BRSI

What do we learn from GPS-data on road speeds?

Behavioural measurement: speed outside urban areas 2015

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Trotta M. (2016) *Que nous apprennent les données GPS sur la vitesse sur nos routes ? Mesure de comportement vitesse hors agglomération 2015.* Bruxelles, Belgique : Institut Belge pour la Sécurité Routière – Centre de Connaissance

Summary

Goal

Excessive or inappropriate speed is a major factor for road unsafety. In order to counteract this dangerous behaviour and assess the effects of the measures put in place, it is important to monitor the driving speeds on the road network.

For more than ten years, the BRSI has been performing measurements on road drivers' speed behaviour. The goal of these measurements is to provide an overview of the driver's free flow speed and monitor its evolution throughout several years. This measurement must give an answer to the following question: do drivers drive globally faster or slower than they did during the previous years and what is the tendency observed since the introduction of the measurement in 2003?

All previous BRSI measurements have one thing in common: they were all carried out by means of devices installed along the roads that were either autonomous (speed cameras) or handled by an observer (radar speed guns). These methods have proved their reliability but have their own drawbacks. In order to obtain data that are sufficiently representative of Belgium as a whole, the speed needs to be measured in a large number of locations (in about 30 per road type), which is costly and requires a lot of logistics. Until now, the measurement campaigns were restricted to about one week of observations for every road segment analysed, which only provides a small time-window. The limitation of traditional techniques for speed measurements (limited number of observation sites, weather conditions impacting on the computation of the indicators, and so on) have led BRSI to consider alternative ways to collect data on road users' speeds. An innovative alternative possibility is offered by floating car data (or FCD). Floating car data refer to vehicle data that may be considered as a representative sample of the whole traffic state (Pfoser, 2008). They include basic data on vehicles such as speed, direction and its position. Furthermore, a temporal record is also associated to this position. In the following of this report, the term "floating car data" refers to the data collected with those onboard positioning devices.

The 2015 indicators are computed for the first time on this data source. This new methodology introduces a break in the computation method compared to the previous speed indicators, which reduces the comparability of the results. However, the use of FCD opens up new perspectives for the future measurements on speeding behaviour. It increases the spatial and temporal representativeness of the indicators. Besides, they should give the opportunity to perform further studies on the profiling of road users and their attitudes with regard to speeding.
The driving speeds are calculated for different speeds regimes and types of vehicles. The present report analyses the regimes outside built-up areas (speed regimes superior or equal to 70 km/h) by distinguishing light vehicles (cars or light vans) from lorries or assimilated vehicles. The speed regimes in built-up areas (30km/h and 50 km/h) were analysed by the radar measurement and are dealt with in the report "Speed(ing) in built-up areas – Results of the BRSI behavioural survey speed in built-up areas in 2015." (Temmerman, 2016).

This report pursues a double goal: clarifying the methodological changes linked to the introduction of a new data source (FCD) for the speed behaviour measurement and presenting the results of the indicators for 2015.

Methodology

The FCD are data collected from « floating » systems of measurement, that is to say vehicles circulating in the traffic flow. By equipping these vehicles with localisation modules (GPS, mobile phone) and communication systems connected to a central system being able to get in touch with tracking vehicles, data on the position and other characteristics of these vehicles can be collected at close intervals (often in real time).

In January 2015, the database included about 450,000 vehicles for the Benelux countries, 200,000 of which regularly circulate in Belgium. 500 locations and four months of observations served for calculating the indicators of 2015. In total, more than 6 million of observations were analysed to build indicators presented in this report. So, thanks to the FCD, the spatial and temporal cover of the speed observations has been improved in comparison with the previous measurements.

The introduction of a new data source has required some methodological adaptations. The first one is the definition of the free flow speed concept. As the distance between two vehicles is not available, the methodology resorts to a probabilistic approach modelling the free flow speeds. The congestions periods are identified by an hourly diminution of the mean speed.

