European University Institute
ROBERT SCHUMAN CENTRE FOR ADVANCED STUDIES
FSR TRANSPORT
Florence School of Regulation

Executive Seminar:
Speed and Speed Management in Road Safety Policy
08 October 2020

Measuring Speeds

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Presentation Outline

1. Introduction
2. Why, What, When, Where and How to Measure
3. Data supported Measures against speeding
4. Future Challenges

Introduction

Speed – The major crash cause

Speed affects:

- the risk of being involved in an accident,
- the severity of an accident

"The higher the speed, the higher the accident risk and the more severe the accident consequences"

- Speed has been found to be a major contributory factor in around:
  - 10% of all accidents and
  - 30% of the fatal accidents

Speed Perception

- Both the Authorities and the road users underestimate largely the role of speed in road accidents
  - Focus is given on positive effects of speed on travel time instead of its negative effects on safety and environment

- In road safety we work mostly in blind, as we have very little knowledge about the frequency of speeding and its real role on accident occurrence and severity

- Thus, road traffic safety measures are largely under-designed and even less accepted by the population

Need for Speed Monitoring

- Absence of speeding monitoring and accountability (both by the users and the Authorities) limits seriously road safety performance
- Decision making in road safety management is highly dependent on appropriate and quality data
- Different purposes of speed data collection imply different data and hence different methods of collection

Why, What, When, Where and How to Measure

Speed measuring techniques (1/3)

Fixed cameras

- The method involves recording the distance moved by a vehicle in a short period, then computing the speed.

Mobile cameras

- They may be hand-held, tripod mounted, or vehicle-mounted.
- Laser Guns are also included, which rely on the measurement of the round-trip time of the infrared light beam to reach a vehicle and be reflected back

- Fixed cameras have a larger safety effect per location, whereas hidden mobile cameras have a larger area of influence.

Speed measuring techniques (2/3)

Traffic counts

- Measures the passage time of a vehicle between two detectors, a measured distance apart.
- Detectors can be pairs of pneumatic tubes, tribo- and piezo-electric cables, switch tapes, inductive loops and photo-electric or electro-magnetic beams, but also traffic cameras

Section control

- Estimates the average speed over a road section, by automatically identifying each vehicle when entering and leaving

Speed measuring techniques (3/3)

Smartphones / OBD

- Sensors on smartphones and/or vehicles are fitted with receiver units that pick up signals from the Global Positioning System (GPS) satellite network.

In-depth investigation

- Vehicle crash profile measurements for calculating crash energy and speed change at impact.
- Among data collected on the site of accident are initial speed and collision speed

Driver perception/attitudes

- Acceptability of driving over the speed limits
- Self-declared speeding

Speed measurement types

- Vehicle speed:
  The instantaneous speed of the vehicle
- Average speed of vehicle(s) at a specific point in time
  - on a road axis
  - at a network
- Average speed of vehicles over time:
  - by road type
  - by area type
- Traffic Police collects data on speeding from enforcement controls
- Data on speeding from sample counts are collected for the estimation of Speeding KPIs

Data Sampling

- Sampling - Road type
  (Urban, Interurban, Motorways)
- Sampling - Traffic conditions
  (junctions or not, weather conditions, week/weekend days, day/night)
- Sampling - Vehicle type
  (Passenger cars, Motorcycles, Trucks, Cycles (incl. e-scoters and e-cycles))
- Sampling - Driver type
  (Driver Age, Driver Gender, Distraction, Drink-and-drive, trip purpose)

Data supported Measures against speeding

Data for policy making support

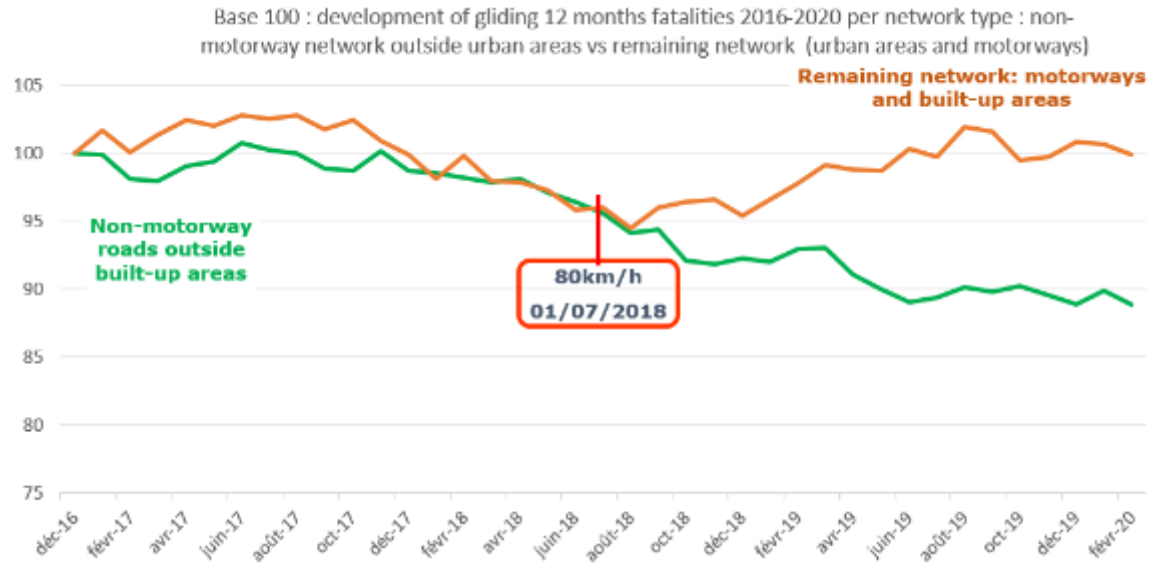
- Policy making support by identifying properly the problem and taking prompt and customized measures

