



Sauver des vies par le retour d'analyse sur incidents



# USING EVENT DATA RECORDER TO DETECT ROAD INFRASTRUCTURE FAILURES FROM A SAFETY POINT OF VIEW

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# General context

## ■ Crash-data analysis are very helpful to :

- Define crash typology
- Acquire operational knowledge

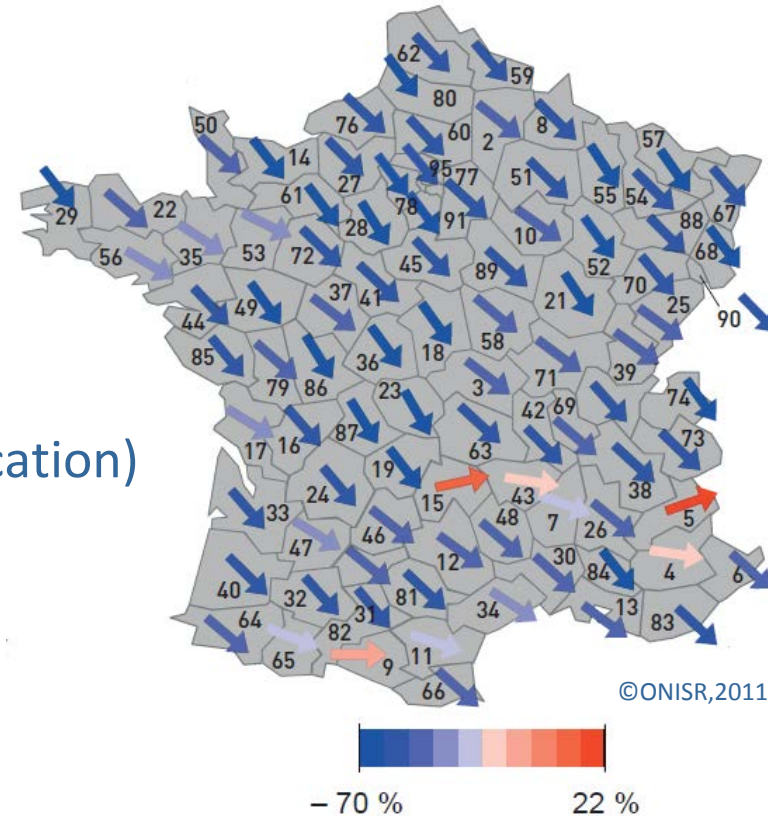
## ■ But

- Less & Less accidents
- More and more diffuse (black-spot eradication)

## ■ Difficulties for local road authorities

- Conduct efficient local road safety policy
- Set priorities in their intervention strategy

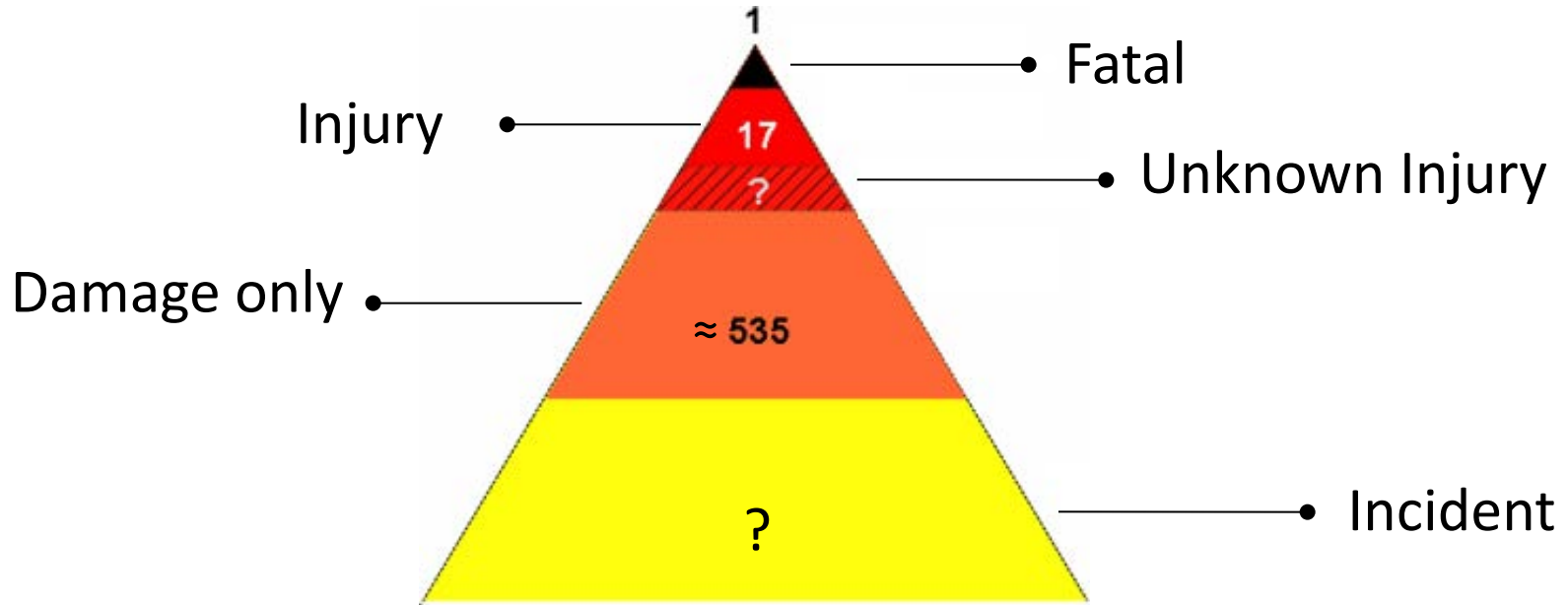
Road fatalities evolution (%)  
2001-2011



