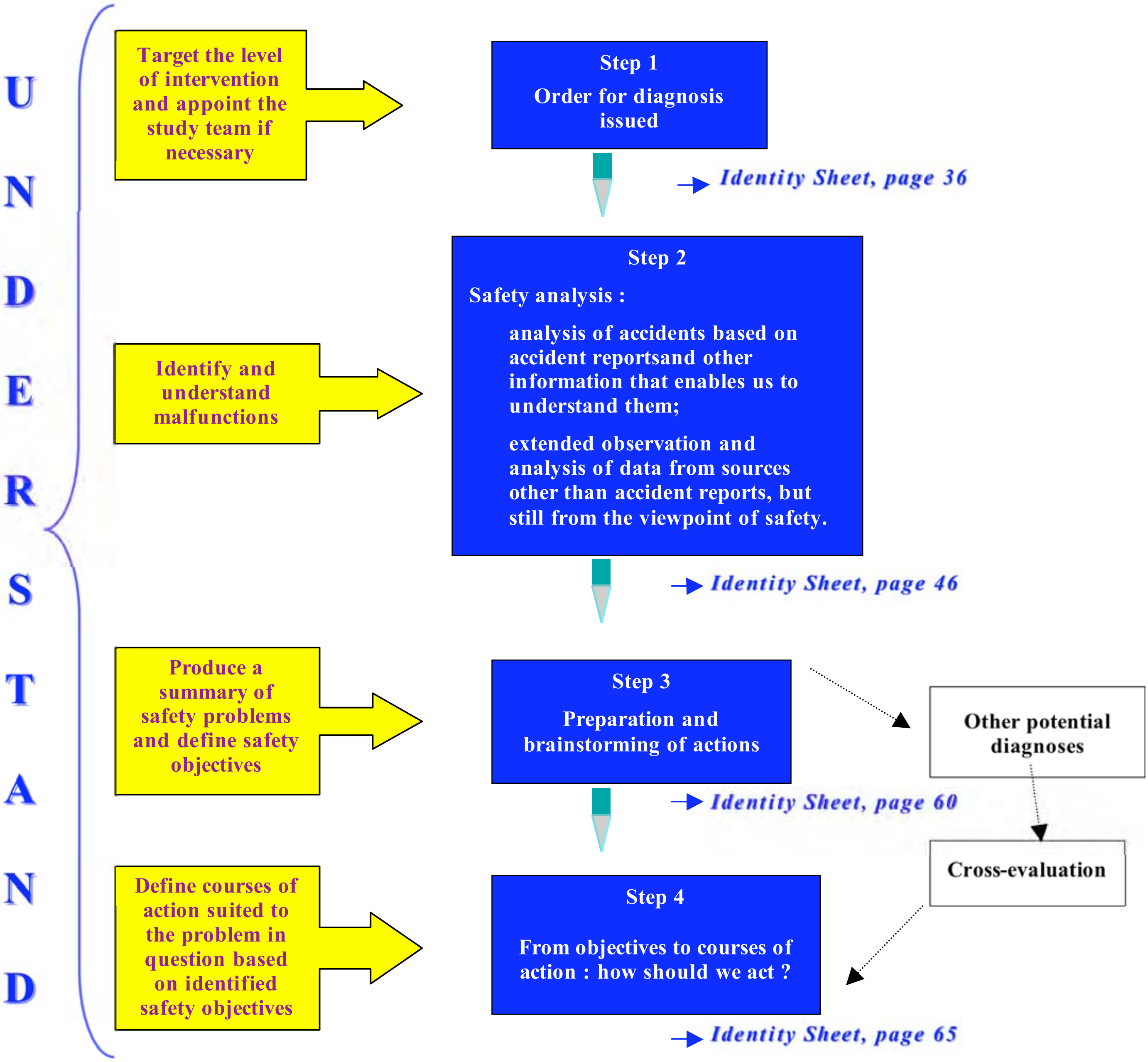
The safety diagnosis will result in justified propositions for courses of action in terms of development plans, communications and enforcement.

Diagnoses are for sharing!

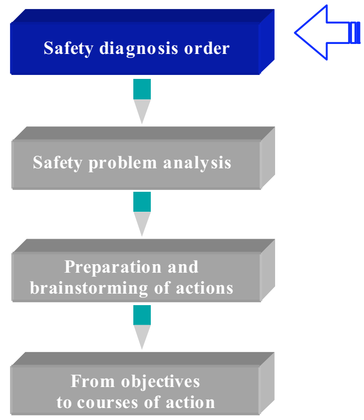
The diagnosis procedure must be shared with the different actors involved at certain key stages of the approach: order, data collection, summaries, proposals for courses of action. These moments of presentations, exchanges and debate make for a richer approach.

Sharing must be reciprocal. The actors involved need to be listened to so that the diagnosis can progress, but these actors also have to participate in order to understand the situation. For a more fruitful dialogue (bearing in mind that these actors will rarely be safety specialists), it is important to clearly state the real objectives of the diagnosis right from the start of the partnership. It is also important to spend the necessary time explaining the chosen method in order to make it easier for the different actors to become involved in the whole procedure. Strong communication skills are also essential to ensure harmonious dialogue throughout.

Conducting a safety diagnosis : 4 main steps



Step 1 –Safety diagnosis order



A safety diagnosis is carried out following receipt of an order. The content of this order depends on whether a safety issue study exists prior to the diagnosis.

Two types of order

Diagnosis of a safety study – If the diagnosis is requested as part of a safety study, the diagnosis order incorporates the results of the safety issue study.

Diagnosis only – If a diagnosis alone is planned, without a safety issue study beforehand, it is highly advisable to carry out a summary safety issue study before beginning the diagnosis. The main advantage of this is that the conclusions of this brief analysis will enable you to reorient the order, target the content of the diagnosis (scopeof the study, volume and types of accidents, overall brief, etc.), evaluate the resources necessary for the diagnosis to be carried out (technical skills, collaboration between departments, partnerships, experts, etc.). Obviously, specifications must be drawn up for this order.

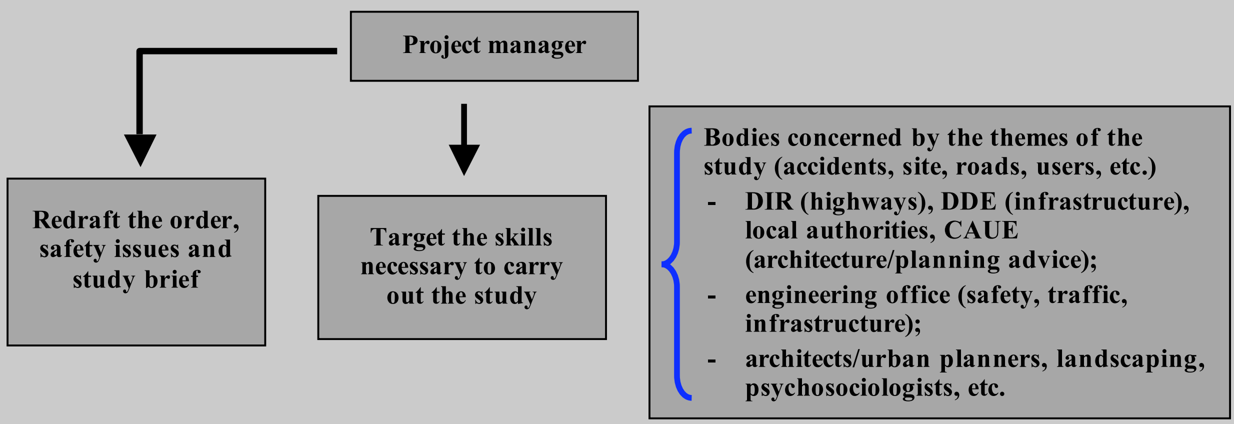
Organisation

Simple order – In many situations, the order will be limited to defining safety objectives. This will be dealt with by a safety expert, who will take on this role.

Complex order – Sometimes, the complexity of the order calls for a multidisciplinary team (project team). In particular, when the analysis of the order and the context require that the study be extended to other concerns in addition to safety. In this case, a project manager will be responsible for coordinating the study. For studies involving a large number of participants and a variety of themes to be studied, setting up a steering committee can be useful for conducting and dividing up the analysis.

How should work be organised in a multidisciplinary team ?

Scenario: study extended to other aspects than safety



Identity Sheet

SAFETY DIAGNOSIS ORDER

Outcomes

- Establish a link between the safety issue study from the previous phase : validation of safety issues and redrafting of order.
- Determine the type of safety diagnosis necessary (specific, linear or territorial) by specifying the scope of the study.
- Determine whether the diagnosis should be extended to other aspects than safety : traffic, public transport, mobility, enhancement of the urban environment, etc.
- Target investigation levels in order to determine who is to participate in the diagnosis.
- Establish subcontractor specifications (where necessary).

Content

- Framework for the content and scope of the study: safety issue, serious incident, opportunity for road layout improvement, constraints, etc.
- Potential redefinition of the study title: "Safety diagnosis", "Safety and urban quality study", "Preliminary study into the redevelopment of...", etc.
- Identification of actors concerned by the study: technical departments of local authorities, DDE (local infrastructure directorate), elected representatives, associations, neighbourhood committees, etc.
- A provisional schedule and estimate of resources.
- Designation of a project leader if a multidisciplinary team is required.

Precautions

The composition of the study team will depend on the themes identified in the order and the level of investigation required.

The safety diagnosis and any other diagnoses that may be necessary can be conducted internally by one or more persons. However, it will sometimes be necessary to call upon experts for certain themes (roadways, traffic, parking, etc.) or even contract out work to an engineering firm specialised in transport safety.

In the case of an extended study, it is important to appoint a multidisciplinary team, headed by the project manager, to conduct the multi-criteria analyses necessary for the different diagnoses to be carried out.

The project manager must be promptly appointed so that he may fine-tune the working method and appoint the study team members.

The study procedure must respectthe order and be adapted to the data, available resources and production constraints.

EXAMPLE SHEET : Forming a project team suited to the particular context of the safety study order

The problem in hand

The mayor of a town of 60,000 people calls upon the DDE (local infrastructure directorate) to make a signal-controlled intersection in the heart of a 1960s-built neighbourhood less dangerous. This intersection is located at the end of a motorway slip road where it meets an urban radial road. It is known as the "junction of death" because of the high number of accidents that occur here. In parallel, the council asks the CETE (Centre for Technical Infrastructure Studies) to carry out a preliminary study, the initial order of which boils down to producing a safety evaluation. Behind this order lies the expectation of State involvement, as the radial road– the source of much of the traffic at the intersection – is a State-maintained road.

Initial information and analysis

First, the project manager from the CETE reviews the problem upon which the order is based. He carries out a safety issue study. Transport modes, frequency, manoeuvres, accident severity levels, etc., are taken into consideration. The study shows that the figures concerning this intersection are no higher than the reference averages, and that the blame lies more with the behaviour of road users on the link sections leading into and out of town , than the configuration of the intersection itself. . He also obtains other information : the BAAC file is poorly completed in terms of both addresses and locations. Searches for local information, in particular by consulting press articles, reveal that local residents have been petitioning for a roundabout or a grade-separated junction, that different municipal projects are being considered close to the roads in question (e.g. municipal casino, bridge club), and that the State is considering transferring responsibility for part of the urban highway beyond the intersection to the local council.

Redrafting the order

All these factors mean that the order has to be redrafted – first, in order to study the safety issues in greater detail based on an analysis of accident procedures. The status of the infrastructures requires co-ownership of the project between the local and central government and the configuration of the site requires a study partnership to cover all urban development problems (project sponsors, engineering office responsible for the urban mobility plan, urban planning agency, and the town entrance delegation of the conurbation council). Considering the problem from this wider angleleads to an expansion of the study scope beyond the scope of the intersection. Finally, communication aspects are introduced into the order so as to respond to residents' sense of frustation.

Extending the order

An initial order for a safety study evolves into an order for a layout improvement study with objectives that are far wider-ranging than the original safety objectives alone ; actions likely to improve safety produce effects that need to be studied and brought back into the context of a wider, more general urban project. As the themes to be tackled go beyond the skills of the safety expert alone, we need to call upon multidisciplinary skills in urban planning, landscaping, mobility and highways geometry and design. Furthermore, as the simplified safety issue study shows that local operations are poorly managed from the viewpoint of vulnerable users, a fine analysis of local pedestrian and cycle practices is also necessary.

Forming the project team

This new order requires a steering committee to be set up, comprising councillors with responsibility for traffic and transport, neighbourhood councillors, the highways officer from the technical department, and representatives from the DDE and motorway operating company. This committee defines the project team, following propositions from the project manager.

The composition of the project team depends on the pending thematic diagnoses : traffic flow, local usage, how the town works, aesthetic/heritage enhancements, mobility/public transport. Here, the project manager has requested the services of :

- the CETE for its accident knowledge (sequential analysis of all accident procedures, processing by accident scenarios, highlighting of accident factors for each branch of an intersection and within the intersection), its ability to analyse user behaviours, its observation-based qualitative procedures, its efforts to take account of cyclists, its technical skills in the field of geometric configurations for highways and intersections ;
- the CDES (Local Road Operations and Safety Unit) of the DDE for its knowledge concerning traffic speeds and flows on link sections ;
- an engineering firm specialised in PDUs (urban mobility plans) for its knowledge of current and future traffic levels predicted for road networks in the PDU ;
- the Urban Planning Agency for its analysis of pedestrian practices and its enquiries ;
- the Urban Planning Agency and technical departments for the study of neighbourhood functions and how they change ;
- the CETE and a landscape architect for the study of the physical and symbolic image of the intersection ;
- the transport technical department for its knowledge of changes to the public transport system.

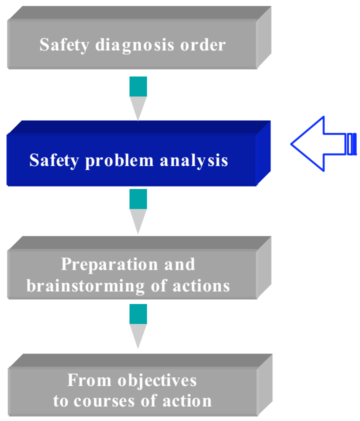
Using the specifications as their starting point, each member of the project team produces a diagnosis and proposes courses of action. A first meeting ensures the consistency of the various procedures and tries to meet the interdisciplinary expectations of the project team members.

The general programme for the study gradually takes shape through production meetings concerning all or part of the project team and feedback meetings. The project manager's key role is to bring together thoughts and ideas, ensuring in particular that they respect the primary objective, i.e. improving transport safety.

The objectives resulting from the thematic procedures are redrafted, adapted and brought into line with the safety objectives. This means that any plans to enhance the entry approach to the town in an established landscape must not compromise the safety or clarity of the intersection for road users. Trees, walls and other features of landscapes must not become potential obstacles. Neither must efforts to achieve better traffic flows simply transfer the existing accident risks onto the motorway network or the next intersection.

The steering committee validates the various diagnoses and development objectives. The project team is then able to move on to the design phase. Once its mission is accomplished, the project realisation team is selected following standard project management procedures. The safety study project manager participates in the realisation of the project by monitoring safety conditions during the works phase.

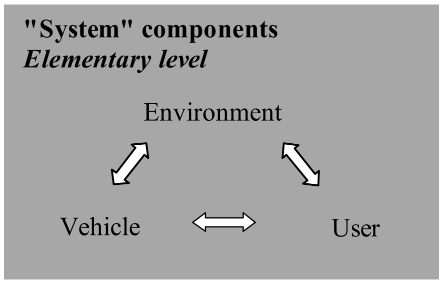
Step 2 –Safety problem analysis



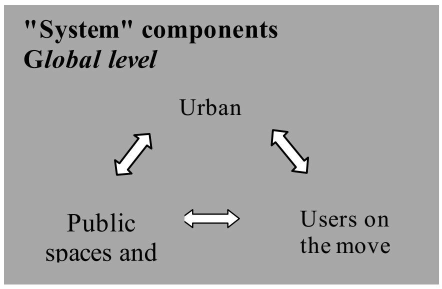
Concepts

Understanding the accident : the notion of systems

The transport safety analysis relies on the notion of systems rather than causal approaches (which are not very effective in helping us to understand the accident). The notion of systems enables us to represent the accident using a set of three interacting components : the driver, the driver's vehicle, and the environment in which it is travelling. This is the **elementary level**.



However, this representation must be interpreted in a much wider sense, by taking account of the **global level**. This includes interactions between users on the move, the public space and the transport networks, elements associated with mobility, and the urban environment in its broadest sense.



At this scale, the notion of systems leads us, in particular, to consider that transport safety risks do not result from simple "causes" that can be attributed, for example, to features of the urban environment or the design of public spaces and road networks. As research by Marine Millot[7], has shown, the problems lie in the interactions between these different elements, in the difficult mutual adaptation between the urban environment and the design of public spaces and roads.

Microcontrol and macrocontrol

The following elements are based to a large extent on work carried out by Dominique Fleury (INRETS)[8].

Microcontrol by users – This involves exclusively users on the move, whether as a driver, pedestrian or other road user, who exhibit microcontrol by adapting their behaviour, in real time, to the environment they travel through. This microcontrol occurs from the outset of a mobility requirement, through the choice of transport mode, choice of route, travel conditions, and specific behaviours at a particular location.

Macrocontrol by administrators – The role of administrators is particularly important. Their actions concerning the urban environment, public spaces and the road network constitute macrocontrol, over a longer timeframe. Their choices in terms of planning and urban development shape the urban environment and the way the territory is organised. In particular, they determine residential choices and mobility needs.

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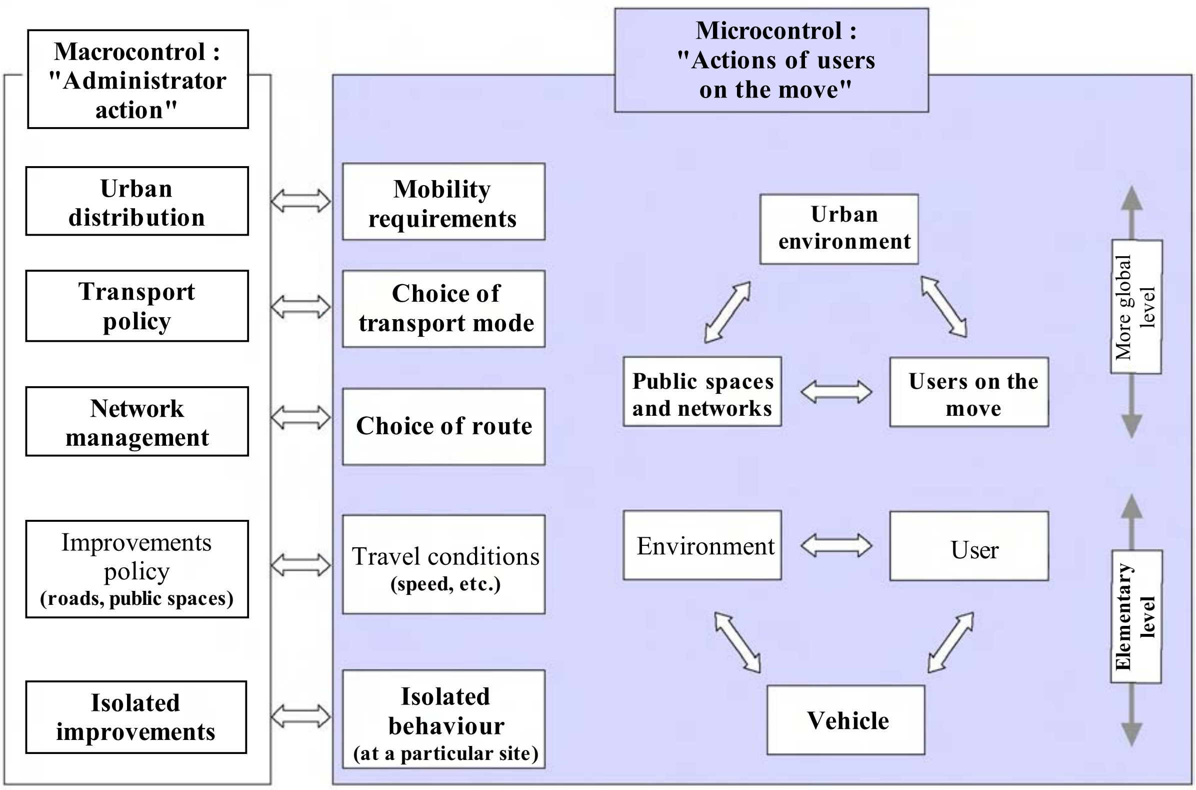
[7] *Développement urbain et insécurité routière : l'influence complexe des formes urbaines, ENPC, December 2003.*

[8] *See in particular: Sécurité et urbanisme, Presses de l'ENPC, 1998.*

Transport and road policies will have a particular influence on choices of transport mode and choices of route. The overall design and management of public spaces and roads in a neighbourhood will condition general driver behaviour. The specific design and management of a particular site, such as modifications to traffic-light sequences or changes to kerb layouts, will also have an effect on behaviour.

In the context of this macrocontrol, transport safety is, of course, one of the objectives (to be) taken into account, along with other objectives linked to city life and urban development.

Macrocontrol, which (among other things) concerns courses of action to be implemented as a result of the safety study, is a matter for administrators in charge of highways, transport organisation and public spaces only, not users. For Dominique Fleury[9], a researcher at INRETS, "*macrocontrol achieves its objective if and only if it encourages microcontrol among drivers and pedestrians. For this, it must enable situations to be rapidly understood, allow sufficient margin for error, and ensure good time-constraint management.*"



[9] *Synthèse INRETS* No. 49.

Analyses

What data is necessary for the analysis ?

Accident reports – an essential source of information

Accident reports constitute an essential source of information for safety experts. Analysis of these reports – which should ideally cover a five-year period – is based on qualitative data contained in the different sections (places, transport modes, etc.), the accident diagram, and the declarations of the parties involved and eyewitnesses.

These elements make it possible to identify and understand the sequence of events involved in the accident by breaking it down into individual situations according to the sequential analysis method defined by INRETS[10] and presented on page 43 of this guide (accident analysis methods).

ECPA (formerly REAGIR) data available may be used under the same conditions.

Accident reports

Where can I consult them ?

Access to accident reports can generally be obtained on police premises (police stations (*Police Nationale*), *gendarmeries*, etc.). *Préfectures* and *sous-préfectures* sometimes have copies that can be sent to DDEs. In the absence of a local agreement, individual (named) authorisation from the *Procureur de la République* (French State Prosector) is required to consult them on police premises.

How can I use them to best advantage ?

Before going to the police station, it is a good idea to read through the BAAC accident file beforehand, in order to identify the accident reports you wish to consult (number and date). It is highly advisable to read the accident reports in their entirety. However, depending on the type of diagnosis (accumulation zones, specific safety issues, etc.), this reading may be reduced to a sample. It is often useful to visit the sites concerned in order to visualise some of the reference points on the route in order to make reading easier.

Why do I need to be careful when analysing them ?

