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Summary of deliverables concerning accidents on two-way roads outside built-up areas - Sécubidi project

Study of issues arising from the BAAC and analysis of the FLAM database

STUDY REPORT

February 2022

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Summary of deliverables about accidents on two-wayroads outside built-up areas - Sécubidi project

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- Accidents on two-way roads outside built-up areas 2013/2017 - study of the issues (Laurent Dodet and Nicolas Dubos - Cerema)
- Fatal accidents on two-way roads outside built-up areas in 2015 - Analysis of the FLAM database (Bérengère Varin - Cerema)

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References

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Nicolas Dubos	Cerema Normandie-Centre	Main author	02/2022
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Summary of the study

The purpose of this report is to provide a summary of the methodology and results of the 2 deliverables of the accidents theme of the Sécubidi project, namely :

- Accidents on two-way roads outside built-up areas 2013/2017 - Study of the issues, based on BAAC data
- Fatal accidents on two-way roads outside built-up areas in 2015 - Analysis of the FLAM database.

Based on the results observed, it also suggests a number of courses of action that decision-makers can take to hopefully reduce the accident rate on the two-way network outside built-up areas.

5 to 10 key words to remember from the study

fatal accident	**FLAM project**
two-way road	**outside built-up areas**
long-distance	**issue study**
accident factor	
infrastructure	

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SUMMARY

1- GLOSSARY

BAAC: Bulletin d'Analyse des Accidents de la circulation
(Traffic Accident Analysis Bulletin)

FLAM: Facteurs Liés auxAccidents Mortels (Factors linked to
fatal accidents)

ONISR: Observatoire National Interministériel de la Sécurité Routière
(National Interministerial Road Safety Observatory)

VMA: Vitesse Maximale Autorisée (Maximum authorised speed)

RD: Routes Départementales (Departmental Roads)

RN: Routes Nationales (National Roads)

VC: Voies Communales (Municipal Roads)

2- CONTEXT AND OBJECTIVES OF THE SECUBIDI PROJECT

Two-way interurban roads make up a vast network of over 400,000 km managed by both the state and local authorities, mainly the departmental councils. This network performs multiple functions (transit and/or service) and has diverse characteristics in terms of infrastructure provision. It accounts for a significant proportion of journeys made for a variety of reasons, with a mix of different types of user such as passenger vehicles, heavy goods vehicles, vulnerable road users, farm machinery, etc. In terms of accidents, this network accounts for most of the fatalities on roads outside built-up areas.

While, overall, the BAAC file can provide some insight into the accident rate, there is a lack of more in-depth knowledge that would enable a diagnosis to be made that is better suited to the heterogeneity of this network.

One of the main objectives of the Sécubidi project is therefore to provide detailed knowledge of the acci- dentology on two-way roads outside built-up areas, with particular emphasis on infrastructure analysis, in order to :

- Get a better knowledge for action, in particular estimating and prioritising safety issues,
- Identify the main accident mechanisms in order to make a diagnosis and estimate the role of infrastructure and users;
- Evaluate the possibility of proposing a specific analysis for each type of network.

3- METHODOLOGY

Analyses were carried out on 2 types of incoming data, each of which was used to produce a deliverable:

- The BAAC files for the period 2013/2017 for the "stakes study" deliverable, making it possible to better estimate and prioritise safety issues. The scope selected was the total number of injury road traffic accidents recorded in France, on the two-way network outside built-up areas. The study was carried out using Traxy's SAP module, and Concerto for certain specificqueries (e.g. alcohol). The period 2013-2017 was chosen for two reasons. Firstly, from 2018 onwards, for accidents occurring outside built-up areas and outside motorways, the information contained in the BAAC no longer makes it possible to separate with certainty those occurring on dual carriageways from those occurring on two-way roads. The second reason is the announcement of the VMA80 measure at the beginning of 2018, with effective implementation in July 2018. Only 2019 is complete with this VMA change and then 2020 was disrupted by traffic restrictions imposed by health conditions to combat the spread of COVID19.

- The FLAM project's 2015 fatal accident database for the deliverable "Fatal accidents on the two-way non-built-up network in 2015", in order to identify the main accident mechanisms and factors, and taking into account the heterogeneity of the network studied. This database represents almost all the fatal accidents in 2015, and more specifically 97% of the fatal accidents in 2015 on the two-way network outside built-up areas. In addition, this database has been enriched specifically for the Sécubidi project, based on the analysis of Official Statements of Offence: identification of roads forming part of the main or secondary network (RN and RD), estimation of geometric data (road width, distance of obstacles from the edge of the carriageway), and details of the accident situation of drivers (overtaking maneuver, drifting out of the traffic lane, dynamic loss of control, etc.). The location of accidents by type of network was based on the classification of networks in the 2018 accident report, page 39, ONISR, 2019.

4- RESULTS

3.1 General issues from BAAC

In mainland France, between 2013 and 2017, 3,400 people were killed each year, 2,400 of them outside built-up areas. Of these 2,400 people killed outside built-up areas, 1,900 (80%) are killed each year on two-way roads. **Two-way roads are very serious: 80% of fatalities outside built-up areas, for 58% of injury road traffic accidents outside built-up areas**.