©ONISR,2011

# General context

## ■ Enrich accident data with other data



## ■ Incident ≈ miss-crash, near-crash

- risky driving situation which is out, or at the limit, of driver's control but that will not lead necessarily to any shock.



# S\_VRAI project



- Main objectives of the project
  - Evaluate the contribution of incident analysis to **diagnose road infrastructure** and drivers behaviour
  - Study the road safety impact of the presence of Event Data Recorder in a vehicle and evaluate their acceptability
- How ?
  - Equip public vehicle fleets with Event Data Recorders
  - Collect incident data
  - Develop tools adapted to their analysis
- Constraint :
  - Ensure the legality of the experimentation
- Financed by French road traffic and safety Directorate



# EDR : EMMA2



- Developed by IFSTTAR
- Acquires data :
  - Internal sensors (accelerometers, gyrometers, GPS,...)
  - Available information on vehicle CAN BUS
- Send (and receive) data using GSM network
- Note : No video



# EMMA2 : Process



Record data continuously

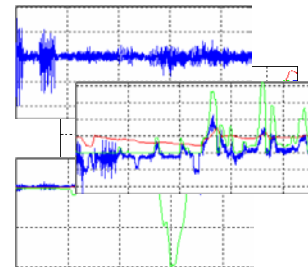
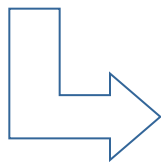
Acc. and jerk > thresholds

Event

Send data  
(30s before and 15s after the trigger)

Itineraries

Secured transmission



Semi-automatic treatments

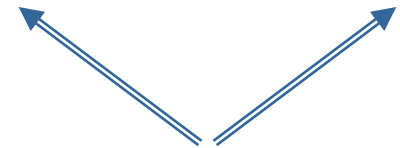


Database



Incident

Simple events



# EDR's dissemination

- 51 equipped vehicles
  - 5 public vehicle fleets
  - 3 geographical areas

- Data collection

- Aug. 2012/ Aug. 2013
- 1 year

- 221 volunteers

- For legal reasons, volunteers have to opt-in by pushing a button to activate the EDR