Accident reports are to be handled with care: they are records written for police purposes, and their primary function is to make it easier to determine or apportion blame, not to understand the accident.

What should I do if there are a lot of accident reports ?

In this case, a sampling process can be useful. If there are a large number of accidents for a particular safety issue, a few accident reports can be selected at random. You may also wish to select only those reports from the most recent year(s). If there are still too many reports from the previous year alone, it may be necessary to narrow the selection further (randomly or systematically, e.g. all those with even-numbered dates).

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[10] *"Outils et méthodes n°3"* INRETS report, T. Brenac. 1997, 79 p.

External data unconnected with the accident report

Accident analysis very often requires information from other sources than just the accident report.
This information can be divided into two categories :

- **Information linked to observation of the accident site**

In many cases, making a site visit will help you to understand (or better understand) the sequence of events involved in the accident, along with the site's malfunctions : a complex intersection that is difficult to understand, poor traffic-light visibility, poor layout that does not emphasise the presence of an intersection, the end of right-of-way or a pedestrian crossing, a configuration that encourages high speeds on the section of highway prior to the intersection, etc.

This visit also enables you to observe the particular usages, practices, habits and behaviours of the site concerned. The preliminary analysis of the accident reports will act as a guide for your observations : the aim is to understand how accidents come about.

- **Information linked to knowledge or study of the territory**

This concerns collecting knowledge about housing, businesses, how the public transport network is organised, transport habits, etc., in the area in question. The analysis of an accident report often (but not always) makes it possible to obtain information or draw conclusions regarding the origin and destination of the journey in question, its motive, its context, sometimes driver constraints (e.g. bad weather), more rarely the activities that preceded the journey. It is then possible to piece together all these facts in order to build a picture of the territory and how it functions.

We can then note, for example, that a pedestrian involved in an accident, having left his or her home to go to the shops, went to a nearby shopping area, passed through an area of collective housing and crossed a main road laid out in a way particularly poorly suited to pedestrian access. The lack of coherence between the organisation of the urban area and the layout of the roads may be cited as a contributing factor of this accident.

Generally, other recorded accidents on the same road reflect the same logic and enable us to draw more general conclusions. It is only through the analysis of "clues" taken from the accident report and through site observation that external data can be collected. The main pitfall to avoid is conducting a safety risk diagnosis based on elements that have no direct link with the accident.

Tackling a perceived lack of safety

Perceived lack of safety must be taken seriously and tackled like any other safety issue. This is something that comes to light through surveys, interviews, neighbourhood meetings and so forth. It is a phenomenon that helps explain certain behaviours and which helps us to better understand accidents.

In some cases, this perceived lack of safety can play an important role in maintaining objective safety levels. Let's take an extreme example: we don't usually feel safe standing between the rails of a tram line, and this is just as well! A less caricatured example would be the way in which a simple pedestrian crossing can improve the feeling of safety for pedestrians in dense urban environments, and also improve objective safety. However, in an area with heavy traffic, on the edge of the built-up area or at the "entrance" to the city, the effect on objective safety would be negative. Care must therefore be taken to ensure that measures intended to improve the feeling of safety do not in fact have the opposite effect. As a rule of thumb, most speed reduction measures increase both objective and perceived safety for local users.

The analysis can be more or less thorough, depending on the needs linked to the type of study [see Information Sheet : "Data external to the report", page 55].

Which accident analysis methods ?

Before analysing accidents in detail, it is important to keep in mind the principal conclusions of the safety issue study. In the absence of a safety issue study, it is highly advisable to conduct one (in greater or lesser detail, depending on the number of accidents concerned) in order to orient the order more effectively.

To understand an accident, an analysis of the interactions between the user, the vehicle and the environment in which it is travelling is necessary. These three components are to be considered in fairly broad terms, so as to include users on the move, public spaces and transport networks, and the surrounding urban environment. If necessary, the results of this analysis should be complemented by other data in order to help us understand the safety problems involved and formulate courses for action. These approaches are often described as functional, as they concentrate on the description of the mechanisms concerned in order to try to understand the malfunctions.

Analysis method for accident reports using INRETS standard scenarios

INRETS defines a standard scenario as the typical sequence of events for groups of accidents bearing similarities in terms of the sequence of phenomena and causality relationships, from the driving situation to the accident situation and emergency situation, as described below. Certain types of accident are indeed closely linked ; the sequences of events concerned share many aspects and "tell the same story", without being exactly identical. Furthermore, preventive action in response to these accidents may also be similar.

The use of the reference scenarios established by INRETS simplifies the analysis and makes it easier to manage : the method, which involves comparing the accident to a reference scenario, requires less expertise on the part of the safety expert than the complete creation of a scenario based on the analysis of accident reports without any references [see Example Sheet : "Content of an accident report analysis grid", page 49].

Understanding how the accident occurred and bringing malfunctions to light : using the sequential analysis

The sequential analysis enables you to reconstitute events and describe what happened by highlighting the processes, functions and malfunctions in interactions within the system, particularly concerning how the driver processed information from the surrounding environment.

Malfunctions result from, for example, a lack of awareness of a road layout or another road user, a misinterpretation of how a particular intersection operates or the misinterpretation of another user's behaviour. Where data allows, these processes must be looked into as far ahead of the accident as possible. For example, the urban organisation of a city can create travel needs between two neighbourhoods and explain certain facts relating to the accident, such as pedestrians crossing an urban highway with heavy traffic in order to get from a residential neighbourhood to a shopping area.

Describing and understanding how the accident occurred – In order to fully understand the accident and draw as many lessons from it as possible, the utmost care must be taken in this final phase to do no more than describe and understand the facts and processes, i.e. concentrating solely on how the accident happened, without seeking at this stage to identify accident-causing factors, explanatory elements or courses of action.

A description and understanding of how the accident happened (sequence of events, as well as processes, functions and malfunctions that explain this sequence) ensures that multiple lessons can be learnt from the analysis, particularly in terms of prevention :

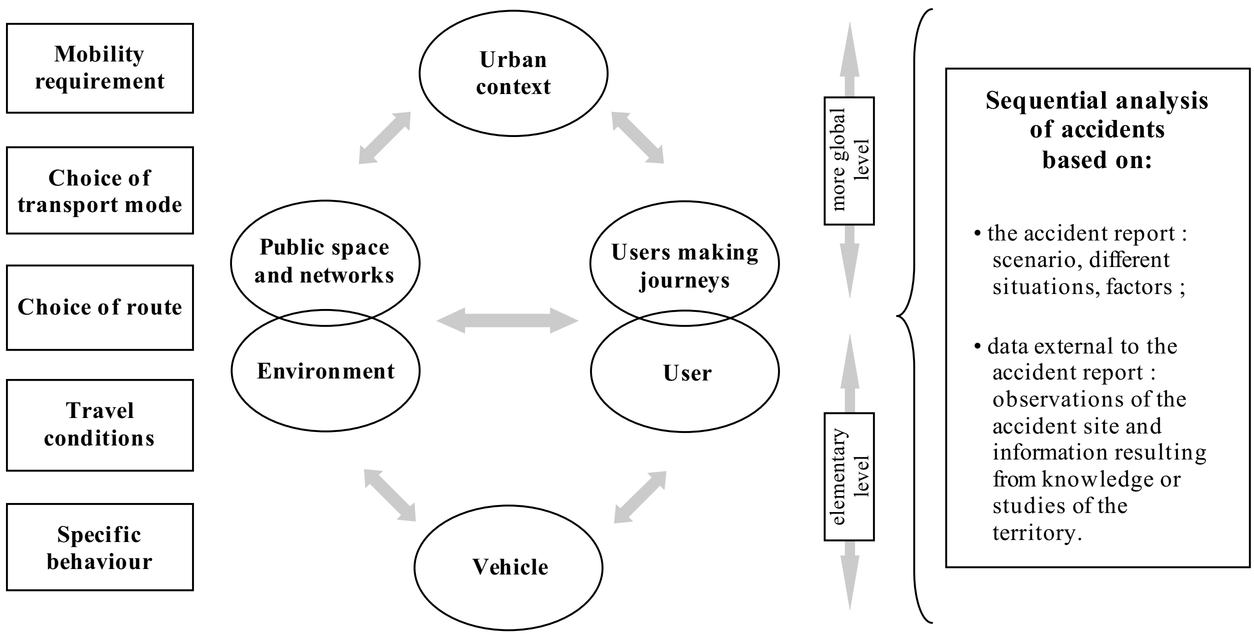
- either directly, by considering how the accident came about and by imagining other system configurations, such as a layout that could have changed the sequence of events and avoided the accident, e.g. speed humps or speed tables on the main road to avoid accidents at a stop-line intersection ;
- or by identifying accident-causing factors described in the following phase, i.e. the specific state of one or more of the system components involved in bringing about the accident and against which it is possible to take action.

Is it possible to identify situations deemed conducive to unsafe travel without reference to accident data ?

In the field of transport safety, it is generally accepted that the systems at play work in a complex manner that implement many control and retroactive loops, making the behaviour of these systems unpredictable or difficult to predict. As a result, it is in general very risky to declare – based simply on the location, the network configuration in a neighbourhood or observed behaviours – the presence of a situation that generates safety risks.

For example, does the (too) high proportion of school journeys made by car lead to an "unsafe" situation ? To date, it has not been clearly established that taking children to school in the car constitutes a safety risk. While using the car in this way does mean that children learn road safety skills later, and that road traffic levels increase, it also means that children are exposed to fewer accident risks than if they were to walk or cycle to school, and also eliminates the risk of accidents upon leaving public transport. From a road safety perspective, priority should be given to making pedestrian routes to school safer, particularly through appropriate road layouts, in order to encourage walking to school.

Accident analysis



Accident-causing factors

In the analysis, it is important to distinguish between :

- accident-causing factors ;
- other explanatory elements that contributed to the accident ;
- severity factors.

Some elements can be both accident-causing factors and severity factors, such as a road configuration that encourages high speeds.

For each accident-causing factor, we must be able to identify its role in the sequence of events surrounding the accident. This could be alcohol slowing down reactions to another road user or to the situation in hand ; a complex, non-intuitive intersection that is difficult to understand for non-local drivers ; parked vehicles reducing visibility ; wide roads and/or very powerful vehicles encouraging higher speeds, etc.

Coming back to the analysis after on-site observations

"*Observations must make it possible to back up or invalidate a certain number of elements of the analysis of the accident case : these observations must therefore be oriented using knowledge of the case in question given by the first analysis of the accident report. These observations or subsequent measures sometimes lead to modifications of the initial analysis of how the accident occurred, or, more frequently, serve to confirm or invalidate the intervention of a particular accident-causing factor. However, in most cases, they make it possible to describe more precisely each accident-causing factor relative to the infrastructure or its environment.*"[11]

Also studying the relations between accidents, territories and networks

The qualitative analysis of accidents allows additional lessons to be learnt concerning safety risks in urban transport.

This more in-depth analysis may concern the type of space usage, housing typology, the sociodemographic structure of the population, the morphology of the built-up area, public transport provision, the organisation of public spaces other than roads, the visual characteristics of the street environment from the viewpoint of drivers, the organisation of parking, the configuration of main traffic corridors, etc. In order to achieve this, it is useful to split the analysis up into sequences [see Information Sheet : "Sequencing method", page 57].

Comparing the qualitative analysis of the cases, their spatial distribution and the characteristics of the neighbourhood studied enables conclusions to emerge regarding links between the nature of transport safety risks and the organisation of the territory and the network (a more global system), as well as regarding options for improvements. In the context of a territorial study, it is desirable to combine this approach with maps of the standard scenarios concerning the study scope, as well as a precise analysis of this scope.

[11] *"Outils et méthodes" no. 3*, INRETS, March 1997.

Identity Sheet

SAFETY ANALYSIS

Outcomes

- Highlight the relation between the organisation, functioning and perception of the space and behaviour.
- Identify problems and understand malfunctions.

Content

Target investigations on the basis of two approaches :

- a "system" at elementary level: user/vehicle/environment ;
- a "system" at global level : urban setting/users on the move/public space and networks.

Precautions

The themes analysed at diagnosis level depend on the content of the order, the context and the safety issues.

Analysis levels can differ from one theme to another, leading to variable data collection methods and variable levels of expertise.

Information Sheet: Sequential analysis of accidents and types of factors (adapted from the INRETS method)

Sequential analysis, based on data interpretation (accident report, on-site visit, etc.), seeks to understand the accident by :

- reconstituting and describing the succession of facts and events that occurred (journeys, routes, manoeuvres, vehicle positions, etc.) ;
- organising these facts and events into different sequences and situations ;
- identifying, for each situation, the processes, functions and malfunctions of the elementary and more global systems which explain this chain of events.

At elementary level, it is mainly interactions between the user and the environment (infrastructure, public space, other users, etc.) that are interesting to examine. What do users expect when they take a road like this ? Could the layout of this road have had an effect on travelling speed ? How do the parameters of the situation (other users, environment, etc.) determine the perception, understanding, expectations and decisions of the parties involved ? Do neighbourhood activities and the way public space is organised explain the presence of a pedestrian, the execution of a particular manoeuvre or the diverted attention of one of the parties involved ?

At a more global level (upstream), it is the interrelations between users on the move, the way the city is organised (urban context) and the city's networks (public spaces and networks) that need to be examined. It is important to understand how activities, housing, etc., have been able to play a role in transport and the choice of transport modes. Also, to what extent have the road network and public transport system influenced the choices of transport modes and routes made by users involved in this accident ?

It is often a matter of proposing hypotheses founded on both factual elements from accident reports and knowledge of the urban environment and its networks. Sometimes, more detailed clues appear in declarations and eyewitness statements, such as the motive behind the journey or the choice of route (e.g. "*As the ring road was congested at this time, I preferred to cross the city*").

Different situations

In many cases, it can be beneficial, after examining the accident report, to find out about the accident in more detail using one of INRETS' standard scenarios and seeking inspiration from its description in order to analyse and describe the accident studied [see Information Sheet: "Analysis method for accident reports using INRETS standard scenarios", page 52]**.**

The driving situation

The driving situation commences as soon as the user's journey starts. We must then study what the driver (or pedestrian) was doing before the accident, where he was going, at what speed and whether another action was in progress (e.g. slowing down, changing lane). We must also try to find out the point of departure and the intended destination, the user's activities just before the journey, the user's state of mind, and so forth – i.e. those aspects prior to the accident , as described below.

The accident situation

The accident situation corresponds to a momentary break, generally linked to a particular event. This is the moment when a certain element (or elements) lead to a critical situation: a pedestrian crossing a road, a driver making a left turn just as a vehicle is approaching from the opposite direction...

The emergency situation

The emergency situation corresponds to the time period separating the accident situation from the shock. It is important to know whether the driver understood the situation, noticed the other party, tried to perform an emergency manoeuvre to avoid the collision (and if so, what ?), and also whether the vehicle skiddedon a wet road surface, if the motorcyclist went down on his side as he crashed, etc.

The impact situation

The impact situation commences as soon as the initial impact occurs and ends with the immobilisation of all vehicles. We need to know how the impact occurred, between which vehicles and/or pedestrians, and because of what obstacle(s). We also need to establish whether a second impact occurred, whether the moped rider or pedestrian fell to the ground following the impact, etc.

Factors

Accident-causing factors

An accident-causing factor is a state (and not a process) of one or more system components without which the accident would not have occurred and against which action can be taken.

Severity factors

Elements that served to aggravate the impact and damage (obstacles, seat belts/restraining devices not worn, etc.).

Other explanatory elements

Other elements necessary for the accident to occur, but against which it appears impossible to act (habits, unfamiliarity with vehicle, etc.).

How to find out more about aspects earlier in the chain of events leading to the accident: looking for data external to the accident report

The general approach of this guide follows the "analysis/action" principle. From this perspective, the fact that every factor and significant element of an accident procedure points us towards the corrective action required, the domain(s) concerned, even the administrators to involve, is of particular interest.

It is only through the analysis of "clues" found in the accident report and through on-site observation that the search for external data can begin [see Information Sheet: "Data external to the report", page 55]. In particular, avoid the common pitfall of conducting a safety risk diagnosis based on elements with no direct link with the accident.

Delving into the history of an accident means being aware of "theoretical" situations. It means understanding the "enigma" that lies behind the drama.

During sequential analysis of an accident, the following questions may help you take into consideration the aspects prior to the accident:

- **What was this person doing there ?**

Was he travelling at the time – and, if so, for what reason ? Was he simply going about his business ? Was he just a passer-by ?

- **Why did this person choose this means of transport ?**

Could she have easily taken public transport instead ?

- **Why was this person using this space in this way ?**

Why did this motorist take this street ? Why was this cyclist riding on the pavement going the wrong way up a one-way street ? Why did this pedestrian cross over the road at this point at an angle while running ? Why did he walk along the roadway and not the pavement ?

It is by asking themselves these kinds of questions that safety experts find descriptions of established facts when reading or rereading accident reports, and uncover verifiable clues out on the field in declarations or eyewitness statements, that then just need to be confirmed by external data (from sources other than the accident report) and analysed.

EXAMPLE SHEET : Content of an accident report analysis grid

Example of a typical minor accident and a typical accident report (in terms of content)

In a provincial town in winter, shortly before 8.30 a.m. and the start of primary school classes, a female driver with three children on board begins to reverse out of a parking space in a service road in front of her apartment building. In the process, she runs over a man – the caretaker of the apartment building – who was walking behind the vehicle to put out the dustbins.

The content of this file may be reduced, depending on the type of diagnosis (to just the accident identification and the general conditions).
Similarly, less information is required for a specific safety study.

Accident identification

ACCIDENT report NO. : 212	**Date :** 20/02/2002	**Time :** 8.55 a.m.	**Police unit :**	**Municipality :** XXX
Street : Allée des Chênes	**Ref. Pt/Building No. :** 9	**Ref. Pt Direct'n :**	**Locality :**	**Intersec'n (road 2) :**

General conditions

Urban area :	**Weather :**	**Surface cond'n :**	**Light levels :**	**Traffic :**	**Notes :**
In	Light rain	Wet	Dawn	Low	Service road, parking

Users

Vehicle		**Users**						**Victims**
Parties involved	**Category**	**Age**	**Sex**	**Driving Licence**	**Home address**	**Journey** *(leisure, work, etc.)*	**Seriously injured/in hospital**	**Slightly injured/ injured but not hospitalised**
A	Car	35	F	1995	Town of XXX	School run		
Y	Pedestrian	57	M		Town of XXX	Work		1
etc.								

Sequence of events

Specify the different phases :	
Driving situation *Normal traffic, approach lights, stop at lights, approach slip road, approach stop line, stop at stop line, overtaking ; motives and circumstances of journey, etc.*	Day breaks under a shower of light rain. "A" has just put her children in the car, parked at an angle in front of the entrance to the building (her home), in order to take them to school. "Y", the caretaker of the building, goes to put out the dustbins in the dustbin bay.
Accident situation *Loss of control, 180° turn, pulling out of parking space, hindered by user, jump red light, surprised by roundabout, etc.*	"A", preoccupied with not catching her wing mirror on a tree and anxious to drop her children off at school on time, begins to reverse out of her parking space without paying full attention to her immediate surroundings. "Y" sees the woman looking in her mirror, and assumes that she has seen him and is letting him pass.
Emergency situation *Veer to right, veer to left, cross over centre line, etc.*	"A" is not at all aware of the situation. "Y" notices the car reversing suddenly and tries to move back a few steps, but he doesn't move quickly enough.
Impact situation *User/obstacle on carriageway, obstacle on verge, etc.*	"A" hits the dustbin, which in turn causes "Y" to fall. "Y" loses his balance and falls hard onto the roadway.

Remarks

In general, relatively little information is provided about the driving situation in the accident report, particularly in terms of circumstances, motives, and the perception or understanding of the situation. This lack of detail can sometimes make it more difficult to understand the malfunctions involved. However, clues often appear in declarations and steer investigations in the right direction during on-site visits.

These clues can be corroborated and complemented by external data from sources other than the accident report[see Information Sheet : "Data external to the report", page 55], still in connection with the accident, in order to help obtain a "bigger picture" of the interactions between users on the move, the public space, the transport networks and the urban environment in the broadest sense of the word.

In this particular case, some of these elements were able to be identified.

Example of analysis formalisation :

*Elements in **black** result from the accident report, elements in **blue** are to be corroborated by data external to the report*

Clues	Urban context	Public space and networks	Users on the move	Environment	User	Vehicle
Elementary level		The service road is narrow and makes manoeuvring difficult.	The caretaker is walking along the roadway. Angled parking spills over onto the pavement.	Visibility for manoeuvring in reverse is limited by trees.	Leaves home at 8.30 a.m. Probably in a rush. Careless manoeuvre.	Reduced visibility at the rear, mist, frost, three children.
Global level	The school is far enough away from home to justify the using the car for the school run. There is no suitable school near the apartment building.	The pedestrian route to the school is dangerous. No public transport.	The mother chose to take her children to school in the car. The mother works in the city centre.	The presence of trees (see plan) makes reversing into a parking space difficult.	Entering parking spaces forwards provides easier to access to the boot of the car (e.g. for putting school bags inside).	

What can be deduced from these circumstances, even in the absence of any absolute certainties ?

The driver was taking her children to school. Because of the time, her manoeuvre was no doubt a little hurried. The man she knocked over was going about his work at the time.

Looking at a map of the city or neighbourhood or public transport plans and timetables can help evaluate whether the distance between home and school made the journey on foot feasible or if public transport could have met the needs of this journey.

Accident-causing and severity factors

Accident-causing factors

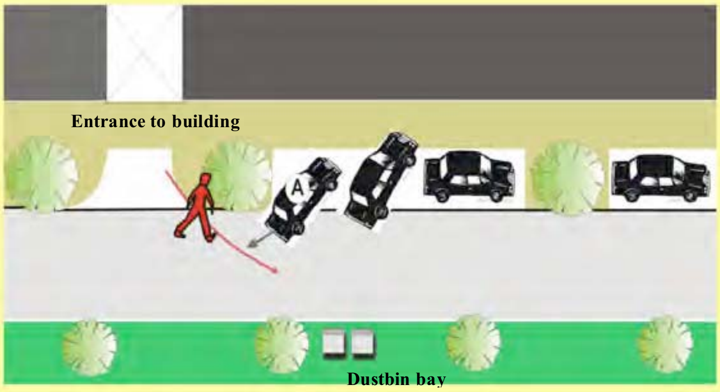
- Design and implementation of roadside parking spaces makes good mutual visibility impossible.
- The presence of a tree also reduces visibility.

Severity factors

- None

Other explanatory elements

- Local habits and preoccupation with being on time.
- Reduced visibility conditions leading to the pedestrian not being detected.
- Driver's attention focused in the opposite direction to the pedestrian.



Remarks

This particularly clear example shows that identifying accident-causing factors alone is not enough ; beyond the main prevention measures possible, such as improvements to parking areas (either angled spaces for safer manoeuvres or redesigned parallel parking), other measures are to be sought in order to encourage alternatives to the car for journeys to and from school, such as the development of safer routes for non-motor traffic, improved public transport routes and setting up a traffic regulation enforcement scheme for illegal parking...