Moreover, the number of accidents has not declined over the period observed: in 5 years, the number of injury road traffic accidents on two-way roads outside built-up areas has risen by 25% (5 points more than on non two-way roads), while the total number of injury road traffic accidents in France has risen slightly by 3%.

The main problem is non-intersection accidents involving no pedestrians. The number of fatalities (1,900) per year on two-way roads outside built-up areas breaks down as follows:

- **1,600 fatalities in non-intersection accidents involving no pedestrians (84%),**
- 230 killed in accidents at intersections with no pedestrians (12%),
- 90 killed in accidents involving pedestrians (4%).

For non-intersection accidents involving no pedestrians, the main road safety issues are :

- **Accidents on bends**: with 41% of fatalities (650 fatalities per year) on this type of road layout, whereas the proportion of bends on the entire length of the road under consideration is certainly much lower,
- **Night-time accidents** account for 39% of fatalities (630 fatalities per year). Given the lower levels of traffic at night, the risk appears to be much greater than during the day. The number of deaths at night (22) is higher than during the day (16). This can be explained in part by the higher speeds used.
- **Single vehicle accidents against a fixed obstacle** (610 fatalities per year), in which almost one in two fatalities is against a tree,
- **Head-on collisions** (510 fatalities per year),
- **Accidents involving a driver under the influence of alcohol or drugs** (480 deaths per year).

A comparison of the BAAC data for 2013/2017, between RD and RN, shows the specific nature of accidents on these 2 networks. 86% of fatal accidents not involving pedestrians occur on a RD, compared with 7% for RN, a network on which accident fatalities are three points higher than on RD.

On the RD, there is a high concentration of accidents on bends (41% compared with 29% on the RN) and single-vehicle accidents against fixed obstacles (39% of fatalities on the RD compared with 15% on the RN), whereas the RN is heavily involved in head-on collisions (48% of fatalities compared with 32% on the RD).

In terms of user factors, alcohol is proportionally more prevalent on the main roads (35% of fatal accidents compared with 20% on the main roads), while the main road network is characterised by a higher incidence of cases of malaise/fatigue (19% of fatal accidents compared with 11% on the main roads).

3.2 More detailed information based on penalty notices for fatal accidents in 2015

3.2.1 Accident mechanisms

In terms of primary safety, an analysis of accident mechanisms showed that 55% of drivers involved in accidents in the road section on two-way roads outside built-up areas had left the lane.

54% of these lane exits were on curves, 45% on straight sections (1% unknown).

When it is known (i.e. in around 90% of cases), the side of the lane exit is overwhelmingly to the left (71% compared with 29% to the right), whether the user is initially on a straight section (73% of exits to the left) or on a bend (70% of exits to the left).

These lane exits break down as follows:

- 37% of drivers with driver error, generally progressive (falling asleep, sitting down, various inattentiveness), etc...,
- 63% of drivers with loss of control of the vehicle (loss of dynamic control due to inadequate speed in relation to grip constraints, loss of control following avoidance of or collision with an animal).

This distribution (37% vs 63%) is fairly similar to that of the 2012 ROADSENSE study (35% vs 65%), despite the differences in the sample (environment, severity of accidents, types of road).

With regard to lane departures due to a guidance problem (other than discomfort), it appears that this **problem is present on all networks, but with a greater impact on the RN: 30% of accidents on the RN involved a lane departure due to a guidance problem (other than discomfort), compared with 20% on the RD1 and 18% on the RD2.**

It also appears that the majority of drivers :

- Drove in a straight line (55% of cases, and 180 drivers),
- Drove twice as often on right bends (75 drivers involved) as on left bends (39 drivers),
- Made an initial offset to the left (88% of them, and 255 drivers).

There is a clear difference with the ROADSENSE study, which identified 32% of left-hand exits and 68% of right-hand exits, but on a different study perimeter (all networks).

According to the FLAM database for 2015, the 255 accidents involving first offsets to the left represent more than 15% of all fatal accidents on the two-way network outside built-up areas.

In terms of secondary safety, accidents (excluding interurban accidents) involving no third party and hitting an aggravating obstacle accounted for 29% of all accidents on the two-way network outside built-up areas, or 497 cases. In 1 case out of 2, the obstacle hit was a tree.

The distance of the obstacles from the edge of the carriageway was estimated. If only the aggravating obstacles with a known distance are taken into account, it can be seen that :

- 60% were less than 2 m away.
- 83% were less than 4 m away.

These figures are fairly close to the statistics given in the TOL (Treatment of Lateral Obstacles) technical guide (43% of obstacles less than 2 metres and 78% of obstacles less than 4 metres).

It also emerges that most accidents involving obstacles (other than on interurban roads, with no third parties involved) take place on bends (53% of cases), particularly on the less structuring network: 58% on the RD2, compared with 49% on the RD1, and 39% on the RN.

3.2.2 Factors of accidents

Human factors account for the vast majority (92%) of fatal accidents on dual carriageways outside built-up areas. Inappropriate or excessive speed (38%) and drunk driving (31%) are the main factors.