# Data collected at France level

## ■ Incidents

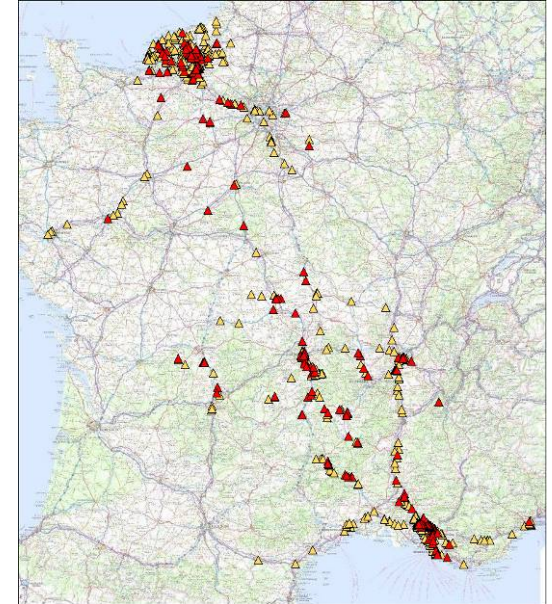
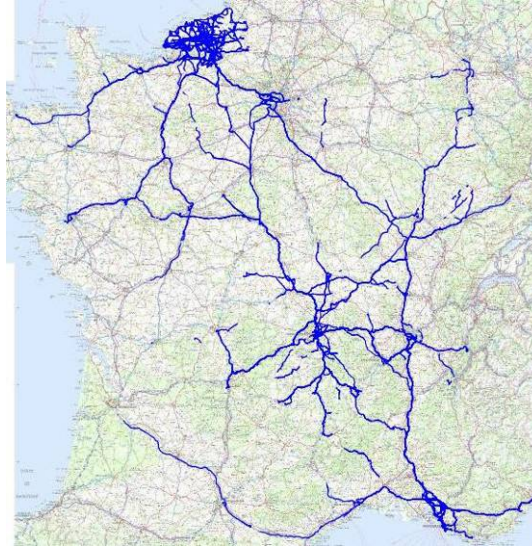
- 339 incidents