INFORMATION SHEET : Analysis method for accident reports using the INRETS standard scenarios

As part of INRETS' research, a set of standard accident scenarios have been developed for accidents occurring in urban areas. Twenty of the scenarios involve at least one pedestrian (INRETS report no. 256), and forty scenarios cover all the other kinds of accident not involving pedestrians (INRETS report RE-O6-919.FR)[12].

The sequential analysis of the accident can be facilitated by referring to one of INRETS' standard scenarios. This allows the facts to be pieced together and the sequence of events to be outlined. It also brings to light all of the processes, operations and malfunctions involved in the various interactions that comprise the system as a whole : notably, in terms of how the driver processes information relating to his surrounding environment.

Suggested method

- Read through the accident reports to become familiar with the sequence of events ;
- compare this sequence of events to the various standard reference scenarios and select that which best matches the accident to be analysed ; accidents that can not be allocated a standard reference scenario are classed together in a "miscellaneous" category ;
- complete the sequential analysis sheet by filling in the different situations relating to : the driving conditions, the accident, the emergency reaction, and the collision ;
- seek the factors involved by drawing on those described by INRETS in the standard reference accident scenario ;
- identify each standard scenario with a reference code.

Note : It is normal for certain types of more unusual accident not to be able to be assigned any standard reference scenario. Also, in certain cases, the details provided in the accident report may be not be sufficient to allow the accident to be analysed.

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12 Provisional reference at the time of publication of this guide

EXAMPLE SHEET

Example of an INRETS standard reference scenario[13]

A pedestrian runs out across the road (often a child whose attention is focused elsewhere)

They are initially hidden, often by a parked vehicle (information based on 17 cases)

Situations

Driving situation

A vehicle is driving along an urban road (17 cases), generally with no intersections (10 cases).

An often very young pedestrian (3 to 11 years-old in 15 cases), frequently accompanied by friends or parents (8 cases and 3 undetermined cases), is either at the roadside or is preparing to cross.

There is generally no pedestrian crossing located at or near to the pedestrian's selected crossing place (14 cases).

Accident situation

The pedestrian is initially hidden from the driver's sight, most frequently by :

- a parked car (10 cases) ;
- a house, building or wall (4 cases) ;
- bushes, a tree, fencing on a road island or central reservation (3 cases) ;

The pedestrian then starts to run across the road at the same time as the vehicle appears (on the first road lane that the pedestrian must cross, after having passed the obstacle blocking visibility – 14 cases)

The pedestrian's attention is often focussed on :

- an object, person, or goal to be achieved on the opposite side of the road (7 cases) ;
- an amusing situation or game (2 cases).

In 7 other cases, the information available was insufficient to draw any such conclusions.

The vehicle driver either does not detect the pedestrian at all, or their detection of the pedestrian is very late.

Emergency situation

The driver does not usually have the time to make an emergency manoeuvre (10 to 11 cases). In other cases he brakes (3 cases) or swerves across the road (1 case).

Two cases were undetermined.

Impact situation

The vehicle collides with the pedestrian.

In 2 cases, the vehicle also drives over the pedestrian's foot or leg.

13 From: INRETS report no. 256, 2003.

Accident-causing factors (an extract of some factors linked to this scenario)

- Large road width or rapid approach conditions favouring excessive driving speeds in relation to the context (7 cases) ;
- the design, organisation or management (control) of parking : vehicles parked in a continuous line offering few crossing points with good mutual visibility (3 cases) ; the absence of footpath build-outs or other measures to discourage parking in immediate proximity to a pedestrian crossing, an intersection, or an important access area (3 cases) ; vehicles parked illegally on the footpath in an area where the curve of the road hinders visibility (1 case) ;
- the pedestrian's young age and inexperience can result in insufficient information gathering (at least 12 cases). In other words, the pedestrian does not register information concerning the traffic flow as their attention is generally focussed on an object, a goal or an activity ;
- ...

INFORMATION SHEET :
Example description of data external to the accident report

Only from the "clues" obtained from the accident report, and from observing the site can a search for additional factors be undertaken. The usual pitfall of establishing a safety problem diagnois based on elements that have no direct link to the accident itself is to be especially avoided.

Urban setting

In urban settings, the following factors are of interest :

- the overall character of the district or neighbourhood : rural, suburb, village, town-centre etc. ;
- the morphology of the urban spaces (type and form of housing) ;
- the density of urbanisation – sparse or dense ;
- the structure of the different districts or neighbourhoods, in terms of their layout, the location of any facilities, and any centres that encourage journey-making ; the type and distribution of public services and facilities, with or without daily frequentation (schools, shops, facilities such as hospitals etc.) ;
- the urban thoroughfares :
  - main roads (traffic density or road space),
  - natural features (relief, rivers etc.),
  - major infrastructure (motorways, railways etc.),
  - no-through single-use areas (barracks, hospital, cemetery etc.).
- ...

Important warning

This practical card relates to the data exterieures with the procedure of accident being referred to the more total system and making it possible to study the relations accidents, territories and territories and networks to include/understand the phenomena.

It proposes to the "securologist" a description of the external data, knowing that it is not a question for him to carry out a diagnosis of the urban framework, public space, networks and users in displacement.

Competence is elsewhere and, if it can be mobilized within the framework of the study, the « securologist » will have a minimum of elements which will be able to contribute to a more complete comprehension of the accident.

Public space and networks

The functional organisation of the site

How is the road network organised (layout, road cartegorization etc.), and how are users distributed within the public space ? Are there any means of separation between different modes of transport ? How is public space organised outside to roads themselves ? Are there any open spaces outside the roads themselves ? How are these positioned in relation to the road network and, in particular, in relation to main roads ? ...

Characteristics of the site

These can be aspects as diverse as morphology (density and distance of buildings in relation to roads, density of intersections etc.) structure, dimensions, features encountered (roads with islands or central reservations, roads bordered by a cycle path etc.), general design, geometry, signs and markings, parking (angled or parallel), landscaping, transport stops etc.

How the site is perceived

On-site observation allows the evaluation of the different elements that contribute to how the site and its surrounding area is perceived by different users (of all modes of transport). This allows an overall view of the coherence and legibility of the features and facilities to be obtained. Different factors can be considered, relating in particular to the field of vision (legibility, optical width, depth of field etc.), but also to the site's visibility in a wider sense (abundance of urban activities, simplicity and ease of understanding of the road features for both drivers and pedestrians, relationship between the perceived image and the reality of the stretch of road, ease with which users can get their bearings in the town etc.).

Users on the move

When a user needs to make a journey, they first of all select their mode of transport according to the quality and performance of each of the different modes of transport available to them (public transport, cycle paths etc.). In terms of analysing accidents, the organisation of transport stops could be verified. The user then selects their route in function of those available in the dedicated network (see “public spaces and networks”).

Often, the accident report will investigate the user’s behaviour in relation to their route (“I use this route every day, it’s not too congested” etc.). Althouh not everything can be observed, the observation process often allows additional information to be obtained. If necessary, it can be conducted by means of a simplified investigation.

In the suggested analysis method described above, the notions of practice, use, and behaviour have been introduced :

- **practice** is the concrete manner in which an activity is conducted (the practice of using a given mode of transport, for example) ;
- **use** is the act of using something to satisfy a need. The choice of route can thus be viewed as use of the network ;
- **behaviour** is the way of acting, the user’s attitude (speed, cycling on the pavement etc.).

These definitions are not universal. They differ between disciplines. Therefore, where psychologists, economists or sociologists speak of “behaviour”, architects or engineers speak of “use” to describe the same phenomenon. However, regardless of the term used, the objective of these definitions is simply to detail our analyses.

Practice

Analysing the practice of using different modes of transport allows the nature and reasons for making the journey to be identified (journeys from home-school, home/facilities/services etc.).

At local level, it is useful to discover the most common practices in terms of journey-making and local life, as this allows the specific problems related to the choice of transport mode to be identified, and in particular, those linked with car use. The impact such practices have on safety can then be evaluated.

Use

This involves improving knowledge of how the space is used, which can vary in relation to the users’ attitude towards the given urban space and the function they attribute to it. The simplest means of establishing use involves observing users and interviewing them on their habits. The choice of route is a good example of this : “I go through the estate because the crossroads on the main boulevard are always jammed”.

Behaviour

Behaviour concerns users’ actions and manoeuvres, especially those considered high-risk or which can lead to particular cases of conflict, as detected in accident reports. The specific actions of all road users are concerned (cars, cyclists, pedestrians etc.), as well as those of local residents (blocking the footpath, billboards etc.).

Driving speeds can reveal the user’s intrinsic behaviour. These are, however, also influenced by the visual characteristics of the surrounding environment and the road itself.

Awareness of road users’ behaviour is not only useful for understanding accidents, but also for defining the objectives that should be fixed in any suggested safety measures to be taken.

INFORMATION SHEET : Sequencing method

In order to observe the site and analyse information additional to that featured in the accident report, the site must be studied via the principle of sequencing. This allows the nature of the relationships between the route under examination and the surrounding environment to be understood.

This information sheet defines the notion of sequencing and explains how this approach can be applied.

Definition

Sequencing : units of space that are homogeneous in terms of their visual and spatial characteristics, and can be considered to form a sequence of segments comprising a journey or thoroughfare.
This general definition, featured in the guide to cross-town links, reveals the dual purpose of homogeneity, which is both visual (dominant contributing factor to users' information gathering, and affecting their behaviour), and spatial (concerns all the functional and physical characteristics of the area which may also affect user behaviour).

Aim

To understand the nature of the relationships between the route under examination and its surrounding environment : to evaluate the different levels of service available to users (performance of both road and roadside ancillaries) : and finally, to comprehend the reasons behind the behaviour and practices of the various users who frequent the space.

Splitting the route into a series of sequences ultimately allows the formulation of hypotheses to explain variations in user behaviour and adaptive reasoning.

It allows the identification of points where the surroundings change, and which users commonly identify as reference points for their journeys. This also reveals the ways in which users experience the public space.

The route is thus divided into segments with identical visual, functional and physical characteristics.

This can help in understanding any malfunctions encountered when observing user practices and behaviour.

Composing sequences

Sequences are defined in consideration of 4 criteria :

- perceptions which the users of public space have

  Perception relies on the user quantitatively scanning the road (its horizontal, transverse and vertical dimensions) in relation to the surrounding environment. It is important to be aware of the effect this relative scale can have on users' ability to read the road (scale of the surrounding environment in proportion to the road's dimensions).

  For example : if the surrounding buildings are detached and set back from the road, the relative scale will be in favour of the road. Conversely, if the surrounding buildings are immediately adjacent to the road, awareness of the urban setting is increased and thus the ability to judge any transversal road uses is also increased.

- the characteristics of the public space and its operation

  The characteristics and organisation of the public space : the number and width of roads, the traffic flow system, the type and organisation of parking, the presence or absence of facilities for specific modes of transport (cycle lanes, bus lanes etc.).

- the landscape of the public space

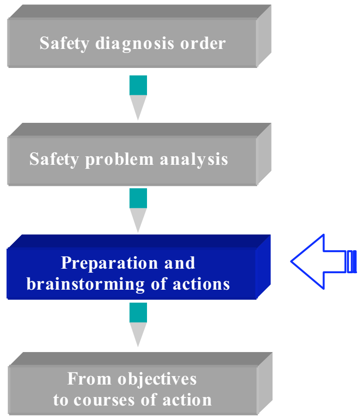
  The landscape is comprised of several subsets of characteristics of homogeneous appearance (but without systematic uniformity) These characteristics are defined notably by the relief, the land use, the form of housing, vegetation, overall atmosphere etc.

- how users experience the space

  User experience is directly linked to the operational performance of all activities which border the road, and which are principally aimed at the area's residents (shops, housing, activities etc.).

  Changing the dimensions, whilst taking into account pedestrians, is particularly important for the basic characterisation of sequences. This consideration of the quality of public space use by pedestrians is, in fact, found in all of the criteria used to define sequences.

Step 3 –Preparing to act



Summarizing the safety analysis and formulating safety objectives

Step 3 is a key stage in drawing up the diagnosis. It should allow the consolidation of all of the main safety issues identified, analysed and apprehended in the previous step.

To facilitate this transition, it is useful, at this stage, to determine the objectives that can be proposed in response to each problem highlighted.

Formulating the safety objectives forms part of the safety analysis and not the courses of action. This stage should be carried out in direct relation to the problems identified, and should be very clearly distinguished from the subsequent process of formulating courses of action. This precaution prevents over-hasty action being undertaken in the absence of any previously established objectives.

Example objectives depending on the scale of the area concerned and the safety problems encountered.

- **On the scale of a particular site -** reduce driving speeds at the given site ; improve visibility ; improve the perception and legibility on approach of a pedestrian crossing or crossroads ; improve the perception and legibility of a pedestrian area ; remove any risk of overtaking a stationary bus ; avoid exposing children leaving schools to crossing wide roads with fast-moving traffic ; discourage the rapid build-up of queues ; protect users turning left etc.
- **On the scale of a road or a section of road -** modify the road to avoid giving the impression that its use is reserved exclusively for cars ; reaffirm the commercial aspect of the area for roads lined with shops ; avoid or limit u-turn manoeuvres ; harmonize the road's use with the surrounding urban environment etc.
- **On the scale of a neighbourhood or a network -** reduce driving speeds in the whole residential or commercial district, or even in the entire town-centre ; reduce visibility problems linked to parking by means of a strategy implemented throughout the network ; limit the risks relating to overtaking stationary buses, or pedestrians crossing in front of buses at all public transport stops ; provide protected routes for young pedestrians travelling to school throughout the neighbourhood etc.

Identity Sheet — GETTING READY TO ACT

Aims

Give an overall evaluation of the safety problems analysed and apprehended.

Prepare for the definition of courses of action by identifying the objectives to be pursued, in response to each problem, in view of improving safety.

Contents

A brief description of each safety problem that may correspond to a typical accident scenario, a typical problem, certain conditions of use, or an accident-causing entity etc.

Associated objectives: one or two objectives should be defined for each problem in view of modifying the system's operation and rectifying the problem.

Additional analysis and summary processes

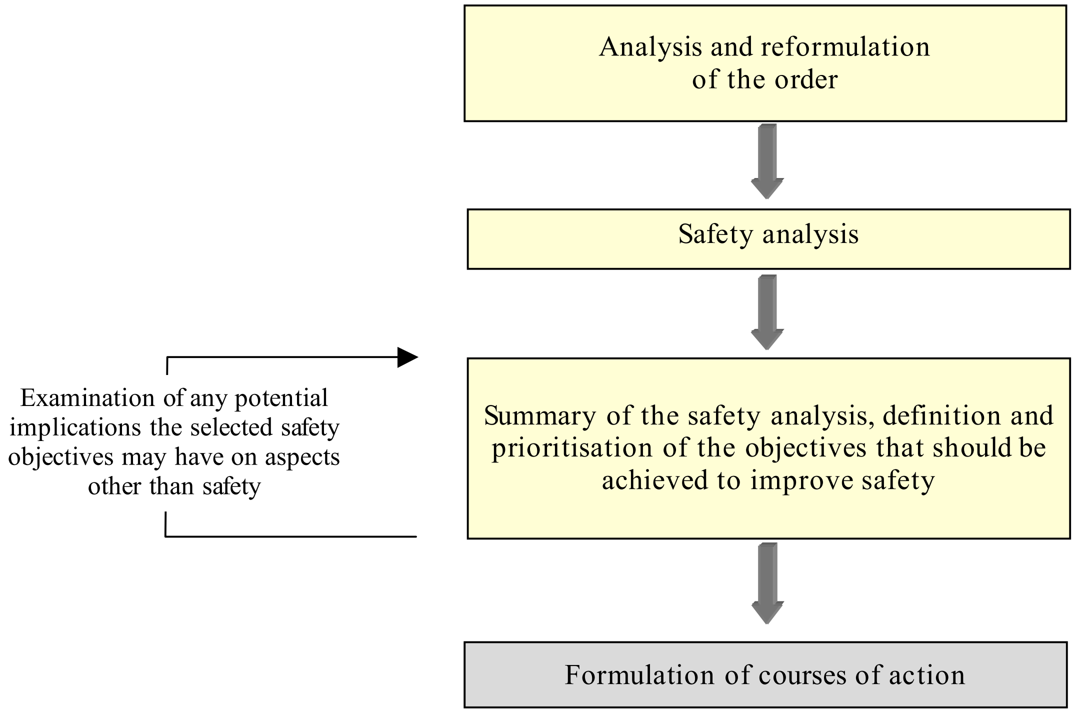
Two potential outcomes can result from the conclusions of the "Analysis" and "Formulating the order" sections.

- Outcome 1 : the safety problem initially encountered does not require the field of study to be expanded to cover other issues. In such cases, summarizing the information contained in the safety analysis is sufficient to formulate courses of action.
- Outcome 2 : examination of the safety problem initially encountered suggests that it cannot be considered in isolation from other non-safety related issues. In such cases, it is necessary to widen the field of study to include other analyses, all of which must then be cross-evaluated before any courses of action can be defined.

Outcome 1 : Summarizing the safety analysis

Even if the safety problem initially encountered does not require the field of study to be expanded to cover other issues, factors such as the potential effects on different modes of transport, parking, accessibility, the operation of public transport etc. must still be considered when deriving the safety objectives from the safety analysis.

For example, if one of the objectives is to limit the number of heavy goods vehicles passing through a given area at certain times of the day, then delivery access for local shops must also be taken into consideration.



Outcome 2 : Cross-summary of the safety analysis and the additional analyses

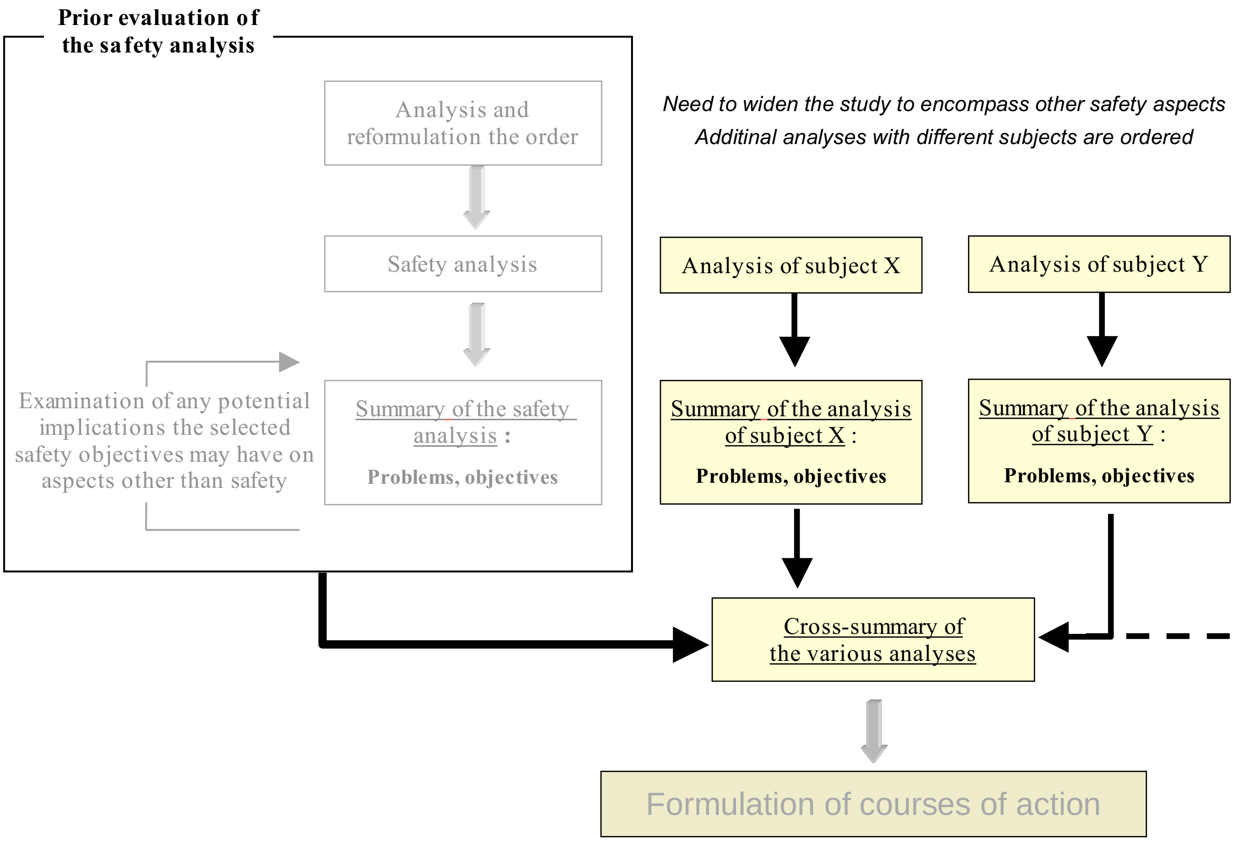
If the summary of the safety study shows that the problem can not be considered in isolation from other factors, then the order must be reformulated to allow the field of study to be widened (a multidisciplinary study). In such cases, additional analyses will be conducted in parallel to the safety analysis. Such analyses can cover subjects such as traffic flow, parking, public transport, mobility developing the urban setting etc.

Here is not the place for outlining the analysis processes to be implemented in fields other than safety. Such analyses are to be conducted according to the norms of good practice specific to the given field, and should be based on the relevant technical literature (transport studies, parking studies, analysis of access and public transport needs, mobility studies, analyses of the urban morphology and urban landscape etc.) For information on adopting a multidisciplinary approach, the 1990 CETUR publication *Ville plus sûre, quartiers sans accidents, savoir-faire et techniques* (Safer cities, accident-free neighbourhoods – know-how and techniques) remains a pertinent reference work.

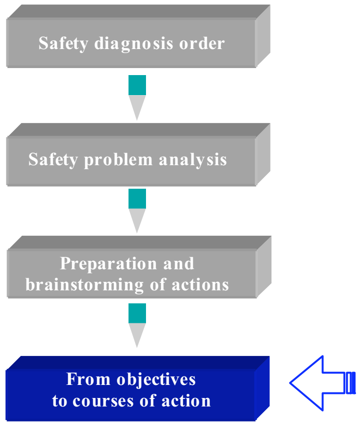
The flow chart below shows how such studies should be consolidated with the safety analysis. The summaries of both the safety and additional analyses are used to conduct a cross-summary. This is achieved by representing all of the problems and objectives derived from the various analyses in the form of tables, cartographic representations or diagrams. The convergences, contradictions and overall complementarity of the various objectives are then analysed, allowing a set of common objectives to be defined.

Any potential contradictions must be resolved, otherwise conflicts of interest within the common objectives can ensue. Such conflicts must then be debated and validated by the steering committee and the decision-making bodies.

Once the common objectives have been established, they are used as the basis for formulating courses of action.



1. Step 4 – From objectives to courses of action : making the right moves.



This step involves the transition from a set of objectives obtained from summarizing the analyses, to the formulation of a set of courses of action to satisfy these objectives.