The second one concerns the classification of vehicles. Given the fact that the vehicles' length is no longer available, this classification (performed by Be-Mobile, the data provider) uses a probabilistic approach based on their speed profile. The method makes a distinction between light vehicles and lorries.

The following indicators are calculated: mean speed, the 85 percentile (the V85) of the driving speeds and the percentages of speeding violations for the light vehicles and the lorries for all the following road types: motorways, two-lane roads (120 and 90 km/h), one-lane roads (90 and 70km/h). In order to obtain indicators representative of the population of Belgian drivers as a whole, the ponderation of the mean speed and the V85 takes into account the variability and the traffic volume per study site.

Results – Light vehicles

The mean speeds are superior to the maximum authorized speed for the regimes outside built-up areas: motorways, two-lane roads (90 km/h) and one-lane roads (70km/h).

The V85 are very high for all the speed regimes. The differences between the mean speed and the V85 underline the big variability of the drivers' speeds.

The number of speeding violations in Belgium varies from 30% to 60% according to the speed regime. The two-lane regime (90 km/h) is the one for which we observe the largest share of speeding offences (more than 60%), 40% of which are superior to 10 km/h above the speed limit.

As far as time is concerned, the driving speed of light vehicles is higher during the night and on weekend days. On motorways, speed amounts to 128 km/h during the night. On two-lane roads (90 km/h), it is around 100 km/h with few hourly variations. For one-lane speed regimes (70 and 90 km/h), the speeds are inferior or close to the speed limit during the day. On the contrary, during the night, the mean speeds are above this speed limit.

As far as space is concerned, there are regional differences for light vehicles with higher measurements in the Walloon provinces than in the Flemish provinces excepted for the one-lane speed regime (70km/h).

All the indicators confirm that the two-lane speed regime (90km/h) is the one with which drivers comply the least. These indicators underline the importance of distinguishing the one-lane speed regimes from the two-lane speed regimes in order to calculate the indicators.

Results – Lorries

The lorries' mean speeds are all below the speed limit and do not exceed 90km/h, irrespective of the speed limit.

The V85 are very close to the mean speed for the speed regimes superior or equal to 90 km/h, which shows the efficiency of the speed limiters.

The one-lane 70km/h and 90km/h speed regimes seem to be problematic. During the night, the speeds are superior to the speed limit.

With regard to speed violations, almost one lorry out of four commits a speeding offence and one out of ten commits an excessive speeding offence (more than 10 km/h above the speed limit) for the 70km/h speed regime. For the one-lane 90km/h speed regime, it concerns one lorry out of two with about one out of three committing a serious speeding offence.

Discussion and conclusions

In general, Belgian drivers drive too fast in 2015. The computation of the indicators enables us to identify the most problematic speed regimes as far as non-compliance with the speed limits is concerned. It mainly concerns motorways and two-lane roads (90km/h). These speed regimes present high hourly mean speeds and an alarming number (more than 30% of the observations) of speeding violations of more than 10 km/h.

The 2015 driving speeds are superior to those observed during the previous behavioural measurements. These results should nonetheless be nuanced given the methodological break created by the new data source, i.e. the floating car data. So, the high speed observed can be explained by the modifications of drivers' attitudes but also by modifications in the traffic sampling. However, the 2015 results should be treated with caution. The future searches will try and better understand the origin of the differences observed with the radar measurements.

The ways to influence the driving speeds and their heterogeneity are generally spread over the infrastructural, educational, awareness-raising, enforcement and vehicle adaptations measures. The better results from the neighbouring countries must inspire Belgium in its struggle against speeding.

From a methodological point of view, the 2015 results show that although the FCD are not designed for that purpose, they enable us to calculate the free flow speed indicators in a quite accurately way. They require a certain number of methodological adaptations in order to reckon with their characteristics. In this study, we have adopted a probabilistic approach with the view to identifying the congestion problems (that is to say "speeds that are not free-flow). The future efforts will focus on the validation of this approach and on the differentiation of the speed profiles from different types of users/devices.

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