## ■ Travels

- 3052 itineraries
- 116 000 km
- 1507 hours of driving

## ■ Incident rate

- 1 incident every 340 km
- 1 incident every 5 hours of driving

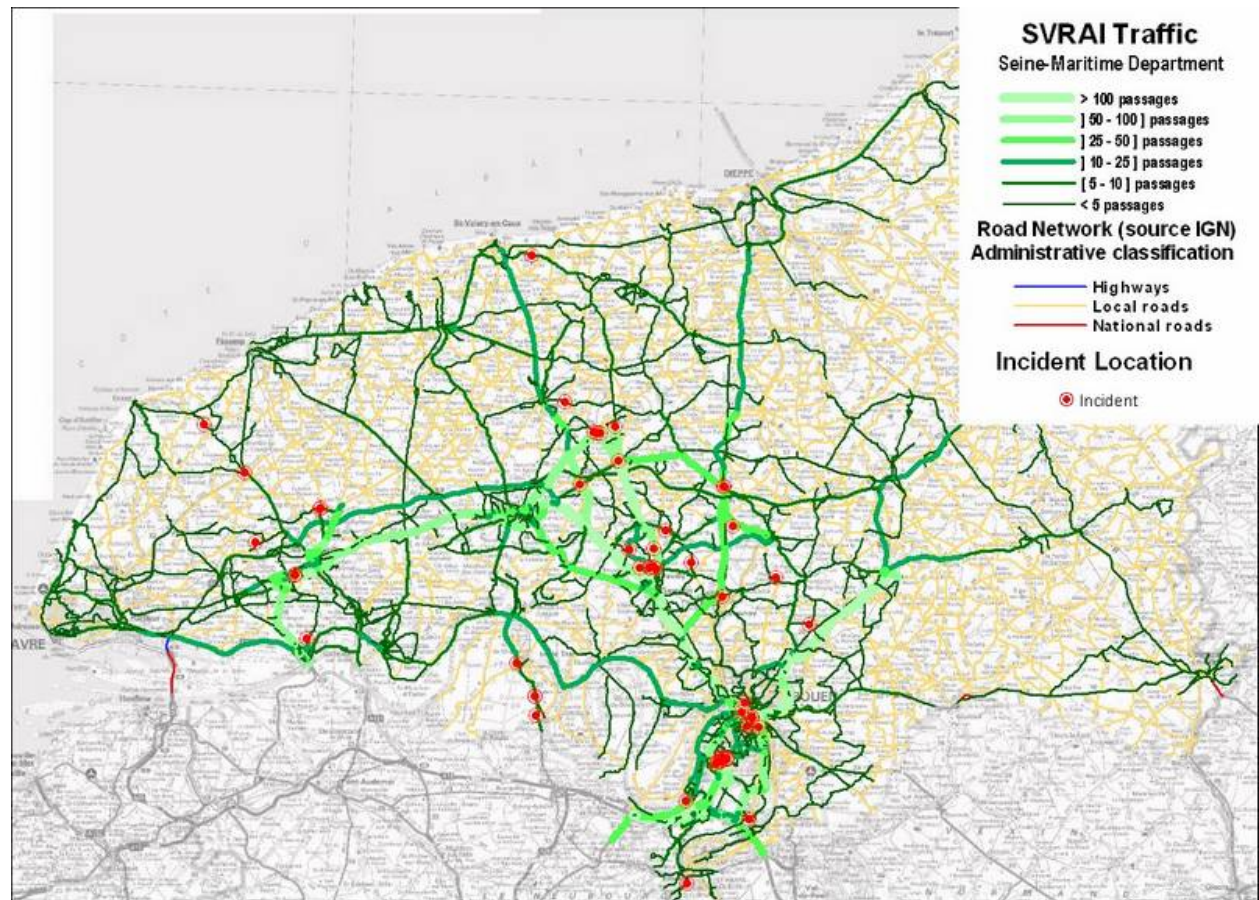




# Data collected at local level

## ■ Seine-Maritime Department

- 24 vehicles
- 35 000 km
- 62 incidents



Maps derived from map-matching process of all itineraries

# Road network circulation

- 22% of all the network was travelled at least one time by an equipped vehicle

Administrative road classification	Length of the network (km)	Network travelled by equipped vehicle (%)
<b>Highways</b>	247	84%
<b>National roads</b>	124	93%
<b>Local Roads</b>	6374	37%
<b>Other Roads (urban roads...)</b>	8074	8%
<b>Total</b>	<b>14819</b>	<b>22.5%</b>

# Incident / Network type

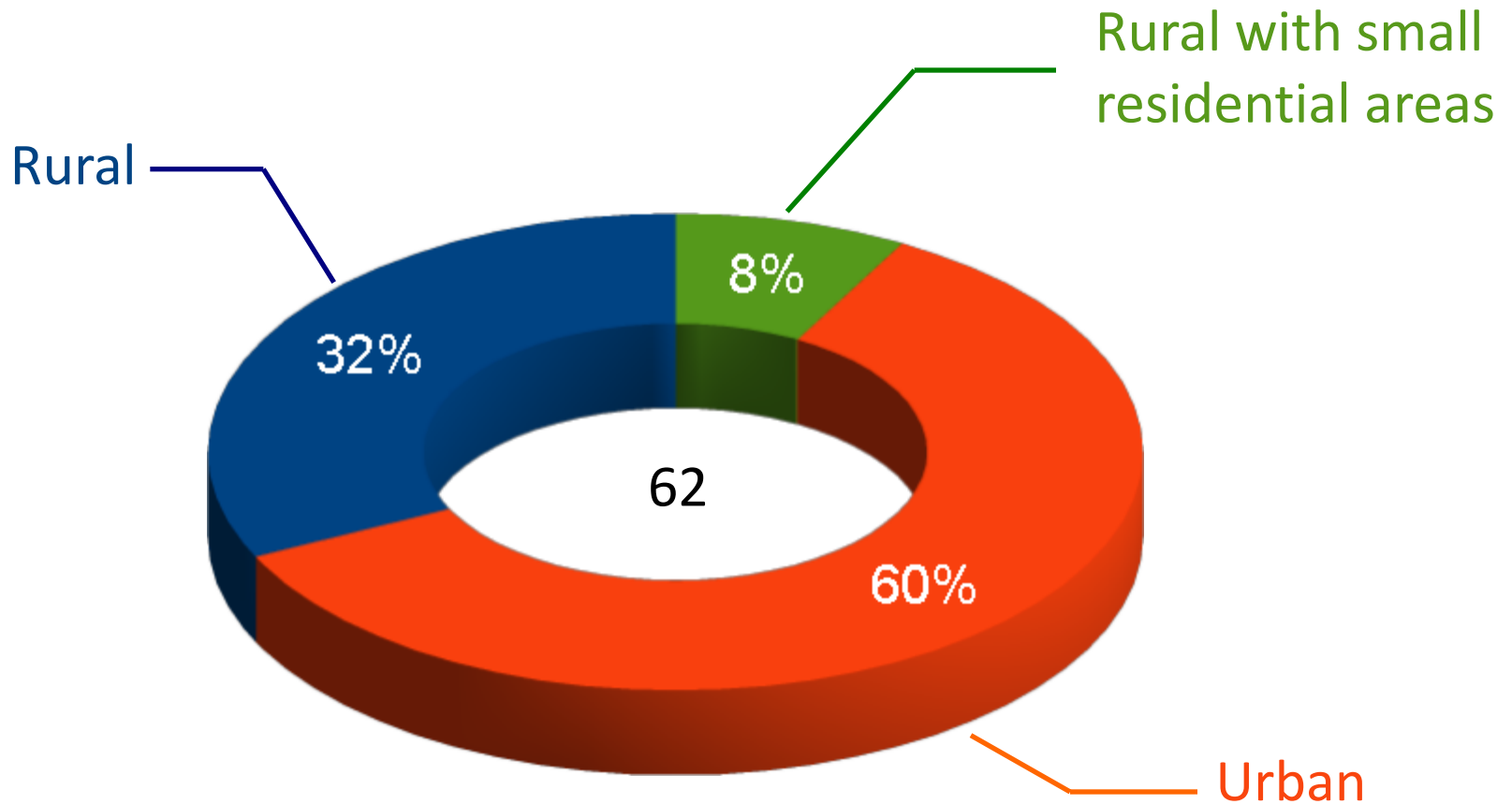
- 98% of incidents outside Highways and National roads