This process draws on :

- the objectives obtained after summarizing the various analyses,
- previous knowledge and experience of the effects of the various types of urban planning measure and action on the safety and the functioning of urban life.

From safety and other objectives to courses of action

The objectives derived from the safety analysis constitute the objectives that should be fixed for any planning measures or actions implemented in view of improving safety. If any additional analyses reveal similar objectives (not necessarily safety objectives), then the “cross-summary” will have allowed a set of common objectives to be established that address the various concerns raised in the study (safety, traffic flow, public transport, mobility, parking, accessibility etc.).

When the objectives have been correctly formulated, it is generally easier to identify the different possible courses of action available for meeting each such objective. For example, the objective to “improve visibility” can often be achieved by reorganising parking or adapting street furniture, facilities, the commercial use of public spaces etc. Another example is the objective to “reduce driving speeds” throughout a neighbourhood, which suggests the use of techniques such as implementing 30kph zones. Similarly, the objective to “limit situations requiring the overtaking of stationary buses or pedestrians crossing in front of buses” can be investigated by systematically re-examining the location of transport stops, and by elaborating an overall strategy to implant traffic islands that prevent users overtaking buses at transport stops or intersections.

In certain cases, several different courses of action can be suggested for the same objective. For example, the following courses of action can be identified for the objective to “harmonise the road’s use with the surrounding urban environment” :

- modifying the urban setting. This solution can, however, rarely be implemented, as land use can not generally be changed in the shot or medium term ;
- diverting some of the traffic flow onto other parts of the network. This is, however, often a delicate measure to undertake, as it risks simply moving the safety issue elsewhere ;
- modifying the characteristics of both the road and the public space in order to moderate driving behaviour and promote behaviour appropriate to the urban setting (reduced driving speeds, improved legibility of the road and its various urban uses etc.). The positive effects of this strategy are clearly established.

Identifying courses of action that are appropriate to the problem in hand

All courses of action should be appropriate to the context and the problem in hand. It is important to carefully estimate the potential effects each course of action could have on safety, as well as any other aspects. This ultimately relies on knowledge and experience [14].

> **Favour collective decision making**
>
> Collective input can be a great asset when conducting this stage of the process, even if the study undertaken is not multidisciplinary. People with good local knowledge of the area in question should be mobilised, as they can notably help prevent the implementation of solutions that are ill-adapted to the context or to specific local uses (presence of a market on certain days, seasonal traffic etc.) When such cases arise, the objectives should be re-worked in order to identify more appropriate courses of action.
>
> This process can be prepared and initiated by the officer(s) in charge of the study in collaboration with local technicians (technical team or project team). At this stage in the process of defining courses of action, two or three different strategies can emerge. Such strategies must obviously be submitted to and discussed with the project backer (potentially within a steering committee), and are therefore subject to arbitration and amendment. The project backer can, at this stage, choose to introduce a form of consultation or participatory democracy by inviting citizens, groups or associations to meetings. Whether or not this takes place, the skills of the technical team are ultimately essential in highlighting past experience and preventing the implementation of any solutions based on ill-informed decisions or drives by common interest groups.

It is also important to be aware that the measures implemented may often have effects outside the immediate area of the project itself. These potential effects could, for example, be linked to traffic being diverted into a wider area of influence. Such effects must be taken into account and can, where necessary, require the implementation of supplementary measures.

For example, if the conclusions drawn from the analyses suggest that in order to improve safety, it is favourable to modify a crossroads or the phasing of a set of traffic lights, then the potential effects on pedestrian journeys and traffic flow must also be considered.

The factors to examine are likely to differ according to the problem encountered and the objectives and solutions envisaged. For example, considering solutions such as “flat-top road humps” or “raised pedestrian crossings” may require the issue of noise pollution to be addressed (depending on the surrounding environment). For sites featuring listed buildings, the quality of any proposed urban planning measures and their compatibility with the site’s historical heritage must be carefully examined.

As mentioned in the previous step, such factors should be considered after the safety analysis has been carried out, or even after the courses of action have been initially thought out. This can require certain courses of action to be modified or abandoned. In such cases, the objectives defined via the various analyses should be re-examined, as they can allow alternative potential courses of action to be identified.

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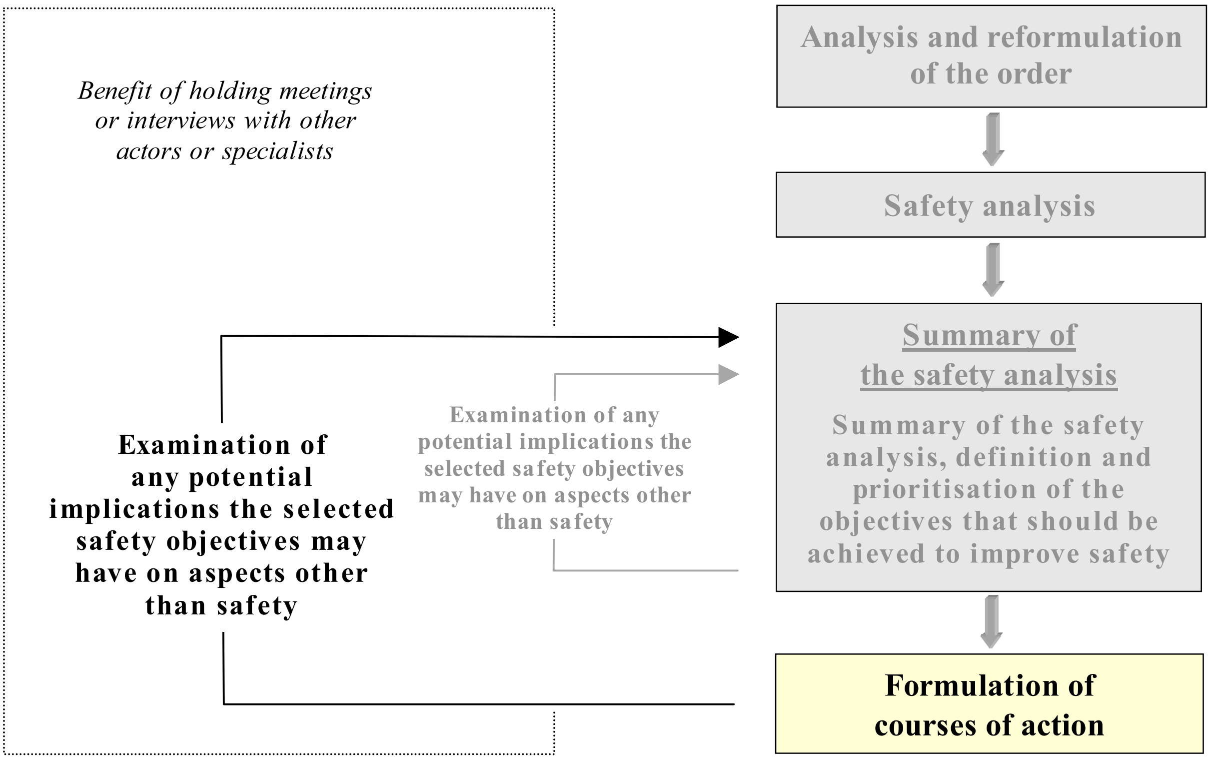
[14] For example, the following reference works and more specialised works contain useful information for help with selecting courses of action :
- *Sécurité des routes et des rues*,Setra-Certu, 1992 ;
- *Ville plus sûre, quartiers sans accidents, réalisations, évaluations*, Certu, 1994 ;
- *Réduire la vitesse en agglomération*, Certu, 1989 ;
- *Sécurité et urbanisme*, Presses de l'ENPC, 1998 ;
- *Scénarios-types d’accident de piétons et éléments pour leur prévention*, INRETS, 2003 ;
- *Gestion urbaine, sécurité routière et environnement*, INRETS, 2002.



When it comes to formulating courses of action in response to the safety objectives, it is essential to define the indicators that will be used to assess the action in question.

Identity sheet

FROM OBJECTIVES TO COURSES OF ACTION

AIMS

- The transition from security objectives derived from the diagnosis to concrete courses of action ;
- Preparation of the next phase consisting of implementation studies (not outlined in this guide).

CONTENTS

Courses of action are chosen according to:

- the scale (specific, linear or territorial) ;
- the safety objectives ;
- the common objectives, if a cross-summary has been established ;
- the context and the problem encountered and by favouring collective choices after a participative diagnosis.

INFORMATION SHEET : From objectives to courses of action

The following selection of sheets use highly concise tables to outline how objectives can be transformed into courses of action. This then allows the actions to be studied and ultimately implemented.

The sheets have a similar lay-out to project information sheets, and offer a summary of :

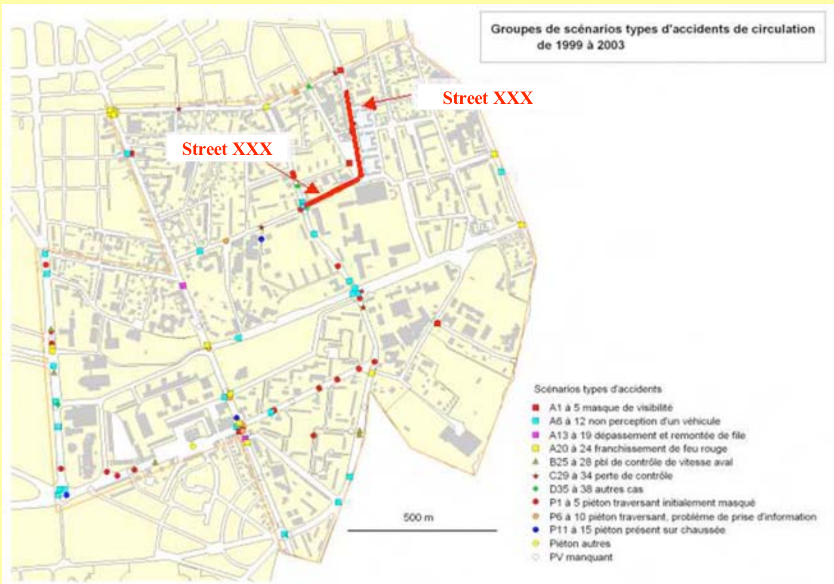
- the three fields of action for the project manager ;
- the standard scenarios involved as a result of the safety analysis ;
- the safety objectives obtained from evaluating the analyses ;
- the level of priority suggested to the client ;
- the courses of action resulting from step 4 ;
- the client(s) who may potentially oversee the project ;
- the assessment criteria - essential for project follow-up ;
- the evaluation sheets required for this course of action.

Filling in a “from objectives to courses of action” summarysheet facilitates the process of both prioritising and scheduling any action implementation studies in a given area. See page 72 for an example.

INFORMATION SHEET : From objectives to courses of action

FIELD OF ACTION	☐ **Urban setting** ☐ **Public space and networks** ☐ **Users on the move**
Safety objective(s)	When faced with an identified safety problem, the listed safety objectives state the intention to reduce the recurrent accident-causing factors. Under no account, should the stated objective include the courses of action.
Standard scenarios involved	For example, scenarios P1 to p10, A1 to A3…
Level of priority	On a scale of 1 to 3 (or higher), in relation to the safety issue study and the safety objectives stemming from the diagnosis.
Topic-based or space-based target	Scope of intervention : for example, "from intersection A to intersection B on avenue XYZ". Moped accidents involving 14-16 year olds travelling to/from school.
Courses of action	For example, traffic-calming facilities that do not hinder public transport, day and night speed measurement operations for each mode.
Potential client	"Département" council, municipal engineering departments…..
Assessment criteria	One, and generally several, quantitative and qualitative criteria are identified and based on the safety objective, for example : • speed : measurement locations and measurement protocol with maximum speed reference, V85… ; • heavy vehicle noise linked to speed ; • traffic volume and speed on several link sections… ; • changes in accident patterns
Summarysheets involved	Sheets FS 031, FS 036, FS 038 to FS 042….

Location map



EXAMPLE SHEET : From objectives to courses of action

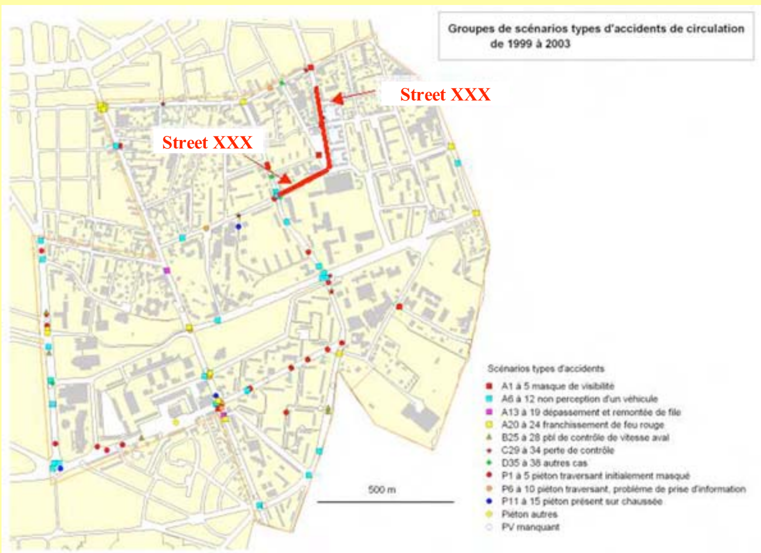
Sheet no. F A 006

FIELD OF ACTION	☐ Urban setting ■ Public space and network ☐ Users on the move
Safety objective(s)	Reduce speeds to 30 km/h on all local distributor roads with high levels of local day-to-day activity
Standard scenarios involved	P1 to 9 – 25 accidents
Level of priority	1
Topic-based or space-based target	- xxx and xxx avenues - xxx and xxx streets - Main intersections or radial roads with pedestrian traffic
Courses of action	- xxx and xxx avenues : implementation of flat-top road humps in front of the main pedestrian hubs - xxx and xxx streets : narrowing the carriageway - xxx street : widening the pavement, refurbishment of the intersection of xxx and xxx with flat-top road humps - xxx and xxx avenues : suppression of parallel parking, installation of cycle lane delineators at intersections, with the effect of visually narrowing the carriageway and preventing short-stay parking.
Potential client	Municipal engineering department
Assessment criteria	Statement speeds at the points furthest away from the plates and **follow-up of the accidents**
Summarysheets involved	FS 025, FS 032, FS 045 to FS 048

EXAMPLE SHEET : From objectives to courses of action

Sheet no. F A 012

FIELD OF ACTION	■ Urban setting ☐ Public space and network ☐ Users on the move
Safety objective(s)	Improve the quality of pedestrian areas
Standard scenarions involved	P1 to 10 : accidents involving crossing pedestrians – 25 accidents
Level of priority	2
Topic-based or space-based target	- Xxx street - Xxx street - Xxx square
Courses of action	The means are very similar to those defined in the previous point Xxx street, xxx street and xxx square are priority locations in terms of quality of space, similarly to the hub xxx/xxx
Potential client	Municipal engineering department
Assessment criteria	Monitoring accidents
Summarysheets involved	FS 025, FS 008, FS 012 to FS 018



EXAMPLE SHEET : From objectives to courses of action

Sheet no. F A 020

FIELD OF ACTION	☐ **Urban setting** ☐ **Public space and networks** ▣ **Users on the move**
Safety objective(s)	Raising awareness of safe travel among children and parents
Standard scenarios involved	P2 : young initially hidden pedestrian crossing the road, P3, P5, P6, P9 – 12 accidents
Level of priority	1
Topic-based or space-based target	- Xxx and xxx avenues, xxx street - xxx, xxx, xxx traffic islands
Courses of action	Raising awareness among children and parents via **in-school interventions** and activites led by local **associations** to explain how the most common accidents occur. Setting up a **walking bus scheme** in a school or neighbourhood. Walking bus schemes offer many advantages for raising awareness : • long term safety education rather than via a few educational sessions ; • safe travel is learned via real situations ; • accompanying parents learn how children think and behave, the effect of accompanying a group is thus of clear educational interest in terms of better understanding dangerous situations ; • being in a group increases childrens' visibility to car drivers (this must be correctly managed however, as a group of children can also constitute an accident causing factor). If a primary school catchment area is not sufficiently wide within a neighbourhood, then walking bus schemes can prove a less relevant measure. The educational dimension remains, however, completely relevant.
Potential client	Municipal engineering department, *préfecture*
Assessment criteria	• Number of accidents involving children under 14 • Number of parents mobilised • Number of walking bus schemes • Number of information-providing interventions (meetings, articles etc.) and number of participants • Observation of certain types of behaviour near to schools : crossing on red, illegal parking at school arrival/departure times, with measurement before/after)
Summarysheets involved	FS 002, FS 010

INFORMATION SHEET :
"From objectives to courses of action" summary sheet

Aim :

In response to a theme-based or space-based target identified in the "from objectives to courses of action" information sheets, the aim is to consolidate and merge all of the basic actions, and to organise them in a way that can assist in outlining an advised schedule for implementation studies.

FIELD OF ACTION	DESCRIPTION
Level of priority	Graded in relation to the level of priority of the issues concerned.
Recap and consolidation of the basic actions	The summarysheet is drawn up for a given problem, whether spatialised or not. This sheet responds to all of the courses of action relating to the site, the target users, and even to the service that is likely to take action (such as the school transport service).
Advised schedule	To meet the objectives (numerous) assigned to a given problem or site, several courses of action should be conducted simultaneously or successively. The advised schedule is outlined here.
Reference to "from objectives to courses of action" sheet	Reference to the basic sheet featuring the objective to fulfill and the corresponding courses of action to be implemented.
Assessment criteria	Recap of the assessment criteria associated with each basic sheet according to the previously defined schedule of action.

EXAMPLE SHEET :
"From objectives to courses of action" summarysheet (FS 025)

XXX Road

Level of priority	**Recap and consolidation of the basic actions**	**Advised schedule**	**Reference to "from objectives to courses of action" sheet**	**Assessment criteria**
1	Narrowing the carriageway (5.8 m) and installing cycle lane delineators in order to prevent short-stay parking at the intersection of XXX andXXX		FA 006	Measure and monitor speeds Monitor the amounts by which speed limits are exceeded.
2	Widen the pavement in front of the shops up to XXX road to facilitate pedestrian passage, but also in support of the local shops and acssociations, modify the intersection with xxx road to improve the perception of continued pedestrian passage, irradicate illegal parking	1	FA 02	Growth in the number of local shops in the neighbourhood.
1	Organising short-stay parking	2	FA 012	Monitor the occupation levels of on-street parking or parking in central reservaltions or islands
1	Raising awareness of, and ultimately suppressing, illegal parking	3	FA 019	Idem FA 012
1	Reorganising the intersection of XXX andXXX into a raised mini roundabout	4	FA 008	Monitor the number of accidents per year at the intersections concerned

1	Reorganising the intersection of XXX andXXX : • consider implanting a roundabout with pedestrian priority in the form of raised exterior sections for pedestrians/bicycles which should cater for the high level of mobility at the site ; • reduce the road from 2 lanes to 1 at the intersection ; • implant crossing islands well into the intersection, to limit the diameter of gyratory traffic flow, and lengthen these on approach of intersections to limit driving speeds. Their design should be large and wide enough to cope with large numbers or groups of pedestrians crossing together ; • consider the restricted rotation of buses heading from XXX towards XXX. Create footpath build-outs to limit the diameter of of gyratory traffic flow ; • limit unruly parking ; • remove any obstacles to visibility formed by plants or street furniture on approach of the intersection.	5	FA 008	Monitor approach speeds in flowing traffic before/after Monitor the number of accidents per year at the intersections concerned
2	Improve the quality of pedestrian areas		FA 012	
2	Promote bicycle use : • work on the image of cycling in the given road (or in the whole neighbourhood) ; • strongly develop cycling in PDEs (company mobility plans) ; • improve bicycle parking facilities for appartment blocks.	6	FA 017	Counting bicycle traffic Survey bicycle parking facilities

Chapter 2 :

Different types of safety study :

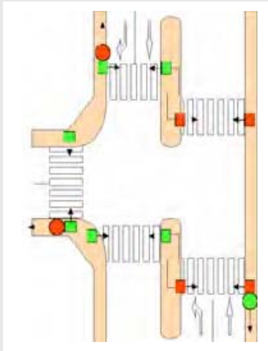
Exemples

Three types of safety study are possible, and their use depends on the nature of the site in question :

- the "targeted" safety study only covers a limited geographic area such as a crossroads, a school entrance, a square etc. ;
- the "linear" safety study covers a route, a road, a section of road etc. ;
- the "territorial" safety study covers a whole neighbourhood, town or even urban area.

These studies follow the general process outlined in Chapter 1 of this guide.

The "targeted" safety study generally targets one specific feature (crossroads, pedestrian crossing, bus stop, school entrance etc.), and is strongly based on a problem relating to unsafe travel. It is sometimes necessary to widen the area of study and the on-site investigations.



The "linear" safety study concerns a succession of specific and linear sites over a minimum distance of around 400 metres, such as a section of road, a particular route from point A to point B, or entry routes into the city.

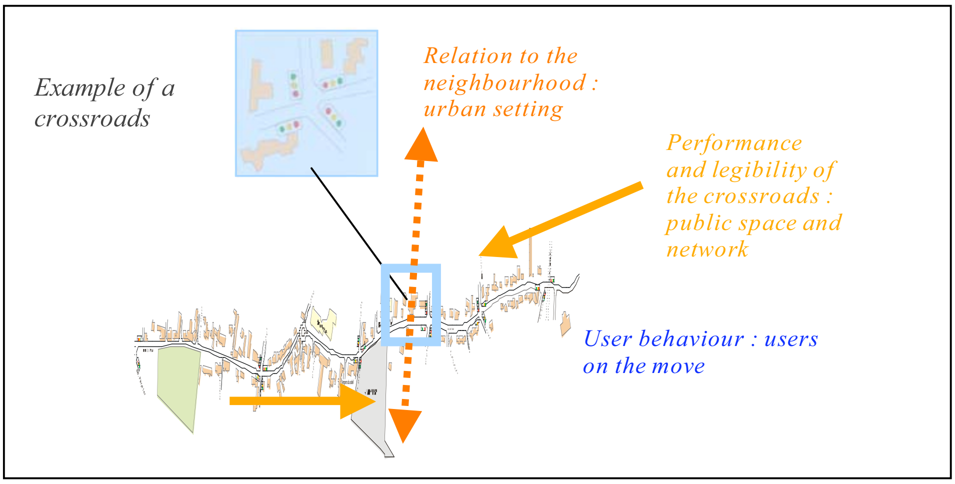
This type of study can also be integrated into other studies oriented around urban redesign or development projects.

The "territorial" safety study concerns a neighbourhood, a town or an urban area.