The Infrastructure factors are divided in a similar way between triggering factors (33%) and aggravating factors (36%).

The main factors linked to Infrastructure or traffic conditions are :

- Visibility defects, mainly caused by fixed masks (7%) linked to the environment (4%) and the profile or layout of the road (2%),
- Poorly legible infrastructure that does not allow users to adapt their behavior: poor legibility of curves (4%), intersections (2%),
- Inadequacy of the infrastructure to cope with dynamic constraints: grip problems on wet roads (7%), poor road condition in 2% of accidents,
- Recovery or avoidance possibilities limited by insufficient shoulder widths (8%) or by the presence of an obstacle on the shoulder (3%),
- Collision with an aggravating fixed obstacle on the shoulder is present in 35% of accidents.

3.2.3 Accidents by type of network

By analysing the FLAM database, we were able to determine the accident figures for each type of two-way network. These were classified according to the same classification as that carried out by the ONISR in 2018, namely:

- The main departmental network [RD1]: sums of categories 1 and 2 (defined by the managers) if the proportion of linear category 1 and 2 is less than 42%, otherwise it is category 1 only.
- The non-main departmental network [RD2]: the rest of the departmental network,
- RN and VC are defined by the status of the road.

Departmental roads [RD2] appear to account **for the highest proportion of fatal accidents, with 877 accidents, or 52% of all accidents on the two-way network outside built-up areas**. Departmental roads [RD1] accounted for 570 accidents, or 34% of the total, followed by trunk roads (144 accidents, or 9%) and local roads (140 accidents, or 8%).

Overall, there were 702 accidents on the main road network (RN+RD1), or 42% of all accidents on the two-way network outside built-up areas.

5- COURSES OF ACTION

4.1 Infrastructure

- **Install audible warning devices, mainly at the centre of the carriageway,** to limit lane departures due to guidance problems (excluding those involving discomfort). At least 328 fatal accidents occurred in this configuration in 2015, i.e. 19% of all accidents studied. In cases where the information is known, the phenomenon is much more prevalent on the centre of the carriageway (255 accidents: 15%) than on the edge (39 accidents: 2%), and with 34 cases where the direction of offset is unknown. It should be noted that since the FLAM database only includes 97% of all BAAC accidents on this type of network in 2015, the above figures are probably underestimated.
- **Initiate or continue steps to deal with side obstacles**. Priority can be given to obstacles located within 2 metres of the edge of the carriageway, a distance that covers 60% of cases of collisions with aggravating obstacles in accidents (excluding inter-vehicle accidents) without third parties, i.e. at least 270 cases of collisions among the 1,685 accidents studied.

  In relation to the issue of accidents occurring on bends, obstacles on bends need to be given particular attention, since 54% of accidents involving obstacles take place on bends, particularly on the RD2 (58%).
- **Carry out skid resistance measures** to limit loss-of-control accidents in wet weather, an accident factor encountered 121 times out of the 1,685 accidents studied. Routes with curves could be treated as a priority. If the coefficients turn out to be low, it may be possible to propose lowering the speed limit while waiting for the surface course to be repaired.
- **Limit the presence of masks to visibility**, in particular fixed masks, which were a factor in 115 of the 1,685 accidents studied.
- **Pay particular attention to the legibility of the road**, especially curves, which were a factor in 60 of the 1,685 accidents studied. Tight bends after a long straight stretch of road are more of an issue for motorbikes. To this end, the ALERTINFRA method and the principles of signposting bends should be applied more systematically in practice.
- **Check that sections with authorised overtaking offer good visibility conditions.** Overtaking accidents account for 13% of all accidents on the main network, and 11% on the secondary network.

It would be worthwhile limiting overtaking opportunities upstream of junctions with high levels of left-turn traffic, which presupposes an improvement in the current level of traffic knowledge.

- **Step up the policy of creating cycle routes or facilities on the secondary network**, which accounts for 61% of accidents involving cyclists, i.e. 43 cases.

4.2 Doctrine technical

- Take into account the knowledge elements put forward in this document to guide the methodology to be implemented for road infrastructure safety management (European directive) for the RN's two-way roads and to adapt it to the main RDs managed by local authorities.
- Take account of the information provided in this document when considering the distribution of the cross-section of two-way roads, in particular by reducing lane widths in favour of the recovery zone so as not to reduce the safety of road users.
- Take account of the knowledge highlighted in this document when amending the TOL guide in the future. This consideration should lead to different solutions being proposed for different types of network, which do not present the same challenges (closer obstacles on the secondary network),
- Incorporate the bicycle statistics from this study into the next update of the ARP guide, in order to take greater account of cycling issues.
- More broadly, technical doctrine should take into account the diversity of issues associated with the diversity of two-way networks, which calls for appropriate responses. To do this, we need to improve our knowledge of usage.

4.3 Users

- Check speeds, blood alcohol levels (particularly at night and off the main road network) and drug use.
- Carry out information/communication campaigns on the risks associated with fatigue and inattention, which are more prevalent on the main RN and RD networks.
- Step up communication on the need to share the road in order to take account of the presence of vulnerable road users, particularly at junctions, taking account in particular of the increase in cycling (link with cycling master plan).

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