Administrative road classification	Number of incidents	Distance travelled (km)	Incident rate (travelled km / incident)
Highways <sup>1</sup>	1	7 429	7 429
National roads	0	3 373	-
Local Roads	34	20 250	596
Other Roads (communal roads...)	27	3 446	128
<b>Total</b>	<b>62</b>	<b>34 500</b>	<b>556</b>

<sup>1</sup> on an exit ramp

# Incident / Environment

- Majority of incidents occurred in urban environment



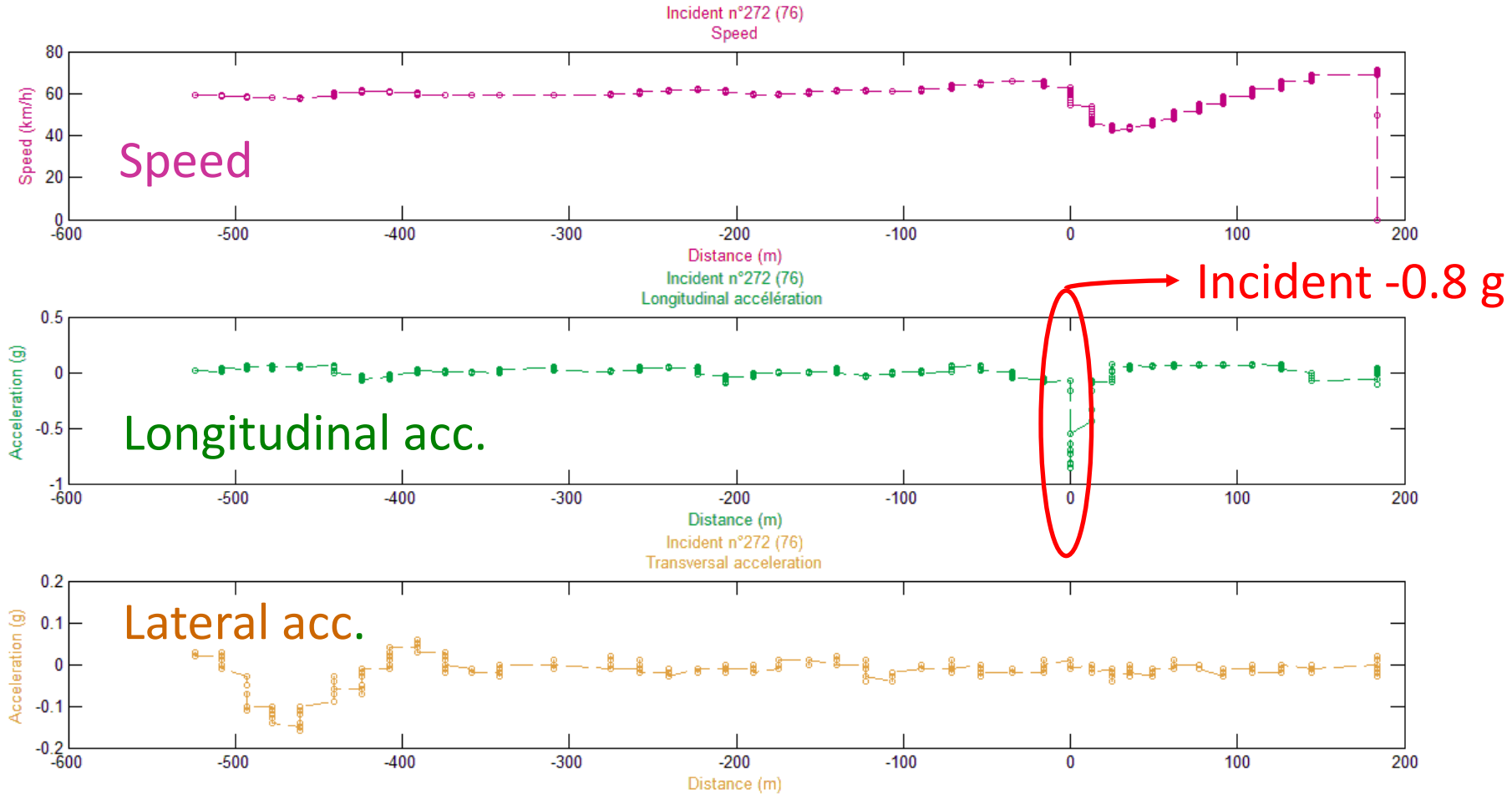


# Incidents and Infrastructure



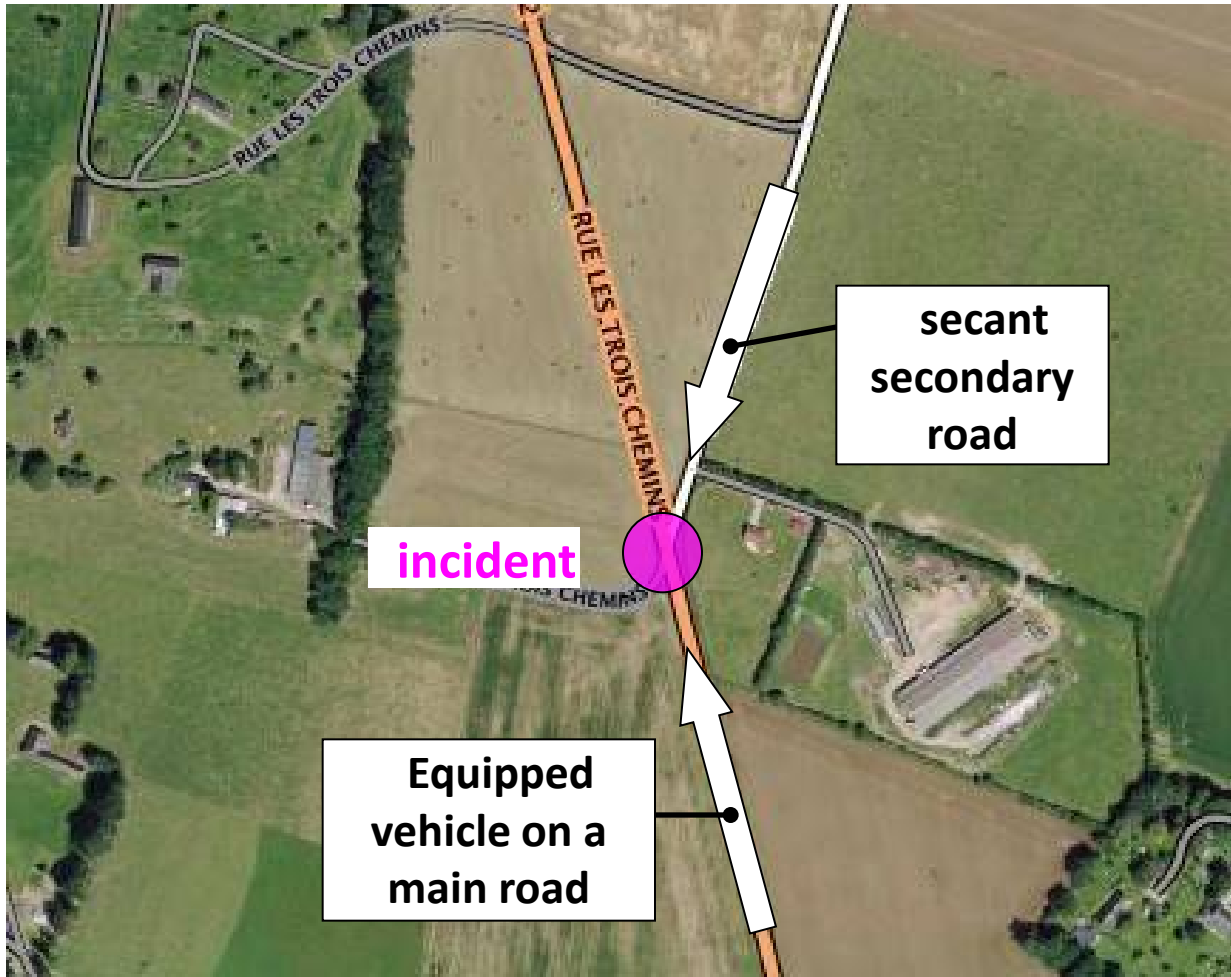
- Infrastructure defects/failures at the origin of these incidents ?
- Methodology
  - Incident data extraction
  - Safety visit on each incident location
  - Inspection rapport
  - Conclusion about the role of infrastructure
    - **YES** : Infrastructure defects or failures were certainly at incident's origin
    - **NO** : No major problem identified, infrastructure cannot be incriminated
    - **UNDETERMINED** : It was not possible to determine if infrastructure has played a role or not