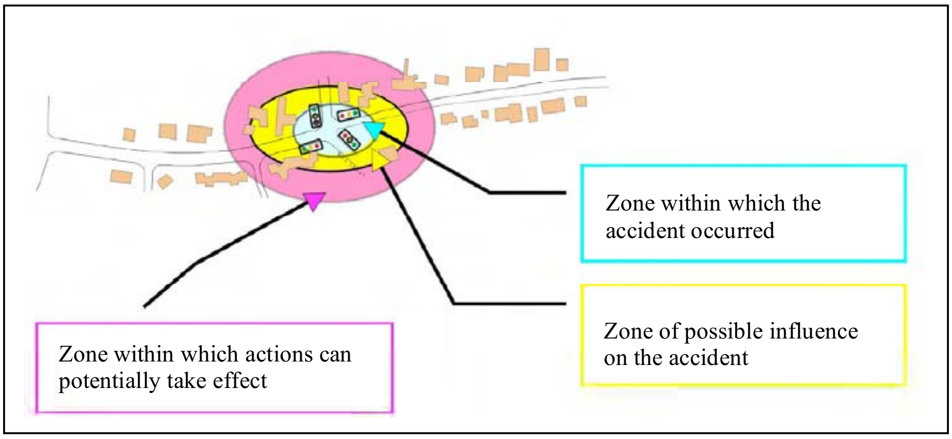
Safe travel is often only one concern among several others such as, for example, mobility management, improving the surrounding environment or the quality of public spaces etc. Due to to the fact that it deals with a high number of accidents, the "territorial" safety study requires a large amount of summarizing to be undertaken.

The targeted safety study

The notion of a specific site or targeted feature concerns the different locations within the **accident zone** : crossroads, square, pedestrian crossing, bus stop, school entrance etc.



The area under examination can be widened to incorporate **an area that is likely to have had an effect on causing the accident**, or even a wider **area of influence** within which courses of action could potentially have effect.



The cause of a request

The request for a targeted safety study can arise as a result of :

- **the identification of an accident-causing entity**, confirmed by the realisation of a safety **issue study** on the scale of a network or route ;
- **pressure from locals** such as councillors, residents, associations, police etc., highlighting proven safety problems such as personal injury accidents or behavioural issues (speed, rat-run traffic, obstructive parking etc) ;
- **a serious incident** that triggers a desire for urgent intervention. Typical case : an accident near to a school which leads to an immediate reaction on behalf of the political authorities who wish to quickly resolve the problem.

Example request : The Eisenhower/Seysses intersection in Toulouse

As part of its road safety policy, the City of Toulouse carried out a city-wide study of global safety issues in 2003. One of its objectives was to detect the roads and crossroads that cause particularly high numbers of accidents.

Phase 1 – The targeted safety issue study

Information sheet :

"Accident status report analysis"

Page 25

If knowledge of the location derives from a previous study, it is sufficient to use the results of this. If the request is not based on the results of such a study, it is best to perform a simplified issue study, using the method explained in the section "Issue study" on page 19, to establish guidelines for the order.

For a severe accident, the first step is to put the event into perspective, without underestimating its importance. The event often creates an opportunity for looking more deeply into an issue.

If there are few or no accidents, it is the initiating accident or incident which becomes the catalysing factor in the approach, but at least this will have been checked.

Example of a targeted safety issue study :

The Eisenhower/Seysses intersection in Toulouse

Nom de 2 des branches du carrefour	Nombre d'accidents 1997-2001	Evolution des accidents depuis 96						Nombre de Tués + BG	Commentaires
		96	97	98	99	00	01		
AV JEAN ZAY AV DE FRONTON	23	4	6	5	8	3	1	5	Aménagement d'un rond point à feux Septembre 2000 (évaluation positive)
AV DU GENERAL EISENHOWER RTE DE SEYSSES	22	1	3	5	3	5	6	1	Projet giratoire à programmer
BD DE BONREPOS RUE MATABIAU	18	2	6	2	6	3	1	2	Modifications du carrefour prévues dans le cadre des travaux de la piste du canal
RTE DE SAINT SIMON CHE ABADIE	17	6	3	3	3	4	4	0	Etude en cours d'achèvement
ALL JEAN JAURES RUE NICOLAS BACHELIER	17	1	1	4	6	5	1	0	A l'étude
PONT SAINT MICHEL AV DU GRAND RAMIER	16	0	1	2	4	5	4	1	A étudier

The overall issue study performed by the Toulouse city departments brought to light the streets and thoroughfares that are most likely to lead to accidents, according to the type of network previously prioritised, and detected points where accidents accumulate, such as the Eisenhower/Seysses intersection, with 22 accidents between 1997 and 2001.

In looking further into the issue, analysis of accidents between 1998 and 2002 confirms how increasingly unsafe the intersection is, unlike the rest of the city where the trend is towards greater safety. This in-depth analysis also shows a high proportion of night-time accidents – in excess of 50 %.

Phase 2 – The targeted safety diagnosis

In the conventional case of a known accident black spot, the diagnosis can be simpler, while still respecting the general diagnosis procedure described in the first part of this guide.

In this example, Step 1, corresponding to an order for a diagnosis, is implicit.

Step 2 : The safety analysis

1) The analysis of accident reports

Information sheet : **“Sequential accident analysis”** Page 47

The analysis of accident files is based on qualitative data featuring in the various headings (places, transport, etc.), as well as in the accident diagram and the statements of those involved and of eyewitnesses. This information makes it possible to gain a better understanding of the accident by breaking it down into its different situations, using the sequential analysis method defined by INRETS. The aim is to formulate, on this basis, the initial conclusions or hypotheses concerning the safety of the site in terms of layouts or operating conditions. Later on-site observation may be guided by the validation of certain hypotheses.

Information sheet : **“Accident report analysis method using standard scenarios”** Page 52

To grasp the event in dynamic terms, simple questions need to be answered. What happened before the accident and as it took place ?

If the number of accidents at the site being studied is relatively large (greater than 10), assigning these accidents to standard scenarios defined by INRETS, in relation to the sequential analysis, makes it easier to find accident-causing factors. This approach also contributes to finding clues which will help channel investigations during observations out in the field to gather data external to the accident report.

Example of accident report analysis :

The Eisenhower/Seysses intersection in Toulouse

The safety analysis was based on an initial reading of the accident report and comparison of the accident history with the sequential analysis described in the INRETS standard scenarios. But it is above all the accident-causing situations described in these scenarios and identified in the accident analysed, which were used to assign them. Overall, all but four of the accidents were assigned without great difficulty to standard scenarios.

Even though the information contained in the accident reports was sometimes succinct, the standard scenarios made it possible to select the accident-causing factors based on those described in the INRETS document and on the accident diagram.

Class	Group	Scenarios	No.	Special features	Severity
With pedestrians	Crossing, or stepping onto the road "Other conditions (generally information processing problems or waiting time problems, etc)"	**P 8** : Driver turning and hitting an often-undetected pedestrian as he leaves the intersection.	1	ERH, car, young driver	SI
		P 10 : Driver going through a red/amber light and hitting a pedestrian that he saw too late as he leaves the crossroads	1	ERH, hit and run car	SI
No pedestrians	Visibility hindered	**A 3** : Vehicle turning left and colliding with a motorcycle coming from the opposite direction and initially hidden from view by the vehicle preceding it	1	Night, car with young driver/ motorcycle	Sev. I
	Other non-perception problems	**A 6** : Driver turning left without seeing a road user driving in the opposite direction	9	Night (5), October to March (7), week-end (5), HC (7), young driver (5, incl. 4 car), car/car (7), not local (3)	12 SI (8) Sev. I (1)
	Accidents occurring at signal-controlled intersections, one party involved in red light running	**A 21** : Going through as lights change to red and colliding with a vehicle going through on green	1	Night, wet, car with young driver	4 SI
		A 23 : Driver deliberately going through on red and colliding with a vehicle going through on green	5	Night (3), October to March (3), weekend (3), off-peak (7), young driver (3) incl. 2 motorcycles car/car (3)	3 SI (3) 2 Sev. I (2)
		A 24 : Collision in an intersection with lights not working	1	Dawn, car/HGV	SI
	Keeping control of speed in relation to the vehicle in front	**A 26** : Driver encountering a sudden slowing-down of traffic in front	2	Young driver (1) RH (2)	3 SI
	Loss of control	**A 34** : Loss of control as a result of changing lane or vehicle cutting in front	1	Young driver (1) car/car	SI

SI : Slightly injured
Sev. I : Severely injured
ERH : Evening rush hour
RH : Rush hour

This table gives the breakdown of accidents at the intersection by class, scenario group and INRETS standard scenarios.

Certain special characteristics from the BAAC, but above all from the accident report, such as the road user living in the area, and the notion of local or otherwise have been kept, in view of on-site observations.

From this analysis two dominant scenarios emerge :

- accidents involving road users making protected left-hand turns and confronted with problems of perception or poor awareness of a vehicle coming from the opposite direction (9 accidents) ;
- accidents involving red light running (5 accidents).

Comparison of factors (unfamiliarity with the area, lighting problems, etc.) with certain time characteristics and road users involved have made it possible to better target the period and the type of observations to be implemented out in the field (night-time and off-peak hours).

Severity levels for the accidents are, on the whole, relatively low. The only serious victims are from accidents belonging to the two most common scenarios.

2) Preparing on-site observations

Depending on the decisions made as a result of the analysis of accident reports, various aspects related to infrastructure, facilities, visibility, approach conditions, behaviour, traffic volumes, etc. will need to be examined by observation or measurement. The initial objective is to confirm or invalidate, or even specify, the initial conclusions and assumptions arising from the accident report analysis and in certain cases remove uncertainties relating to certain accidents. More general observations on the accident site and the way it works can then, if necessary, be made.

An overly thorough analysis of the site prior to the accident report analysis is not recommended because it is likely to bias the analysis of the reports, whether consciously or not.

An example of preparing on-site observations :

The Eisenhower/Seysses intersection in Toulouse

Accident report analysis made it possible to guide on-site observations , thanks to the statements of those involved and the identification of accident-causing factors. It helped to find the malfunctions related to interactions between the road user(s) as they travelled, and the geometrical, functional and urban characteristics of the area and of its surroundings.

The table below gives a record of the information detected from the factors or clues noted in the accident reports and questions raised with a view to guiding on-site observations.

These various questions are organised according to whether pedestrians were present in the accidents (reference to the INRETS standard scenarios).

For accidents involving pedestrians (2 accidents)

Clues noted or detected in the accident reports in relation to the factors selected in the scenario	**Questions raised with a view to observations out in the field**
• Rapid approach conditions upstream of the intersection and wide carriageway. • Particularly large intersection. • Unfamiliarity with the area.	> What sort of urban environment is it ? (Shops, population, facilities generating traffic, especially pedestrian, etc.) > How does the turning motorist perceive the pedestrian crossing, given the size of the intersection ? > What attention and vigilance does the pedestrian develop as he crosses ? Does he have priority ? > What volume of pedestrians use the crossings and where are they located ?

For accidents not involving pedestrians (20 accidents)

Clues noted or detected in the accident reports in relation to the factors selected in the scenario	**Questions raised with a view to observations out in the field**
• Fluid and wide road layout . • Wide carriageway. • Light phasing does not dissociate protected left and through movements. • Lighting problem. • Approach conditions encourage high speeds. • Insufficient red clearance period between two perpendicular legs (taking into account the geometry of the intersection). • Traffic lights use flashing amber.	> What is the role of the intersection in the immediate urban environment and of the lanes in the network hierarchy ? > What is the environment of the lanes upstream and downstream of the intersection like ? (Lane and environment configuration.) > What are night lighting conditions like ? > What sort of markings are used ? > What perception do LV users have when approaching the intersection (in all lanes) ? > What perception of the intersection do road users have from a distance when approaching from the ring road ? Does this vary with speed ? > How are stop lines organised ? (Distance between them, clearance time, etc.) > What are the effects of vegetation growth on visibility and under certain conditions ? (Emergency vehicles.) > What perception do road users have of the lights at the intersection at night, in particular on one of the legs of the ring road ? > Where and how are protected left-hand turns positioned in the intersection ? > How are motorcycles perceived at night, with and without lighting, at the level of the intersection and specifically in protected left-hand turns ? > How does a person who is unfamiliar with the area perceive, understand and use the intersection ? > What are conditions of mutual visibility like when there is a flashing amber light ? > How do road users behave with regard to lights on amber and red ? Do they tend to go through them, and if so, why ? > What are the impacts of the intersection's layout and management on the behaviour of road users ?

Depending on the clues detected or assumptions formulated following accident report analysis, the following is an indication of how on-site investigation might be carried out :

The urban framework

Information sheet : "Data external to the accident report" Page 55

What is required is to examine the role and the function of the accident site in relation to the structure and urban organisation of the neighbourhood or the sector in which it is located, and to identify from the following elements those likely to help in understanding the accidents observed :

- how urbanisation of the neighbourhood or the sector in which the point being discussed is structured,
- type and distribution of public facilities and services, density of shops and other features that encourage mobility.

Example of external data related to the urban setting :

The Eisenhower/Seysses intersection in Toulouse

The intersection is located on the edge of the city of Toulouse on one of the main entries from the south, in an urban fabric of average density. It plays a key role in the exchanges between the ring-road and the surrounding neighbourhoods. It acts as an important node by distributing traffic flows towards the many industrial and commercial activities in the sector.

Public space and the network

The following must always be described in relation to the accidents analysed :

Information sheet : "Data external to the accident report" Page 55

- the functional organisation of the site as compared with the transport networks in the neighbourhood or even in the city (hierarchy of the roadway system, public transport network, cycle and pedestrian zones). Is the network managed on a mode-separation basis ? How are the surrounding public spaces organised ?
- characteristics and perceptions of the site. This involves checking layouts or road configurations that might generate at-risk situations from the standpoint of accident analysis : how priorities are organised, horizontal and vertical markings, special developments such as zebra crossings, cycle lanes or tracks, car parks (organisation, size, etc.), various equipment (urban furniture, advertising fittings), plants, etc.

It is next necessary to measure the impact of the site characteristics on the user in terms of perception and clarity. For example : is the system of priorities clearly perceived ? Are the lanes oversized ? How clear and easy to understand are the signs and traffic islands ? Are they appropriate for the layout of the site ? These questions are asked with special reference to the safety and comfort of vulnerable users (sufficient time to allow pedestrians to cross safely, etc.).

Example of external data related to the public space and the network :

The Eisenhower/Seysses intersection in Toulouse

The two roads of the intersection have very different characteristics and appearance as one approaches them :

- whether approaching or coming from the centre of Toulouse, the immediate environment of the Avenue des Seysses gives a fairly clear indication of the urban character of the area, in spite of a large amount of vegetation near the intersection. At the crossroads itself, however, the layout shows a marked contrast with how it is perceived upstream and downstream of the intersection.

  This situation can lead either to difficulties in getting one's bearings, in particular with respect to the position in the crossroads, or to too much freedom of movement on account of the extent of space available ;
- Avenue Eisenhower looks more like a bypass or passing place because of the very broad roadway and the fact that the buildings (mainly industrial ones) are set well back.

The large intersection is controlled by traffic lights, with the stop lines set very far back, especially on Avenue de Seysses. The large distance between the stop lines is not completely taken into account in the overall red interval time and does not always allow the intersection to be cleared in complete safety. The slightest anticipation of the lights tuning green, in conjunction with a vehicle going through on amber in an adjacent lane is an obvious source of accident risk.

The number of lanes per intersection leg varies between three and four. Protected left-hand turns are marked on all the intersection legs, with two special features :

- on the legs of Avenue Eisenhower, the special protected left-hand turn lane is in line with the "direct" lane of the opposite leg ;
- on Avenue de Seysses, the left-hand turn lanes are controlled by having drivers turn in front of each other, instead of going behind each other, with axial marking as far as the centre of the intersection to make it easier to get into position. However, this marking is located on the right of the turning vehicle and not on the left as is usually the case.

The crossroads is lit on only one side along Avenue de Seysses, thereby creating an area "in shadow" This may partly explain accidents involving the predominant scenario "Driver turning left without seeing a road user coming from the opposite direction" which occur mainly at night.

Road users on the move

This involves gaining better understanding of practices, habits and behaviour at the site being studied and the immediate surroundings, which are a possible area of influence on the accident.

These three aspects must be assessed in conjunction with the analyses relating to public space and the networks, together with the decisions made and lessons learned from the accident report analysis :

Information sheet : **"Data external to the accident report"** Page 55

- practice : this involves observing current practices as regards traffic and local life ; how shops, public facilities, car parks, etc. are used. Interviews with the people involved locally are possible to supplement observations out in the field and to get a better grasp of the amount of dissatisfaction expressed by local residents, pedestrians and other users on safety issues ;
- habits : it should be understood how the user appropriates the urban space, by observing or questioning users on their habits, how they use facilities according to the means of transport (dedicated pedestrian paths and crossings). Also assess the impact of traffic on how people use the area and on life in the neighbourhood (level of saturation, waiting time, etc.) ;
- behaviour : it is necessary to detect driving styles and manoeuvres deemed to be at risk or which may lead to particular kinds of conflict, depending on the users driving or moving at the site being studied (motorists, cyclists, pedestrians). It should be observed how pedestrians cross - on or off pedestrian crossings ; how users behave during certain manoeuvres (protected left-hand turns, going through the lights, etc.). Also see whether motorists park haphazardly.

Example of external data relating to the user on the move :

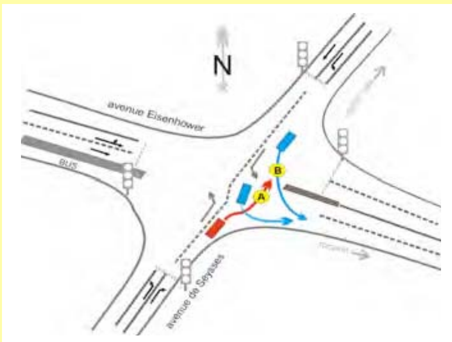
The Eisenhower/Seysses intersection in Toulouse

User behaviour was observed over a period corresponding to that of the majority of the accidents, in particular at the end of the day (fairly low traffic levels) and at night. Traffic was fairly well balanced between the different intersection legs.

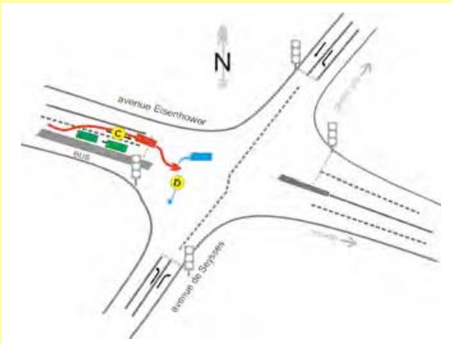
Observation of behaviour revealed the main malfunctions, which concern most of the accidents :

- a vehicle which turns left onto Avenue de Seysses when coming from the town centre tends to deviate from the guideline located to its right and tends to get into the line of the vehicle coming from the opposite direction (A).

  At off-peak times, this behaviour is accentuated by a tighter trajectory (B) when the left-hand turn is begun further upstream. B is very quickly in line with the oncoming vehicle. This type of behaviour is all the more risky as observations show that certain vehicles have an annoying tendency to accelerate as they go through lights on amber or even on red.



- certain vehicles "in a hurry" coming from the western part of Avenue Eisenhower (C) and heading straight for the ring road pull out to take the left-hand lane which is used for mixed movements : straight ahead and left-hand turn. They find themselves in conflict with vehicles coming from the opposite direction and turning left, heading towards the south of the Avenue de Seysses (D).



- accident report analysis and observation in the field reveal an upsurge in the number of motorists and motorcyclists or cyclists going through the lights on amber or red. Given the distance of the stop lines and the overall red time interval, this type of behaviour generates at-risk situations.

Step 3 : Preparing to act

Summary of the safety analysis and formulation of safety objectives

Making a summary of the analyses (accident reports and observations out in the field) is a key stage in drawing up the diagnosis. By bringing together the main safety issues identified, analysed and included in the previous step, this summary makes it possible to draw up the safety objectives and to prepare for action (preventive measures).

This approach described here in linear form is, in practice, often performed in a more iterative way.

Example of a summary of the safety analysis :

The Eisenhower/Seysses intersection in Toulouse

> Summary of the safety analysis

The size of the crossroads and the widths of the roads that compose it create a “no-mans-land” effect at this intersection. Consequently, the user may be confronted with two types of behaviour :

- an impression of “release” that may induce him to increase speed. This is what happens, for example, for users of the Avenue de Seysses who, moving from a fairly closed-in section to a very broad and open space as they arrive at the intersection, may be inclined to pick up speed again ;
- the amount of space and the absence of reference points at the intersection can induce hesitant behaviour which, in conjunction with the behaviour described above, is liable to generate additional risks.

Other malfunctions noted :

- the distance which separates the stop lines, in particular at the level of the Avenue de Seysses, is too great. It encourages tight trajectories during left-hand turns and sometimes increases the tendency to go through the lights on amber or red ;
- the carriageway markings, particularly around the intersection, to guide the position of vehicles, are sometimes ambiguous or even inappropriate. This consequently reinforces certain types of behaviour that go against safety ;
- the absence of homogeneous lighting in the intersection, in particular at the level of the branch leaving the centre of Toulouse on Avenue de Seysses, does not make for good night vision of what is happening in the intersection ;
- the fact that this area is not much used by pedestrians, plus the size of the intersection, does not encourage motor vehicle users to be particularly careful as they make left-hand turns, regarding any pedestrians who might be crossing on the adjacent lane.

These various malfunctions explain in part the very preponderant percentage of accidents involving left-hand turns and the difficulties of perceiving or assessing oncoming vehicles.

The large distance between the stop lines, in conjunction with the minimum safety time and some vehicles going through the lights on red, contribute to conflicts between traffic in lanes at right-angles to each other.

> **Safety objectives**

- Optimise and restrict traffic space in the intersection so as to make manoeuvres easier to see and understand ;
- clarify and perform left-hand turns in complete safety, especially at night ;
- reduce potential conflicts related to the distance between stop lines ;
- encourage people to respect traffic lights more strictly ;
- take the safety of the pedestrians more into account on crossings ;
- reinforce safety at night time.

Step 4 : From objectives to courses of action

An approach of this kind may lead to possibilities of action that are outside the scope of layout improvements to the site being studied (which is what one tends to recommend implicitly a little too quickly). But courses of action may involve other aspects, such as communication, traffic regulation enforcement, and even other fields, such as transport policy.

Example of courses of action : The Eisenhower/Seysses intersection in Toulouse

Here are two examples of sheets drawn up to describe and keep track of a course of action.

These two possible courses of action cover two-thirds of the accidents analysed over the period.