- Measures include road design, engineering measures, legislative initiatives, etc.
  - by Road Authorities (public and private)
  - by Ministries of Transport, Health, Education

The example of reducing speed limits in France

- Reduction of speed limits on rural roads from 90 km/h to 80 km/h since 01/07/2018

- **Detailed data comparisons** and analyses (crashes, exposure, speeding) led to significant conclusions:
  - fatalities on rural roads decreased, while fatalities on the remaining road network increased
  - overall road safety performance on rural roads improved more compared to the remaining road network



Evolution of road fatalities by month and type of road network, France, 2016-2020 (100=December 2016) (*Source: ONISR, 2020)*

Predicting & benchmarking network's risk

- Future short- and long-term predictions in time and space using spatial econometric models
  - e.g. Spatial error model, Spatial durbin model
- Benchmarking and efficiency measurement of road risk using benchmarking techniques (e.g. stochastic frontier analysis and data envelopment analysis)
  - for all existing levels (micro/ meso/ macro)
  - for all different dimensions (time/ space)

Analysis and feedback on driver speeding

- Continuous driver support with aim to improve driver behavior and develop better road safety culture at all road users
- Real-time collection from smartphone sensors and processing of speeding data to create microscopic driving behaviour metrics and KPIs to be used in:
  - Clustering algorithms for driving pattern identification
  - Classification techniques for pattern recognition of the dynamic driving behavior
- Develop recommendation systems algorithms to provide feedback to drivers on their behaviour
  - e.g. Knowledge graphs per trop, at all trips, etc.

Measuring driver behaviour – BeSmart project

- Assessment and improvement of speeding behaviour and safety of drivers in every day trips
- Development of measures by means of smartphone applications and a web-platform, allowing to inform, notify, motivate and train the drivers
- Personalised speeding feedback is communicated to drivers, allowing them to identify their critical deficits or unsafe behaviours
- Between the two phases of the experiment, speeding by car drivers was reduced by 28,39%

More info at: https://besmart-project.gr/

Data for enforcement and campaigns

- Enforcement
  - Design of an efficient road traffic enforcement plan with specific targets
  - Consideration of targeted groups of road users
  - Choice of enforcement operations location and time
  - Set-up and execution of police checks

- Publicity campaigns
  - Speed awareness campaigns by public and private organizations
  - Focused on specific driver groups or aiming at their social surroundings
  - Campaigns are more effective when combined with enforcement

Data for the vehicle industry

- In-vehicle technology identifies speed limits, advises driver and/or limits engine power

- Types of Intelligent Speed Adaptation (ISA):
  - informative: giving information to the driver
  - voluntary supportive: driver can choose to set the maximum speed
  - mandatory supportive – intervenes at all times when the vehicle exceeds the speed limit

- New technologies are also based on the possibilities of vehicle-roadside communication
- Dynamic speed limits take account of the real time traffic, road and weather conditions, reflecting better the safe speed

Future Challenges

Future Perspectives

- Speed is highly misunderstood by all and this must change

- There is great need for:
  - more data and knowledge
  - better exploitation of current and future data
  - broader geographical coverage

- Data focus on:
  - more accurate road accident data
  - exposure data and performance indicators
  - measures and policies effectiveness evaluation

Road Safety Technology Perspectives

- Digitalization (AI, ML, etc.) opens great new data possibilities for more efficient speed management:
  - road user support and guidance
  - evidence based public and private road safety decision making at all levels

- New great potential for seamless data driven procedures from safety problems identification to selection and implementation of optimal solutions

- New increased net present value of road safety data, available for (real-time) early problem detection and prompt and customized decision support

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