# Example : EDR's data





# Example : Incident location





# Safety visit



- Views from the main road



- Facts

- Intersection on the top of the hill **reducing its visibility**



# Safety visit



## ■ Views from the secant road



## ■ Facts

- Second road is not perpendicular to the main one
- Several roadside features mask the visibility
- **Drivers is forced to encroach on the main road**



# Conclusions of the safety visit

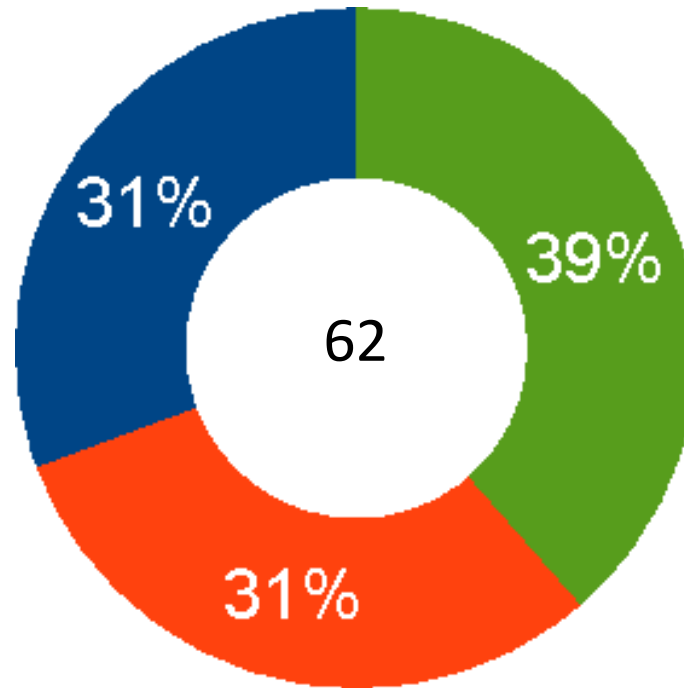


- Driver on the main road was probably surprised by vehicle located on the secant road
- Several infrastructure elements significantly decrease mutual visibility
- **Incident occurrence is explained by Infrastructure defects/failures**

# Has infrastructure defects play a role ?

## Global results

- Same proportion of **Yes** and **No**
- Undetermined in 4/10 cases



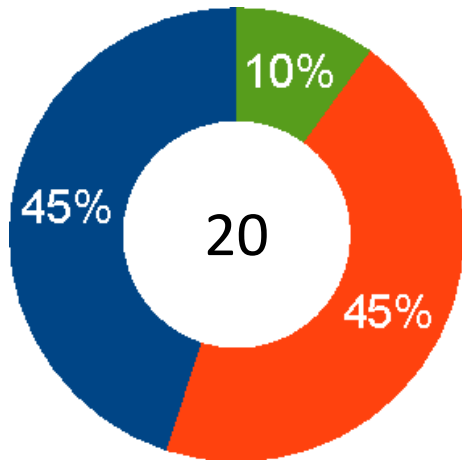
■ Yes ■ No ■ Undetermined



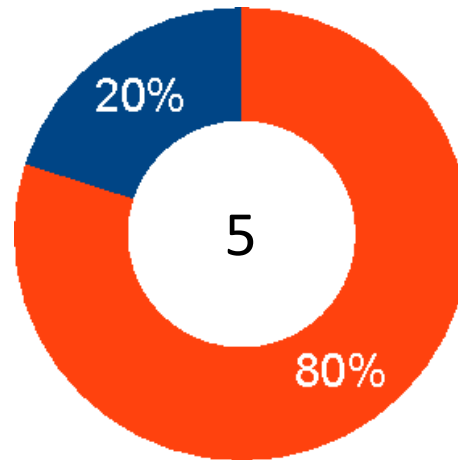
# By type of environment



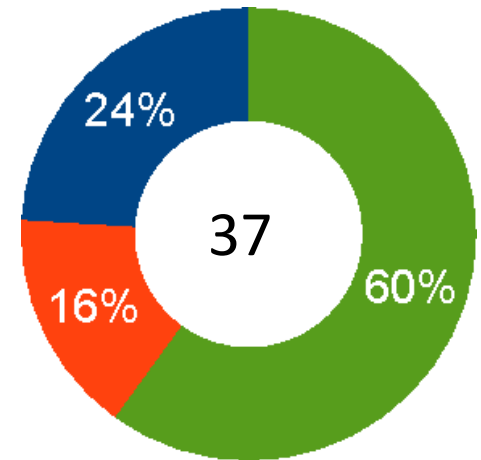
- Infrastructure failure is involved in almost 50% of the incidents in rural areas
- Majority of undetermined situations in urban areas