Sheet n° A1

Field of action	☐ **Urban setting** ▣ **Public space and networks** ☐ **Users on the move**
Safety objective(s)	Clarify and perform left-hand turns in complete safety, especially at night Optimise the space in addition to traffic regulation enforcement actions
Standard scenarios involved	**A 6** – Driver turning left without seeing a user coming in the opposite direction (9 accidents) **A 3** – Vehicle turning left and colliding with a motorcycle coming from the opposite direction and initially masked by the vehicle preceding it (1 accident)
Level of priority	1
Topic-based or space-based target	More specifically on the Avenue de Seysses
Courses of action	Reduce the size of the crossroads to make motorists turn less tightly Specify the positioning of vehicles turning left Make movements at night easier to see
Potential entities in charge	City engineering services The *Haute-Garonne* council, as one of the roads belongs to the network of this French "*département*"
Assessment criteria	Keeping track of accidents Observing positioning
Summary sheets involved	Not applicable

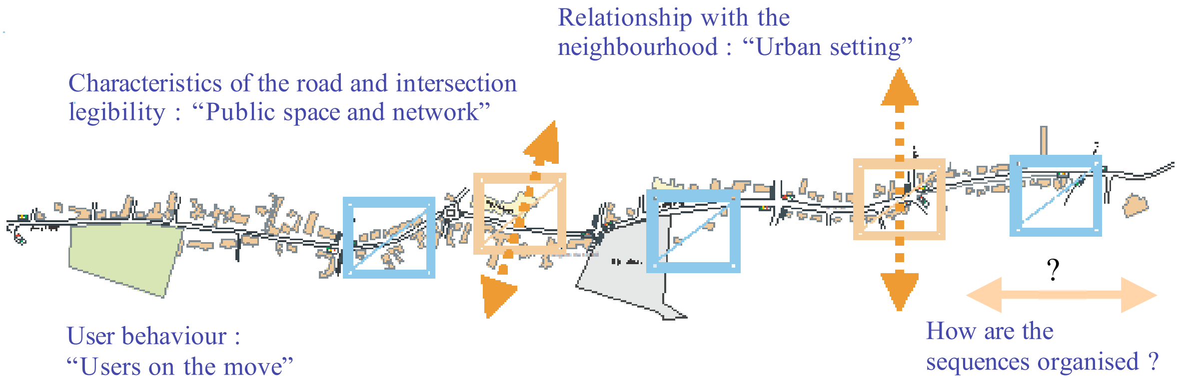
Sheet n°A2

Field of action	☐ **Urban setting** ☐ **Public space and networks** ■ **Users on the move**
Safety objective(s)	Encourage people to respect traffic lights more strictly
Standard scenarios involved	**A 23** – Driver deliberately going through the lights at red and colliding with a vehicle going through on green (5 accidents) **P 10** – Driver going through the lights on red or amber and hitting a pedestrian detected too late as he leaves the intersection (1 accident)
Level of priority	1
Topic-based or space-based target	Motorists, motorcyclists, moped riders and cyclists
Courses of action	Public awareness campaign on respecting traffic lights, based on : • the consequences of this safety problem (many accidents, severity, periods) ; • fighting the notion of wasting time ; • announcement of enforcement actions Enforcement actions on the crossroads that most lead to accidents, including that of Seysses/Eisenhower Making technical people aware of cycles and red light intervals as they relate to the context of the site
Potential entities in charge	City engineering services, *préfecture*, *département*, accident prevention associations, etc.
Assessment criteria	Number of infractions and fines on the site observed during enforcement actions. Accidents related to traffic lights not respected and severity
Summary sheets involved	Not applicable

Linear safety study

The term “linear” can relate to various layouts of a street or sections of a street, such as a residential street, a main thoroughfare, a street limited to 30 km/h, etc. In the context of a linear safety study, the area of study can be extended to an area likely to have had an influence on the occurrence of the accident, or even to a larger area on which possible courses of action may perhaps produce positive effects with regard to transport safety.

Observations out in the field, in conjunction with the analysis of accident reports for the site, cannot be carried out without sequencing the studied route [see information sheet : “sequencing method” page 57]



How a request arises

The request for a linear safety study can arise as a result of :

- the results of an issue study which **identifies** the streets or routes that are particularly liable to cause accidents ;
- **local** pressures (elected representatives, local residents, associations, police force, etc.) denouncing problems of safety that are real (many accidents involving property and/or people) or perceived (speeds, interference from traffic, etc.) ;
- **a serious event** requiring a quick decision. This is the classic case of an accident caused by an HGV crossing a street unsuited to heavy traffic, bringing an immediate reaction from the authorities to deal with the problem as an emergency ;
- **the opportunity** of redesigning a road that has proved to cause safety problems.

Example of the cause of a request : Boulevard de la Tour d’Auvergne in Rennes

The order for a safety study concerning the Boulevard de la Tour d’Auvergne arose from an issue study about the city of Rennes, which made it clear that this road was highly unsafe, confirming the request of pedestrian users who were very worried about the safety of the crossings on this boulevard.

Phase 1 – The linear safety issue study

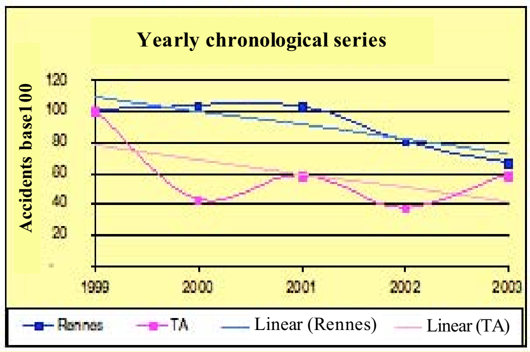
Information sheet : **"Accident status report analysis"** Page 25

If knowledge of the location derives from a previous study of issues, it is sufficient to use the results of this and to go into it in more depth if necessary.

If the request is not based on the results of such a study, it is best to perform a simplified issue study, using the method described in the "Safety issue study" chapter, to establish guidelines for the order.

Example of a linear safety issue study : Boulevard de la Tour d'Auvergne in Rennes

Based on the safety issue study carried out by the City of Rennes, a closer look at the Boulevard de la Tour d'Auvergne reveals that, over the last five years (1998 to 2003), this road is one of those that cause the most accidents in the city because of its length and the amount of traffic using it. Its tally is 52 accidents, involving 61 victims, one of whom was killed. However, compared with accidents in the city as a whole, the annual chronological analysis opposite shows a similar trend for this road.

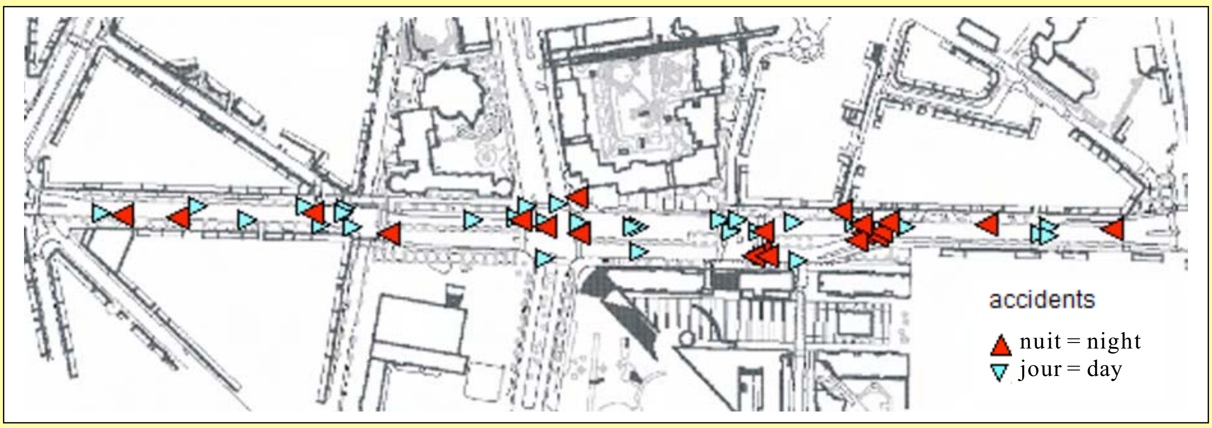


The most at-risk victims are pedestrians and motorcycle users.

Compared with the average for Rennes, pedestrians and cyclists are a major issue, with 22 % of pedestrian victims, as against 13 % for the city as a whole ; and 11 % of cyclist victims, as against 8% for the city as a whole.

Young people aged between 18 and 24 feature strongly, with close to one victim out of three (20 injured).

As far as the location of the accidents is concerned, they are definitely more frequent in the zones between intersections (54 %) than the average for the city. The proportion of night-time accidents is also much greater, with 40 % of accidents, as against 30 % for the city as a whole.



Phase 2 – The safety diagnosis

As with targeted safety studies, the first principle to be remembered when carrying out a diagnosis is to perform the accident report analysis before making observations and taking readings out in the field.

Even if the site analysis shows that the safety issues result in a succession of sites that accumulate, it is advisable to deal with them using a linear approach. The first stage is to analyse the accident reports by grouping them together into standard scenarios.

Step 2 : Safety analysis

1) The analysis of accident reports

Information sheet : **"Accident report analysis method using INRETS standard scenarios"** Page 52

Based on the sequential analysis (page 47), see page 76 "Targeted study", accidents should be grouped together if they share a similar overall sequence, in order to constitute and describe the corresponding standard scenario, then list the factors that cause the accidents, the factors influencing severity and provide explanations.

This approach makes it possible to :

- study the distribution of accidents from the various standard scenarios on the section under consideration. Mapping these will make the analysis more relevant with a view to making a summary of it ;
- formulate initial conclusions or hypotheses concerning the safety of the site in terms of layouts or operating conditions.

The assumptions will have to be validated by later observations out in the field and how these observations are interpreted.

Example of a safety analysis : Boulevard de la Tour d'Auvergne in Rennes

The analysis relates to 51 accident reports communicated by the police out of 52 accidents.

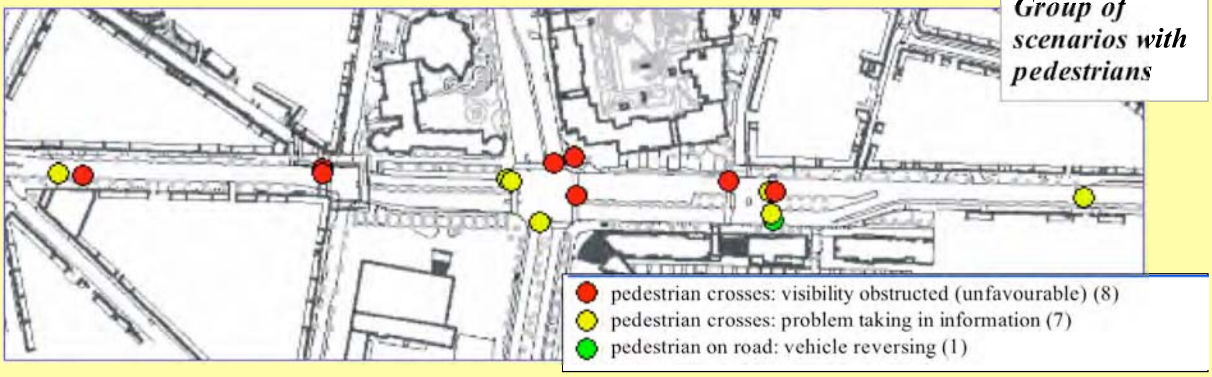
Sequential analysis of the accidents was used to assign them to reference standard scenarios. Only 4 accidents could not be assigned. Despite 11 incomplete reports however, (no statement taken from those involved or eyewitnesses), it was possible to assign the accidents using a summary sheet and the diagram of the accident, since these accidents were simple cases involving loss of control or falling.

To make analysis easier, the various scenarios were grouped together by groups of scenarios defined in the two INRETS reports, with or without pedestrians.

> **16 accidents involving a pedestrian** cover 8 scenarios distributed over 3 groups.

Almost all these accidents reveal problems linked to crossing the road, half of which are related to problems of visibility ; the other half to problems of carelessness by the pedestrian as they cross.

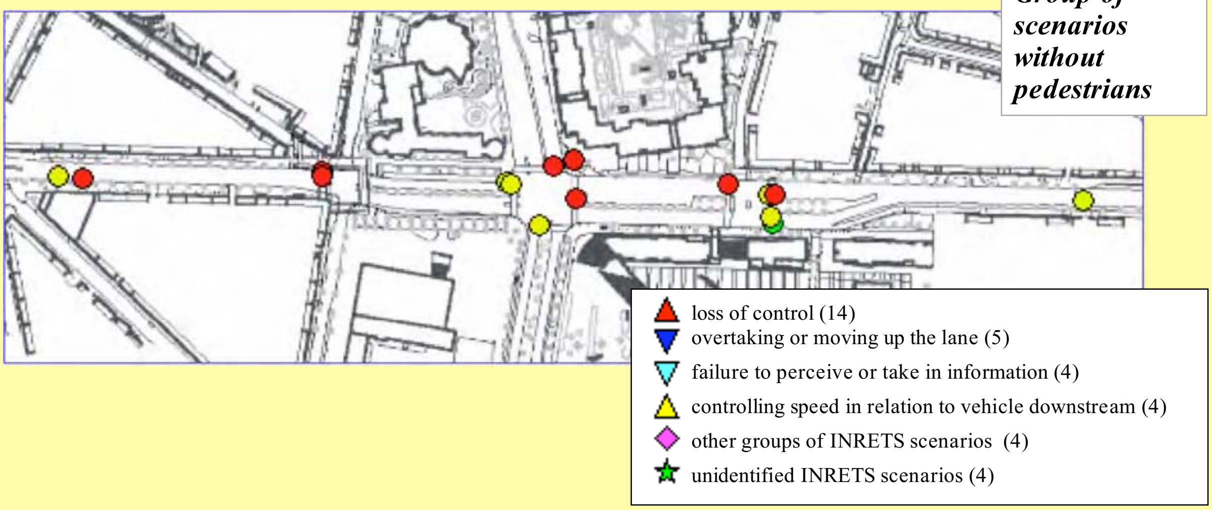
Group of scenarios with pedestrians



> **36 accidents not involving pedestrians** cover 9 scenarios distributed over 6 groups. More than one accident out of three involved loss of control, including some with proven blood alcohol content.

The information incorporated into the scenarios reveals concentrations to do with loss of control, overtaking or moving up lanes which are in fact primarily due to problems of accessing parking spaces.

Group of scenarios without pedestrians



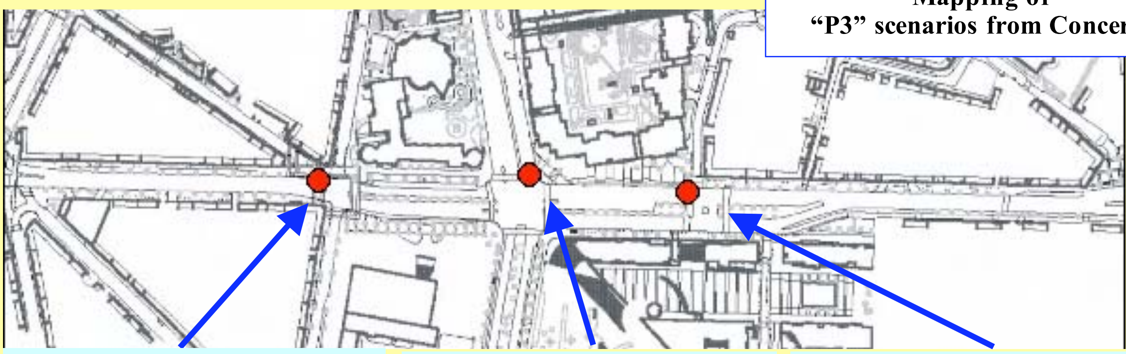
Extract from the break-down of scenarios and groups of scenarios, with or without pedestrians, observed on the boulevard

standard scenario group / no.		scenario / name / no.			killed	seriously injured	slightly injured	Factors
Visibility obstructed or poor visibility of key importance	8	P1	pedestrian crossing road, initially not visible	2			2	* wide road, poor visibility, two lanes (1 case)
		P2	pedestrian running across road	1		1		* rapid approach conditions, too much fluidity in right-hand turns, poor visibility : night
		P3	pedestrian crossing in heavy traffic, not visible	3		1	2	* visibility conditions for the driver (1 case) * wide road (2 cases) * peak traffic time (3 cases) * pedestrian crossing without due precaution (1 case) * inexperienced motorcyclist (1 case)
		P5	pedestrian crossing major road, detected too late	2			2	* visibility conditions for the driver (1 case) * driver blood alcohol level 0.59 g/l (1 case)
Loss of control	14	SP-30	Alcohol and loss of control of vehicle	5		3	6	* road layout encouraging high speed (4 cases, incl. 1 moped) * blood alcohol level * unfavourable night-time conditions contributing to loss of control (4 cases) * obstacle at edge of road (parked vehicle, tree, street lamp, etc.)
		SP-31	Loss of control in bend on slippery road surface	9		3	6	* age of cyclist (62) and car driver (69) * slippery road surface due to rain (3 cases) * motorcycle unstable on slippery road surface * high speed coming into bend (1 case)

For each standard scenario, the severity of the injuries sustained by the victims and the factors leading to the accident are indicated. It is especially the factors leading to the accident, in conjunction with clues noted during the accident report analysis, that have made it possible to learn what to observe on the site in terms of data external to the accident report.

The example below derives from the analyses and assignment to standard scenarios made above. It is used to target special points noted in the accident report and formalises the questions that will direct on-site observations.

Mapping of
"P3" scenarios from Concerto



Accident report source of danger. These stationary vehicles hide pedestrians crossing and, in certain cases, lead to no. ... ; motorcycle/ pedestrian; by day

Pedestrian crosses carelessly

Questions :

Traffic light cycle, safety matrix ?

Pedestrian waiting time to cross ?

Perception of vehicles on the road ?

Intersection legibility ? How does this fit into the sequence on the boulevard ?

Report no. ... ; Car/pedestrian; by day

Pedestrian crosses with pedestrian light on red

Car (west/east) claims he was dazzled by shop window!

Questions :

Traffic light cycle, safety matrix ?

Pedestrians crossing near the Puits Mauger ?

Type of buildings and how far set back ?

Behaviour: lights respected by road users ?

Perception and reading of site laterally on bd de la Tour d'Auvergne ?

Report no. ... ;
motor/cycle/pedestrian; by day
ERH

Young motorcyclist (inexperienced + alcohol) moves up the queue

Questions :

Size ? Crossing conditions at peak times ?

Pedestrian behaviour in the sector ?

Zebra crossings respected ?

Depending on traffic conditions, how much risk does the pedestrian take ? (no lights) ?

Attitude and behaviour of motorcyclists when traffic is dense ?

2) Preparing on-site observations

Depending on the decisions made as a result of the analysis of accident reports, various aspects related to infrastructure, facilities, visibility, layout of the route upstream, behaviour, and traffic volumes are examined by observation or measurement. The aim is **to confirm or invalidate, or even specify, the initial conclusions and assumptions arising from the analysis** and remove uncertainties relating to certain accidents. More general observations on the section studied and the way it works can then be made.

It is within the framework of these observations and the analysis of data external to the accident that sequencing can take place [see information sheet : "Sequencing method" page 57].

Example of sequencing : Boulevard de la Tour d'Auvergne in Rennes

Analysis of how users perceive the boulevard and its immediate environment has made it possible to break it up into sequences.

The north and south ends of the boulevard have fairly similar urban layouts and public space organisation. In contrast, around the central section, the "Abélard/Puits Mauger" crossroads is a very important "singularity" on the route, itself counting as a sequence.

Depending on the clues detected or assumptions formulated through accident report analysis, the following is an indication of how investigation might be carried out on the site :

> Observations on the urban framework

Information sheet : **"Data external to the accident report"** Page 55

As with a targeted study, the function of the section or the road being studied must be defined in comparison to structuring and the urban organisation around the site being analysed. The types of transport generated by the region, and that the road has to handle, must also be clearly understood.

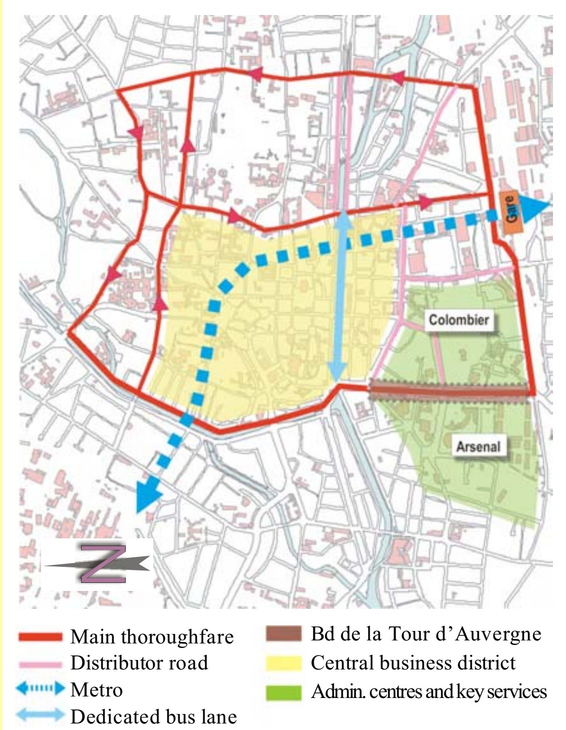
It is important to describe the effects of natural or artificial divisions (rivers, railways, etc.) because these may influence the organisation of transport by creating points through which everything must pass, which can have an impact on the road being analysed.

Identifying legal requirements

Depending on where the request comes from, it may be important at this stage to check in the town planning documents for any specific constraints (classified sites, historic buildings, reserved sites, protected areas, ZNIEF, ZPPAU, etc.).

Example of external data related to the urban setting :

Boulevard de la Tour d'Auvergne in Rennes



The Boulevard de la Tour d'Auvergne, located on the edge of the Rennes central business district goes through two major districts in the centre : Colombier with a large shopping centre, offices, housing, and Arsenal, a tertiary and administrative development.

Integrated into the road network of the city, this boulevard also acts as a connection for crossing the city from north to south and for avoiding the city centre area, particularly because of restrictions due to the one-way system and the dedicated bus lanes in the central business district, but also because of the effects of divisions caused by two waterways.

In the two sectors close to Boulevard de la Tour d'Auvergne, the immediate urban setting is fairly diversified, **two of its characteristics being not unconnected with accident scenarios involving pedestrians :**

- in the centre of the boulevard, large office buildings on the west side and residential buildings on the east side ;
- a fairly dense network of shops and services on both sides of the boulevard to the north and on one side only to the south,
- certain key facilities that require transport (nursery and primary schools, discotheque).

> Observing the public space and the network

Information sheet : **"Data external to the accident report"** Page 55

The analysis deals with the **quality** of the environment through which one passes (mainly urban or highway) and on the **coherence and clarity** of facilities.

How is the road organised ?
What are its characteristics ?
How do the various users perceive it ?

Depending on the sites, attention should be paid to the following aspects :

- <u>this functional organisation of the site</u> : special attention must be paid to the various transport networks at the level of the neighbourhood, or even of the city (road network category, public transport networks, cycle lanes and pedestrians areas). Is the network managed on a mode-separation basis ? How are the local public spaces organised ? What are their roles and how do they tie in with the roadway ? Does there exist a connection between the theoretical function of the roadway, its effective role in the organisation of the road system network and safety issues noted during the sequential analysis ?

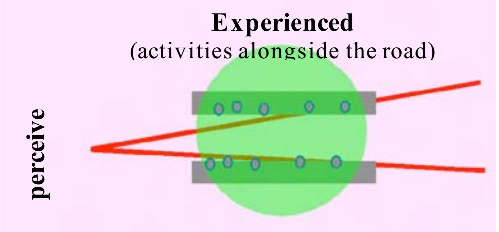
- characteristics of the site : it is important to check whether the type of road (one-way, 3-lane, dual two-lane road with or without central reservation), the landscape aspect (vegetation, hedges, etc), advertising hoardings, equipment (urban furniture, lighting, street signs, etc.) might have had an impact on the accidents observed. The objective is to target observation of facilities or layouts that might generate at-risk situations, based on information deriving from the accident analysis and concerning in particular :
  - general design (coherence of how the intersection is managed : priority to the right, roundabouts, stop signs, etc.), road geometry (radiuses, lanes, lane assignment, oversizing, etc.), road signs and markings ;
  - parking : how it is organised, how close it is compared to the intersections or to accesses of local residents ;
  - facilities for vulnerable users, pedestrians and cyclists, or special equipment, such as bus stops, zebra crossings, etc. ;
  - landscaping and urban furniture from the standpoint of certain safety criteria (visibility, legibility, coherence, obstacles).

Advice

It is advisable to travel on the route over a longer distance than the area being studied, using if possible various forms of transport (car, bus, on foot bicycle, etc), at various speeds and various times of the day (off-peak, rush hour).

A night-time visit may turn out to be necessary to detect particular problems (failed lighting, detrimental effects of neon signs, etc.) and to get a better feeling of the night-time environment along the route.

- how the site is perceived : this involves measuring the impact and the consequences in terms of perception and legibility. For example, is the system of priorities clearly perceived ? Is the road oversized ? Are the road signs sufficiently legible and visible ? Are the traffic islands wide enough for the layout of the site ? Does parking tend to mask visibility for pedestrians in particular ?



The whole of this approach is based on how users perceive the road and its accesses in terms of environmental quality as they pass along it, and of the coherence and legibility of facilities.

But a route is never homogeneous.

Information sheet : **"Sequencing method"** Page 57

The perception of public space that motorised vehicle users may have is not that which composes the route. It needs to be cut up into sequences that allow variations in the environment or in how the road operates to be detected.

Example of external data related to the public space and the network :

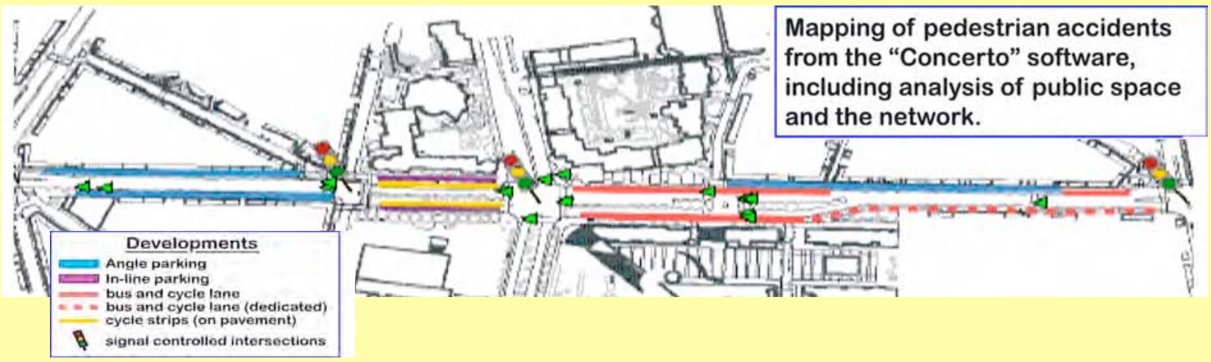
Boulevard de la Tour d'Auvergne in Rennes

The analysis of data external to the accident report, concerning public space and the network, is based on accident-producing factors and other information, and also on the spatial analysis of accident scenarios.

The user moving along this road does not perceive the variations between the various sequences because :

"Papier timbré" sequence at the double chicane

- the central part of the boulevard corresponding to the "Police" and "Papier Timbré" sequences and to the "Abélard/Puits Mauger" crossroads takes up a very large amount of public land. An oversized space dedicated to traffic : two traffic lanes in each direction separated by a broad central reservation, or even three lanes around the "Abélard/Puits Mauger" intersection. At the level of the "Papier Timbré" sequence, two bus lanes run in at the side of the traffic lanes. In spite of the numerous buildings along this section, the layout is hardly conducive to vigilance on the part of the motorist. This situation is unfavourable to pedestrian movement between the two sides of the road, in particular at the level of the "Papier Timbré" and the "Abélard/Puits Mauger" sequences , places where accidents involving pedestrians tend to concentrate ;
- to the north and south of the boulevard, less public space is taken up in spite of relatively comfortable amounts of space devoted to traffic. The 2x1 lane is more like a 2x2 lanes, separated only by a painted axial strip.



Mapping of pedestrian accidents from the "Concerto" software, including analysis of public space and the network.

The organisation of high-density parking at an angle to the kerb, and the mass of vegetation in terms of lines of trees, partly hide what is going on at the side of the road (shops and services) and obstruct the perception of operations generated by local activity. Accidents associated with standard scenario "SP 13 : left-hand turns at an intersection or towards an access with a vehicle overtaking (often a motorcycle)" are a direct result of this organisation.

- the two main intersections are equipped with traffic lights, serving above all to regulate traffic, in particular for the "Abélard/Puits Mauger" crossroads. On the latter, the traffic light cycle and especially the size of the crossroads lead pedestrians to attempt "risky" crossings. As waiting times are too long, pedestrians cross when the crossing light is on red. This is a situation which is made worse because of the large distances to be crossed.

This layout primarily concerns accident scenarios “P2 : pedestrian running across” and “P5 : pedestrian crossing a large road detected too late” ;

- some cycle facilities remain here and there on the route, sometimes in the form of cycle strips (“Police” sequence) or cycle lanes on a shared pavement (“south” sequence, east part) ;
- because of their layout, two particular sites play a key role in the running of certain sequences :
  - the double chicane between “South Part” and “Papier Timbré” sequences with two traffic lanes in each direction maintained ;
  - the signal-controlled intersection between the “North Part” and “Police” sequences which marks the changeover in the variation of road space, but this is not sufficiently easy to understand for the motorist ;
- finally, the many lines of trees and especially landscaping by means of “square” type pruning give the boulevard a deep, straight-line perspective that is not conducive to sustained attention for users driving along it, and even less to their attention to what is going on at the side of it. The motorist driving along the boulevard does not notice what is happening around him and perceives only what is happening in the distance.

> Observations on road users on the move

Just as for a targeted study (see page 85) **practices, uses and behaviour** on the road and the immediate surroundings need to be identified, as this area is likely to have an impact on the occurrence of an accident for which possible courses of action may be taken. These observations are always made in conjunction with information resulting from the analysis of accidents recorded on the site.

As a complement to the various **observations** recommended within the framework of a specific safety study, special attention must be paid to the following aspects :

- the number of people using shops, pedestrians’ preferred routes and crossing places, parking needs, especially for bicycles, etc. ;
- behaviour induced by traffic caused by the need to move to and fro between certain facilities along the road ;
- how users make use of special facilities (bus stops, respect, or failure to respect, zebra crossings, sufficient safety margin to allow pedestrians to cross, etc.) ;
- the kind of traffic (transit, access, etc.) ;
- unacceptable waiting times at traffic lights (cars and pedestrians), etc.

Advice

Speed remains one of the relevant indicators. But it refers to a specific form of user behaviour, without shedding light on how this behaviour varies according to how the road has been developed.

It is recommended to fine-tune speed measurements by means of vehicle tracking with speed readings. This makes it possible to obtain a more accurate idea of the variations of behaviour of road users, depending on the sequences and various singularities.

Knowledge of **parking habits** is very important (local parking, shopping, how full parking spaces are at a given time, how many vehicles use the same space during the day, etc.) as well as what is available as compared with needs and effects on behaviour.

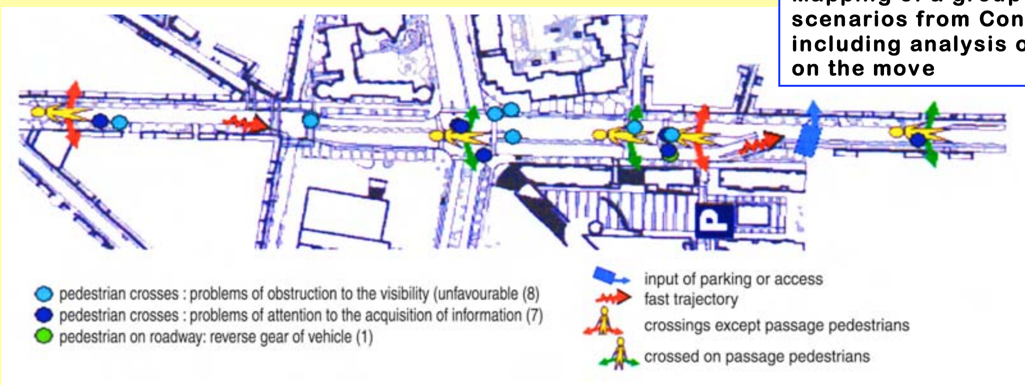
Example of external data relating to the user on the move :

Boulevard de la Tour d'Auvergne in Rennes

The sequential accident analysis, in conjunction with observation of habits, practices and behaviour on the boulevard, revealed the following malfunctions :

- pedestrian crossings are not always safe :
  - either the pedestrian is exposed to increased risks when using pedestrian crossings because of the number of lanes to be crossed. This is the case at the signal-controlled intersection "Abélard/Tour d'Auvergne", with waiting times that are too long, encouraging pedestrians to cross while the pedestrian light is on red. In addition, the pedestrian clearance time is a little short to allow them to cross in one go. The pedestrian also finds himself more exposed, also for reasons of lane width, at crossings without traffic lights ("South Part" and in the middle of the "Papier Timbré" sequence) ;

Mapping of a group of scenarios from Concerto including analysis of users on the move



  - or because of the behaviour of the pedestrian who chooses to cross elsewhere than on the zebra crossings, as is the case at the level of the "North Part". This is generally a deliberate and calculated attitude by the pedestrian to get from one side to the other. This type of behaviour is fairly frequent. It can also be observed in the section close to the double chicane at the level of the "Papier Timbré" sequence ;

- motor vehicles approaching without slowing down, or even accelerating :
  - at the level of the double chicane.
    This kind of behaviour is accentuated at off-peak times because of the broad trajectories that motorists take, encouraging them to systematically cut across both lanes. This situation goes a long way towards explaining loss of control observed particularly at this point ;


Broad trajectories at the chicane.

  - at the point where the "North Part" runs into the "Police" sequence at the level of the signal-controlled intersection. Modifying the trajectory and the use of traffic lights may induce a surprise effect, requiring emergency braking and explaining loss of control ;

- unsafe left-hand turns made by motorists, related to movements into the angle parking area or to access to the buildings on the “South Part”, in particular when trafficis heavy. These manoeuvres can be explained by the great demand for parking in this sector, and for the “North Part”, linked to the type of activity (short-stay parking : service, temp agency, etc.) ;
- finally, fairly frequent stopping, linked to deliveries, is to be observed on the lanes or special lanes themselves (bus lanes) , as no special delivery areas are provided throughout the whole of the route. This type of behaviour has been noted in certain accidents.

Step 3 : Preparing to act

Summary of the safety analysis and formulation of safety objectives

As for the diagnosis of a targeted safety study, this is a key aspect in developing the diagnosis. It must enable courses of action to be prepared by grouping the main safety issues identified, analysed and included in the previous step in order to define safety objectives.

To do this, it is necessary to summarise the accident report analyses and the observations made out in the field.

This implementation of the approach described here in linear form is, in practice, often performed in a more iterative way.

Example of an analysis summary :

Boulevard de la Tour d’Auvergne in Rennes

The Boulevard de la Tour d’Auvergne is a road that causes accidents, especially for cyclists and pedestrians, because of :

- its function in the hierarchy of the road system network, as a route avoiding the central business district ;
- dense activities in its immediate urban environment that are hidden by its highly landscaped character ;
- the large amount of space devoted to traffic and busy parking areas at certain points which create still more space devoted to the car ;

Very large amount of space dedicated to traffic and fairly “risky” crossings for pedestrians : long distances and quite often not on zebra crossings.

- the many exchanges generated, in particular by cyclists and, above all, pedestrians.

But motorists also have to cope with the consequences of this : the singularities create serious breaks on the route, leading to loss of control and motorcyclists falling from their vehicles. Almost half of the scenarios are scenarios not involving pedestrians.

The traffic lights at the two main intersections on the central part of the route, intended as speed calming measures and to enhance the safety of pedestrians crossing, do not fulfil these roles satisfactorily. Crossing distances are too great and waiting times too long at pedestrian red lights. The other crossings that are not controlled by traffic lights have similar drawbacks, with three or even four lanes to be crossed without any refuge.

The absence of pedestrian crossings encourages undisciplined crossings, taking routes as close as possible to the destination. This phenomenon, particularly in evidence at the level of the "North Part", is the cause of certain accidents involving pedestrians.

To a lesser extent, the strategy for managing parking and residential accesses leads to safety problems that have been confirmed in the "South Part".

The use of bus lanes or wide areas of the roadway for "drop-off parking" or deliveries is an additional source of danger. These stationary vehicles hide pedestrians crossing and, in certain cases, lead to bicycles running into vehicles from behind.

Lastly, the size of the trees adds to the perspective and increases the linear effect of the boulevard. Even if this observation does not appear directly in the accident analysis, it may contribute to speeding, which may lead to loss of control.

Example of safety objectives :

Boulevard de la Tour d'Auvergne in Rennes

- Make crossing for pedestrians safer :
  - in specific areas of the "South Part",
  - by distributing them more equally on the "North Part", taking into account the urban development planned in this sector,
  - in a more targeted way on the "Papier Timbré" sequence, at the approach to the double chicane ;
- make it harder to accelerate, particularly at the level of the double chicane ;
- improve perception of traffic lights so as to avoid last-minute braking, in particular on the signal-controlled junction at the bottom of the "North Part" sequence ;
- improve management of access to parking spaces, in particular on the "South Part" ;
- eliminate factors hindering visibility : activities related to deliveries, parking, etc. (scenario P3 : hidden pedestrian crossing in heavy traffic) ;
- reduce the linear effect caused by landscaping which encourages speeding.

Step 4 : From objectives to courses of action

Information sheet : **“Summary from objectives to courses of action”** Page 71

There may be several possible courses of action which go beyond the framework of road development, which is the solution that one tends to recommend implicitly a little too quickly.

They may be directed towards communication, or enforcement policies , or even from other fields, such as the transport policy. However, it should not be forgotten to check the possible implications of the chosen safety objectives on aspects other than safety.

All courses of action are monitored and assessed.

For a linear study of this size, it is not necessary to prepare summaries, as indicated in the first part of the guide. These summaries should be kept for territorial safety studies.

Example of a course of action :

Boulevard de la Tour d’Auvergne in Rennes

Here are examples of three sheets drawn up to describe and keep track of a course of action. These three courses of action cover the vast majority of the accidents analysed over the period.

Sheet number : A1

Field of action	☐ Urban setting ■ Public space and networks ☐ Users on the move
Safety objective(s)	Make crossing for pedestrians safer
Standard scenarios involved	P3. Pedestrian hidden when crossing in heavy traffic (3 accidents) P5. Pedestrian crossing a large road detected too late (2 accidents) P9. Pedestrian crossing confidently on a crossing, taking a long time to cross because of wide infrastructure (2 accidents)
Level of priority	1
Topic-based or space-based target	Zebra crossing in the middle of the “Papier Timbré” sequence. Pedestrians crossing at the “Abélard/Puits Mauger” intersection.
Courses of action	• make the “Abélard/Puits Mauger” intersection smaller and allow sufficient pedestrian clearance time ; • make provision for pedestrians to cross in two stages, with a refuge on the “South Part” sequence and at the level of the intersection, at the junction of the “North Part” and “Police” sequences ; • in the longer term, examine the possibility of making the area into a 30 km/h zone, taking into account the many activities and pedestrians crossing throughout the route.
Potential entities in charge	City engineering services
Assessment criteria	Keeping track of accidents Counting and observing pedestrians crossing (Before/After) Satisfaction survey

Sheet number : A2

Field of action	☐ Urban setting ■ Public space and networks ☐ Users on the move
Safety objective(s)	Make it harder to accelerate, particularly at the level of the double chicane
Standard scenarios involved	SP30 – Alcohol and loss of control of vehicle (5 accidents) SP31 –Loss of control in a bend on slippery road surface (9 accidents)
Level of priority	1
Topic-based or space-based target	Chicane at the junction of the two sequences “Papier Timbré” and “South Part”. At the level of the intersection, at the junction of the sequences “North Part” and “Police”.
Courses of action	• at the level of the chicane : reduce traffic space to one lane in the north-south direction, including upstream and downstream of the chicane ; • at the level of the crossroads, at the junction of the sequences “North Part” and “Police”, install central islands in order to make pedestrian trajectories clearer. Different landscaping upstream and downstream of the point, for example by cutting back the trees more ; • in the longer term, if the area is converted into a 30ph zone, these two points are strategic places for clearly marking the development sequence of the whole of the central part of the boulevard.
Potential entities in charge	City engineering services
Assessment criteria	Keeping track of accidents Speed checks (Before/After) at the level of the chicane

Sheet number : A3

Field of action	☐ Urban setting ■ Public space and networks ■ Users on the move
Safety objective(s)	Eliminate factors hindering visibility : activities related to deliveries, parking, etc.
Standard scenarios involved	P1 to P5 – Group of scenarios : key influence of a poorly visible obstruction or an obstruction in poor visibility conditions (8 accidents) SP9 to SP12 – Other problems related to failure to perceive or to receive information (4 accidents)
Level of priority	2
Topic-based or space-based target	Distributed over the whole length of the boulevard at the most concerned locations.
Courses of action	• create spaces dedicated to deliveries ; • raise awareness of shop or business owners so that they can inform their suppliers about the special delivery facilities and how they should be used ; • monitor and penalise improper use (parking other than for deliveries) or deliveries outside from the assigned areas.
Potential entities in charge	City engineering services, Police department Shopkeepers' associations
Assessment criteria	Keeping track of accidents Counting fines Observing behaviour with regard to these areas (are they respected or not, and by whom ?)

Territorial safety study

The previous pages of the guide stressed how the general method is applied in running a safety study dealing with specific and linear cases. These targeted and linear safety studies are generally justified by the concern to improve transport safety, without neglecting other aspects (environment, local life, organisation of the network and public transport, etc.).

How a request arises

The request for a territorial safety study is mainly related to :

- the development of local road safety policies, given concrete expression today by the drawing-up of the general guidance document (DGO). The issue study, completed by a further, more in-depth stage, is at the heart of the DGO, a reference document, asserting state policy for combating road safety issues at *département* level. In theory, towns are requested to take part in drawing up this document, which is the basis of a public policy whose objective deals exclusively with safety ;
- regional development policies which are expressed in the form of development projects, more significant projects possibly including a mobility project (urban renewal, etc.) or planning documents : territorial coherence scheme (SCoT), urban mobility plan (PDU), local town-planning document (PLU), etc.

Phase 1 – The safety issue and diagnosis study : methodological specificities

In the area of drawing up planning documents, safety is never the primary concern. It is only one concern among others. Performing various diagnoses (traffic, parking, etc.) implies cross-referencing the diagnoses in order to define overall objectives. The other special methodological feature of the territorial study, given the great number of accidents to be studied, is the difficulty of managing :

- on the one hand, the complicated nature of the analysis because of the large number of cases to be processed. This difficulty can be overcome, either by carrying out an issue study to define representative sectors or topic-based targets on which to carry out the diagnosis, or by taking into account in the diagnosis only the previous year's accidents. If the number of cases is still too great, it is possible to carry out random sampling of accidents on the area being studied ;
- and on the other hand, summarising all the information, which can nevertheless also be facilitated by resorting to the concept of a standard accident scenario described in the first part of the present guide. Mapping the standard scenarios is advisable to make spatial analysis easier.

To conclude, carrying out a safety study on a territory requires the use of the entire method presented in the first part of the guide, in particular the constitution and mapping of scenarios.

Recourse to data external to the accident reports, in particular so as to study the relationships between accidents, territory and networks, should not be neglected at any cost. Respecting the recommended approach makes it possible to learn as much as possible from analysing the accident cases studied. This is because expertise alone can never replace a detailed study of accidents.

On-site observation

In certain cases that are too demanding (accidents widely dispersed throughout the territory, etc.), it is possible to do without on-site observation. This is in particular the case for drawing up the DGOs whose study area covers the whole *département*. INRETS also recommends this in a document entitled "*Outil et méthodes*" (Tools and methods, INRETS, n°3, page 25 : "*It is possible not to systematically return to the site of each accident studied, if this is likely to complicate matters avoid in certain general studies, such as a diagnosis prior to a local safety action, the objective of which, as far as the infrastructure is concerned, is to be able to define general principles for action").*

Formulating courses of action

The actions must be appropriate for the context and the problem set. It is important to carefully assess their foreseeable effects on safety and on other aspects. This presupposes a certain amount of experience and knowledge[1].

Preventing potential malfunctions

Often the developments programmed in projects related to territorial studies (building a tram line, creating a bus line with a high level of service within the framework of a town planning document, etc.) considerably modify public space to such an extent that it might be thought that future accidents will no longer have anything in common with accidents in the past and that expertise alone will be sufficient. As things stand, it can be said that *"all symptoms are not equal. Some rare pieces of research which have compared the effectiveness of measures based on past accidents and the effectiveness of the expertise of engineers or "traffic psychologists" alone have shown that past accidents were better predictors of future accidents than expert knowledge applied to the characteristics of the roads studied. Although in certain cases one has to make do without past accidents (in new projects) or with only a few rare accidents, it is especially important to recognise that in this case the danger which we are highlighting is more uncertain than when we can make more use of past accidents. For this reason it might be preferable to contrast "uncertain" or "probable" danger with "relatively certain danger", rather than using an inappropriate opposition between "potential" and "real" danger"* (Brenac, unublished).

The analysis helps to avoid repeating past errors and to give coherence to safety objectives in the implementation of development plans in the broad sense (public spaces, connection between these spaces, taking cyclists and pedestrians into account, etc.).

One must also be aware that the measures implemented generally produce repercussions beyond the project area. These possible repercussions, related, for example, to traffic diverted to a wider area, must obviously be taken into account and give rise, if necessary, to accompanying actions.

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1 These reference or specialised works contain useful information for the choice of possible courses of action :

"Sécurité des routes et des rues", Setra-Certu, 1992 ;

"Ville plus sûre, quartiers sans accidents, réalisations, évaluations", Certu, 1994 ;

"Réduire la vitesse en agglomération", Certu, 1989 ;

"Sécurité et urbanisme", Presses de l'ENPC, 1998 ;

"Scénarios-types d'accident de piétons et éléments pour leur prévention", INRETS, 2003 ;

"Gestion urbaine, sécurité routière et environnement", INRETS, 2002.