Rural



Rural with residential areas

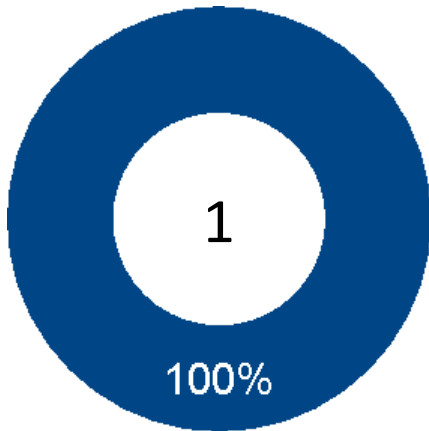


Urban



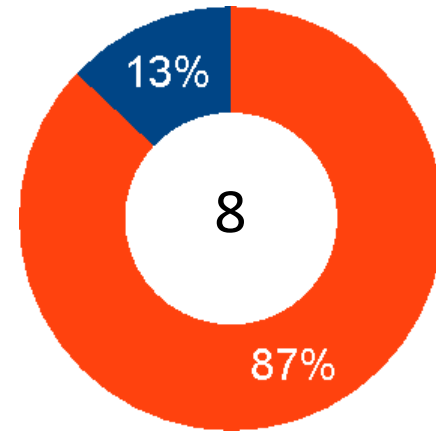


# By road category (rural env.)

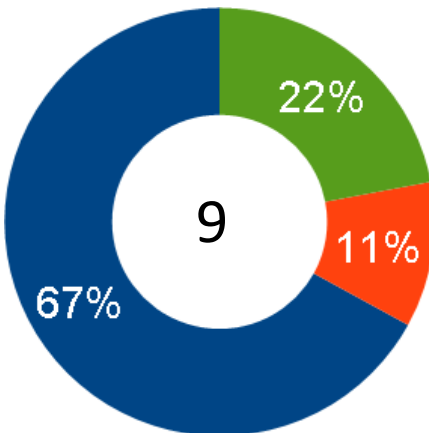


Highways & National road

Main network

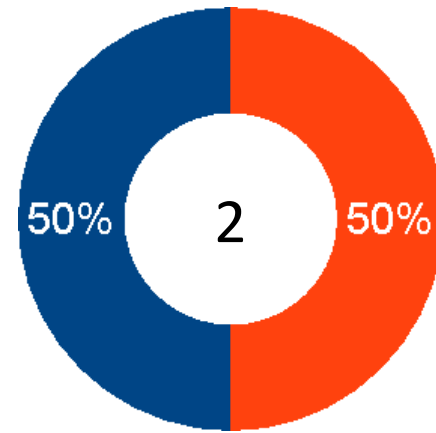


Main local roads



Minor local roads

Secondary network



Communal roads





# Synthesis of the results



- Few vehicles covered interesting proportion of the Département road network.
- Incident Location
  - Incidents occur mainly on the secondary network
  - Majority of them happens in urban areas
- Role of infrastructure failures/defects on incident
  - Difficult to evaluate in urban areas (lack of contextual information)
  - Depends on the road category in rural environment
    - Up to 66% on minor local roads

# Point of view of the local road authority

- Great interest for the results
- Limited knowledge on their secondary network
  - EDR : A new tool to inspect this network at affordable cost
- The detected defects were not identified previously
  - EDR : New source of information complementary to the existing ones (accident and « road patrol » reports).
- Incident cases could illustrate and highlight potential effects of maintenance failure
  - Incident cases to train staff in charge of road maintenance



# Conclusions



- Collection and analysis of incidents detected by EDR are relevant to assist road authorities to diagnose their road network
- Incident detection cannot replace visit and human road safety expertise but allows to identify road sections on which road manager should pay specific attention.
- Integration of video-camera as well as further new developments on incident detection and classification could lead to offer a more reliable and relevant assistance to road managers. The work is under progress....