Planning the evaluation

Lastly, the methodology concerning territorial safety studies, in particular as far as defining possible courses of action is concerned, currently requires further study in order to gain more in-depth knowledge. Meanwhile, recourse to assessment criteria, as stated in the information sheet "From objectives to courses of action" helps provide feedback concerning the implementation of actions, in particular those dealing with aspects other than road developments, whose effects are still largely unknown today. Lack of perspective on the subject justifies the evaluations suggested in the information sheets. When used to the full, these information sheets will help to validate the relevance of the actions and to move forward. Research/action would also certainly be advantageous to get things moving.

Mobilising those involved to share knowledge about the issues

Mobilisation and dialogue between the many people involved are dealt with in depth in the works presenting the development of planning projects. Consequently, it is not necessary to develop these issues within the context of this work. If the safety aspect of transport is dealt with, it is included in the management of the various projects.

Phase 2 - Examples of territorial safety studies

Case n° 1 : the urban transport plan (PDU)

The PDU is a fundamental instrument for transport safety. The guidance law on inland transports (LOTI), modified by law on solidarity and urban renewal (SRU : Article 96), states as its primary goal to improve safety of all transport by taking into account the various categories of users, the balanced modal sharing of the roadway system, and accident observation (at least those accidents that involve a pedestrian or a cyclist). The drawing-up of the PDU (urban mobility plan) often provides the occasion to become aware of transport safety problems in a region.

The Certu guide *La sécurité routière dans les plans de déplacements urbains : approche et méthode* ("Road Safety in Urban Mobility Plans"), intended particularly for PDU project managers, details the value of producing a safer transport system at an early stage. It also presents the organisation to be set up in order to deal with safety, (a subject not touched upon in this guide which has more of a technical vocation), for the use of "safety experts" who have to deal with the orders of their colleagues in the Transport departments.

The method for dealing with transport safety within the framework of a PDU remains unchanged. It is simply adapted to the study of a larger territory than linear studies. There are two possibilities : the study is rolled out either while the PDU is being drawn up, or during its revision phase.

Drawing up the PDU

Reminder of the main stages :

- definition of the PDU issues ;
- pre-diagnosis ;
- analysis/diagnosis ;
- formulating objectives ;
- defining scenarios.

If it does not already exist, it is recommended that the safety issue study be carried out at the time of the pre-diagnosis. As a reminder, this first phase of the analysis must make it possible to identify the safety issues and quantitative indicators for the evaluation, and not safety objectives and courses of action, which is unfortunately too often the case.

During the "Analysis/diagnosis" stage, as was mentioned in the introduction to the territory study chapter, an accident report analysis can be carried out without any on-site visit. This is because, for the PDU, it is more a question of defining general safety objectives.

Based on the issue study, and in order to circumvent the difficulty of studying a great number of cases,, it is possible to focus the accident report analysis on only a limited number of issues identified as being of priority.

The concept of a standard accident scenario described in the first part of the guide is of help in making the summary of the accident report analyses.

It seems a good idea to end by making some "From objectives to courses of action" summaries that are particularly well-suited to prioritizing and programming courses of action. An example can be consulted on page 68.

Revision phase of the PDU

An identical method is used for the revision of a PDU. Depending on the level of investigations carried out when drawing up the PDU and the results of these, the approach described above applies in full or in part. The revision provides the opportunity of of tackling problems and of looking at aspects that were not dealt with when drawing up the PDU.

When initially drawing up the PDU, objectives to do with carrying out a more in-depth diagnosis by means of inspections out in the field within the framework of micro-PDUs, reference plans, development charter, etc. may have been formulated In this case, all that is required is to study the relationships between accidents, regions and networks (see page 42) more attentively.

Other problems

The paragraph "Preventing potential malfunctions" from the introduction to the territory study is particularly relevant to the PDU because programmed developments (building a tram line, or a bus line with a high level of service, etc.) often considerably modify the appearance of public space to such an extent that it might be thought that future accidents will no longer have anything in common with accidents in the past and that expertise alone will be sufficient.

Case n° 2 : the SCoT

The main aim of the SCoT is to ensure the coherence of all sector-based policies , in particular as regards town planning, housing, mobility and commercial facilities. This thinking relates to a territory which is not exclusively urban. The *"*SCoT and mobility" document states, on page 163 : "The *SCoT diagnosis must bring out the major safety issues, in terms of both space (where the accidents happen) or topic (types of users concerned). It is primarily based on computerised "accident" data, knowledge of the roadway system network and how the territory is occupied"*.

For each local situation and its changes on the SCoT scale, the SCoT diagnosis is used to :

- detect the areas and the types of malfunction ;
- localise the sectors where accidents accumulate, identify their nature and their main features ;
- evaluate the potential gains in terms of safety, especially through the main roadway system and public transport development options which the SCoT may define (urban boulevard, 30 km/h zone, etc.) ;
- prevent potential malfunctions following the creation of new accesses or roads leading to new neighbourhoods, created as a result of urban extension or renewal ;
- Mobilize the players involved (to share knowledge about these issues).

For the person in charge of safety, it is the results of the safety issue study that will best meet the expectations listed above (give or take a few details). What is important above all is to detect and locate the sectors where accidents accumulate. Once one is in possession of the accident data base (the BAAC) and a tool like Concerto, it is fairly easy to identify the nature of the accidents and their main features over the whole of an urban and interurban region. It is advisable to prefer maps to graphs and especially to tables.

Consequently, it is the safety issue study that will mainly fuel the SCoT safety diagnosis. To perform a diagnosis of this kind, it is advisable to use the method recommended for performing a safety diagnosis within the framework of a PDU, illustrated by a study carried out for drawing up a DGO (see attached document joint in the CD-Rom).

The safety diagnosis will be part of the cross-referenced summary of the analyses carried out to produce the SCoT.

Case n° 3 : the local town planning document (PLU)

The PLU is a planning document which expresses the urban project of the town or village and translates it into official terms. It can also be drawn up to cover several towns or villages. This is obligatory for towns or villages that are grouped together as an urban community. In drawing it up, the local councillors can gain an overview of the town or village territory and clarify their objectives as regards urban policies and the actions which they wish to carry out in the various neighbourhoods or sectors of the town or village. Under the terms of article L 123-1 of the town planning code, PLUs may specify the use of land parcels, the layout and the characteristics of the traffic lanes to be preserved, modified or created, including pedestrian streets or paths and cycle routes, identify the location of public transport lanes, even though accident analysis shows that these separations increase the risks of conflict at the points where they converge.

When drawing up a PLU, a safety study is essential using the method recommended for a territoty study, in order to take stock of safety issues. This must obviously be appropriate to the size of the town or village, or inter-communal territory. Here too, it is necessary to harmonise objectives and to make all those involved in a project work together as a team, each bringing his or her knowledge, skills and experience to bear on the subject. The road safety observatories of the DDE in each *département* are available to help towns or villages by providing them with figures about the safety risks in their territory. The State awareness campaign* planned as part of the procedure also comprises essential features, in particular in terms of safety issues.

Case n° 4 : urban projects (urban development and renewal, etc.)

The method presented in this guide applies in full to this type of approach.

The CD-Rom joint provided with the guide gives an example in the form of an extract from a safety study carried out within the framework of a major city project (GPV).

* The State makes local government agencies aware of any requirements, rights of way, etc. of which it has knowledge. Concerning road safety, this may be, for example, access to private property from a main road.

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Documents dealing with study methods

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- *Ville plus sûre, quartiers sans accidents. Savoir-faire et techniques,* Cetur, 1990.
- *Guide étude d'enjeux SURE – Diagnostic*, Setra, 2005
- *L'étude détaillée d'accidents orientée vers la sécurité primaire, méthodologie de recueil et de pré-analyse* (by F. Ferrandez et al.), Presses de l'École Nationale des Ponts et Chaussées, 1995.
- *L'analyse séquentielle de l'accident de la route (Méthode INRETS), comment la mettre en pratique dans les diagnostics de sécurité routière*, INRETS report, *Outils et Méthodes*, no. 3, 1997.
- *Prise en compte de la sécurité dans les PDU,* Certu, 2004.
- *Les enjeux des politiques de déplacement dans une stratégie urbaine,* Cetur, 1994.
- *Accidents en milieu urbain. Sorties de chaussées et chocs contre obstacles latéraux*, Certu, 2001.
- *Connaître la vitesse pour agir sur la sécurité de la circulation en agglomération*, Certu, 2003.
- *Ville et réseaux de déplacements vers un métier de la sécurité routière – Synthèse,* INRETS no. 49, 2005.

Articles

- *Diagnostic de sécurité routière sur une ville : intérêt de l'analyse fine de procédures d'accidents tirées aléatoirement*, (T. Brenac and B. Megherbi). in *Recherche Transports Sécurité*, 1996, p. 52, 59–71.
- *Le concept de scénario type d'accident de la circulation et ses applications*, (T. Brenac and D. Fleury) in *Recherche Transports Sécurité*, 1999, p. 63, 63–76.
- *Insécurité routière et aménagement de la ville, étude et cartographie de scénarios d'accident* (by M. Tira, T. Brenac and J.-É. Michel), Transport, Environnement, Circulation, 1999, p. 155, 22–30.

Other documents, including considerations of method or dealing with particular questions :

Monographs

- *Sécurité des routes et des rues* (Chapter 1), Setra, Cetur, La Documentation Française, 1992.
- *Sécurité et urbanisme, la prise en compte de la sécurité routière dans l'aménagement urbain.* (by D. Fleury), Presses de l'École Nationale des Ponts et Chaussées, 1998, 299 p.
- *Sécurité Routière – Dossier de voirie d'agglomération - Projet d'agglomération et schéma de voire,* Certu, 1997.
- *Guide zone 30 – Méthodologie et recommandations,* Cetur, 1992.

Cartography

- Jacques Bertin, Paris, Gauthier-Villars 1967, Sémiologie Graphique, *Les diagrammes – Les réseaux – Les cartes*
- Pierre Corroenne, CETE Normandie-Centre, 2003, *Mieux cartographier des données alphanumérique et numérique pour accéder au document.*
- *Scénarios types d'accidents impliquant des piétons,* INRETS report no. 256, Thierry Brenac, Claudine Nachtergaële, Hélène Reigne, December 2003.
- *Scénarios types d'accidents urbains n'impliquant pas de piétons et perspectives pour leur prévention*, INRETS report no. 274, Nicolas Clabaux, 2007.
- *Développement urbain et insécurité routière : influence complexe des formes urbaines*, École Nationale des Ponts et Chaussées – thesis in the discipline of Transport by Marine Millot – defended 9 December 2003.

Articles and communications

- *Les accidents de poids lourds, analyse des dossiers de l'Etude Détaillée d'Accidents* (by D. Fleury, C. Fline and J.-F. Peytavin), in *Recherche Transports Sécurité*, no. 14, 1987, pp. 31–39.
- *Cyclist fatalities in Denmark* (by I. M. Bernhoft). International conference : "Strategic highway research program and traffic safety on two continents", The Hague, The Netherlands, 22–24 September 1993.
- *Concepts de risque et d'exposition en matière de sécurité des aménagements routiers* (by T. Brenac), in *Recherche Transports Sécurité*, December 1995, no. 49, pp. 35–42.
- *Analyse des biais dans la connaissance épidémiologique des accidents de la route en France* (by B. Laumon and J.-L. Martin), in *Revue d'épidémiologie et de santé publique*, 2002, p. 50(3), 277–285.
- *Under-reporting of road traffic accidents* (by H. F. James), in *Traffic Engineering and Control*, 1991, p. 32(12), 574–583.

Useful internet and intranet links

French national road safety site : **http://www.securiteroutiere.gouv.fr**

French transport ministry : **http://www.equipement.gouv.fr**

French ministry for Ecology, Infrastructure and Sustainable Development :
http://www.transports.equipement.gouv.fr/

CERTU – *Centre d'Etudes sur les Réseaux, les Transports, l'Urbanisme et les constructions publiques* (Centre for the Study Networks, Transport, Urban Planning and Public Buildings) :
http://www.certu.fr

SETRA – *Service d'Etudes Techniques des Routes et Autoroutes* (Roads and Motorways Technical Studies Department) :

- Setra main site : **http://www.setra.equipement.gouv.fr/**
- Clubs and networks site – RD (CEERD) :
  http://hosting.mayetic.com/Quickplace/setra-clubrd/Main.nsf
- FACES intranet site : **http://faces.setra.i2**

INRETS – *Institut national de recherches et d'études sur les transports et leur sécurité* (National Institute for Research into Transport and Safety) : **http://www.inrets.fr**

AITF - Association of French Territorial Engineers : **http://www.aitf.asso.fr/**

INSERR – French National Institute of Road Safety and Research : **http://www.inserr.org**

INSERM – Enter SC8 to obtain mortality statistics by geographical area :
http://www. inserm.fr

Legifrance – French legislation and regulations : **http://www.legifrance.gouv.fr**

French documentation agency : **http://www.ladocumentationfrancaise.fr/**

Definitions

Accident density or collective risk : accident density, proportional to frequency, is a measurement of the safety issues on a section of road or accident risk from the point of view of the community. Accident density is expressed as a number of accidents per kilometre and per year.

Accident rate : like mortality, this term indicates a death rate as a proportion of a population. The term "accident rate" indicates an accident rate as a proportion of a variable which may be the number of vehicles taken into account, or a mileage run by vehicles exposed to the accident risk. It may also be the accident rate within a population.

Accident rate or individual road risk : the accident rate measures the accident risk from the user's standpoint (risk per kilometre travelled). This is an indicator of the intrinsic level of danger of a section of road. The accident rate is expressed in accidents per 100 million vehicles/km (or 100 million kilometres travelled). The rate can be also expressed as people killed or as severity per 100 million vehicles/km.

Accident report : an accident report is much more detailed than the BAAC file and gives information on the circumstances of the accident and factors causing it, provides statements of people involved and eyewitnesses, and also a diagram of the accident. They are essential data for drawing up the diagnosis.

Accident research : an activity whose purpose is the study of accidents and their effects on an interdisciplinary base, from traumatology to all disciplines related to the design of a vehicle, and from studies on risk-taking to legal measures or prevention methods. It has a role in drawing up statistical data in these different areas.

BAAC *(bulletin d'analyse d'accident corporel de la circulation) :* Drawn up by the police force and describing the essential characteristics of an accident, this is the essential alphanumeric basis for establishing the accident status report and processing the accident data to be analysed , in order to identify safety issues.

CDES *(* Within the DDE, this is a traffic and road safety engineering unit, covering the whole of the national and *département* network (traffic and accidentology expertise, malfunction analyses and optimisation of road use).
Since 2007, the CDES have been replaced by road safety observatories in each *département* ; these new units no longer dealing with traffic management.

CETE *(Centre d'études techniques de l'Équipement)* : a public engineering service.

CERTU *(Centre d'études sur les réseaux, les transports, l'urbanisme et les constructions publiques) :* Centre for the Study of Networks, , Urban Planning, Transportation and Public Facilities. It produces statistical analyses on accidents and many documents on road developments in the urban environment.

CISR *(Comité interministériel de sécurité routière) :* Interdepartmental road safety committee, in charge of defining government policy on the subject and making sure that it is applied. Chaired by the Prime Minister, its secretariat is the interdepartmental deputy for road safety, who is also the director of road traffic and safety (DSCR) at the Transport ministry, in charge of safety and traffic issues.

CMSR *(Chargés de mission sécurité routière) :* road safety operation managers

CNSR *(Conseil national de la sécurité routière) :* National road safety council. Created by the inter-departmental road safety committee on October 25th, 2000 and set up in 2001, this is an independent organisation whose mission is to evaluate, study and propose.

DDE *(Direction Départementale de l'Équipement) :* Road engineering department at the level of each French geographic "*département*".

DGO *(Documents généraux d'orientation) :* General guidance documents.

DRE *(Direction régionale de l'Equipement) :* Road engineering department at regional level.

DR *(Direction des Routes) :* State road network department.

DSCR *(Direction de la sécurité et de la circulation routières) :* Road traffic and safety department.

ECPA : Surveys may be used to supplement the information in the reports, as they are much more complete. Implemented by order from the *préfecture* to a multi-disciplinary team of investigators, the purpose of the ECPA survey is to identify characteristics, possible accident scenarios and multiple accident factors that are then indexed in a questionnaire and a report.

Fatal accident : Personal injury accident leading to at least one fatality.

IAL *(Indicateur d'accidentologie locale) :* Local accident indicator, an indicator obtained by the ratio of the number of people killed observed in a *département* to the number of people killed which would have been recorded if the risks incurred there had been the same as those measured in France as a whole by network category. The new IAL takes into account both the amount of traffic and its distribution over the various network categories.

IDSR *(Intervenants Départementaux de Sécurité Routière) :* Road safety operatives at *département* level.

Injured, pre-2005 definition :
- Seriously injured victim : accident victim requiring more than 6 days in hospital.
- Slightly injured victim : accident victim requiring at the most 6 days in hospital or medical care.

INRETS *(Institut national de recherches et d'études sur les transports et leur sécurité)* **:** National institute for research into transport and its safety**.** An establishment in charge of public research in the field of transport. It comes under the joint supervision of the ministry for research and the ministry for infrastructure and transport. It was set up as a result of the merger of the transport research institute, IRT, and the national road safety organisation, ONSER.

INSEE *(Institut national de la statistique et des études économiques) :* National institute of statistics and economic studies.

Issue : An issue is the absolute or relative morbidity, of a target (place, type of user, etc.).

ONISR *(Observatoire national interministériel de sécurité routière) :* The national interdepartmental road safety observatory, which belongs to the ministry of infrastructure. It publishes statistical data on road safety in the form of regular reports or books dealing with specific problems (HGVs, child restraining devices, etc.).

ORSR *(Observatoire régional de sécurité routière) :* Regional road safety observatory.

Personal injury road accident : according to official road traffic statistics, this is an accident, fatal or otherwise, with at least one victim, on a road open to the public and involving at least one vehicle.

PDU *(Plan des déplacements urbains) :* Urban mobility plan

PLU *(Plan Local d'Urbanisme) :* Local town planning document (formerly known as the POS)

REAGIR *(Réagir par l'Etude des Accidents Graves et les Initiatives pour y Remédier) :* An action plan aiming to react to, and remedy accidents, via the study of severe accidents, now replaced by the ECPA. Set up during the 1982 interdepartmental road safety committee, this resulted in the creation of a commission made up of a broad range of road safety professionals who immediately go to the scene of severe accidents in order to carry out on-site investigations–to be distinguished from the legal enquiry - which are used for accident analysis and black spot localisation.

Risk : this is the probability of a negative event occurring, "chance" being its positive counterpart. Both are expressed by a number between 0 and 1 (zero probability corresponds to no risk or chance of the event studied occurring ; 1 corresponds to certainty). An individual more or less consciously ranks the risks to which he is exposed at a level of acceptability that varies according to the nature of the risk, to the level of probability that he imagines, and to how he sees risk-taking.

SCoT *(Schéma de cohérence territorial) :* Territorial coherence scheme.

SETRA *(Service d'études techniques des routes et autoroutes) :* Roads and Motorways Technical Studies Department. It produces statistical analyses on accidents and many documents on road developments in the urban environment.

Severe Accident : personal injury accident leading to at least one person killed, or seriously injured, or hospitalised.

Severity : an indicator to assess the consequences of accidents.

Severity index : the number of severe accidents per 100 personal injury accidents.

SIG *(Système d'information géographique) :* Geographical information system.

SRU *(Solidarité et renouvellement urbain) :* Solidarity and urban renewal.

Urban environment : the environment between the road signs marking the beginning and the end of a conurbation.

Victims, post-2005 definition :
- Person killed : a victim dying immediately or within 30 days following the accident.
- Hospitalised injured victim : a victim admitted to hospital for more than 24 hours.
- Non-hospitalised injured victim : a victim who has undergone medical care but who was not admitted hospital for more than 24 hours.

Victims, pre-2005 definition :
- Person killed : a victim dying immediately or within 6 days following the accident.
- Seriously injured victim : accident victim requiring more than 6 days in hospital.
- Slightly injured victim : accident victim requiring at the most 6 days in hospital or medical care.

ZNIEFF *(Zone naturelle d'intérêt écologique, floristique et faunistique) :* a natural zone of ecological interest or of value for its plant and animal life.

ZPPAUP *(Zone prioritaire du patrimoine architectural urbain et paysagé) :* Priority zone of urban and landscaped architectural heritage.

Transportation safety in urban areas

A methodological guide

In declaring road safety a major national cause in 2000 and one of the key initiatives of the French President in 2002, the State affirmed its determination to fight the lack of safety on the roads, working in close liaison with its partners, especially the *départements* and city councils. The success of a national policy for preventing road accidents is intricately tied to the implementation of local transportation safety policy. In a constantly changing environment, local authorities and road management operators have to be able to target and prioritise key safety issues and assess safety issues in appropriate ways in order to implement the most effective action. Furthermore, a survey carried out in 2000 among local government departments revealed that the methods used in road safety studies are inadequately understood and implemented.

Due to the combination of a lack of a "transportation safety" culture and difficulty in finding suitable new tools and methodologies, among other things, the disparity between the methods recommended since the 1990s and practice in the field is considerable. By focusing on the development of a common vocabulary and clearer specifications, knowledge-sharing and a choice of tools and methods adapted to individual environments, the seminar held on 26 October 2000 helped us gain a deeper understanding of what local actors need and enabled us to assess the lack of techniques and methodologies in detail. It is to address such needs that Certu has published this guide, aimed at helping local authorities take on board initiatives and methods required to carry out road safety studies that can then be shared by all local actors.

Seguridad de los desplazamientos en las aglomeraciones

Guía metodológica

Al declarar la seguridad vial gran causa nacional en el 2000 y "tarea del presidente de la Republica" en el 2002, el Estado reafirma su voluntad de luchar contra la inseguridad de los desplazamientos, en colaboración con sus socios, especialmente los Departamentos y las Ciudades. Pues el éxito de una política nacional de lucha contra los accidentes de tránsito depende estrechamente de la aplicación local de las políticas de seguridad de los desplazamientos. En un entorno en constante evolución, las colectividades y los responsables de la vía pública deben ser capaces de definir y jerarquizar los retos primordiales de la seguridad, y realizar diagnósticos de seguridad pertinentes para poner en práctica las acciones más eficaces. Ahora bien, una encuesta realizada en el 2000 revela que los métodos en materia de estudios de seguridad han sido insuficientemente integrados.

Falta una cultura de "seguridad de los desplazamientos", subyace una dificultad para apropiarse nuevas herramientas y metodologías.... existe una gran distancia entre los métodos preconizados en los años 90 y las prácticas de terreno. Elaborar un vocabulario común, precisar las consignas, compartir los conocimientos, seleccionar herramientas y métodos más adaptados a las exigencias del terreno.... el seminario del 26 de octubre de 2000 permitió profundizar las expectativas de los actores locales y elaborar un estado preciso de las carencias técnicas y metodológicas en los diversos ámbitos. Para satisfacer dichas necesidades, el Certu ha elaborado esta guía para ayudar a las colectividades territoriales a perfeccionar sus conocimientos en materia de gestión y de métodos necesarios para la realización de estudios de seguridad pertinentes y para que éstos puedan ser compartidos por todos los actores locales.

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