



18TH ROAD SAFETY CONFERENCE

9th March 2026, Chambéry

Truck interdistanance analysis

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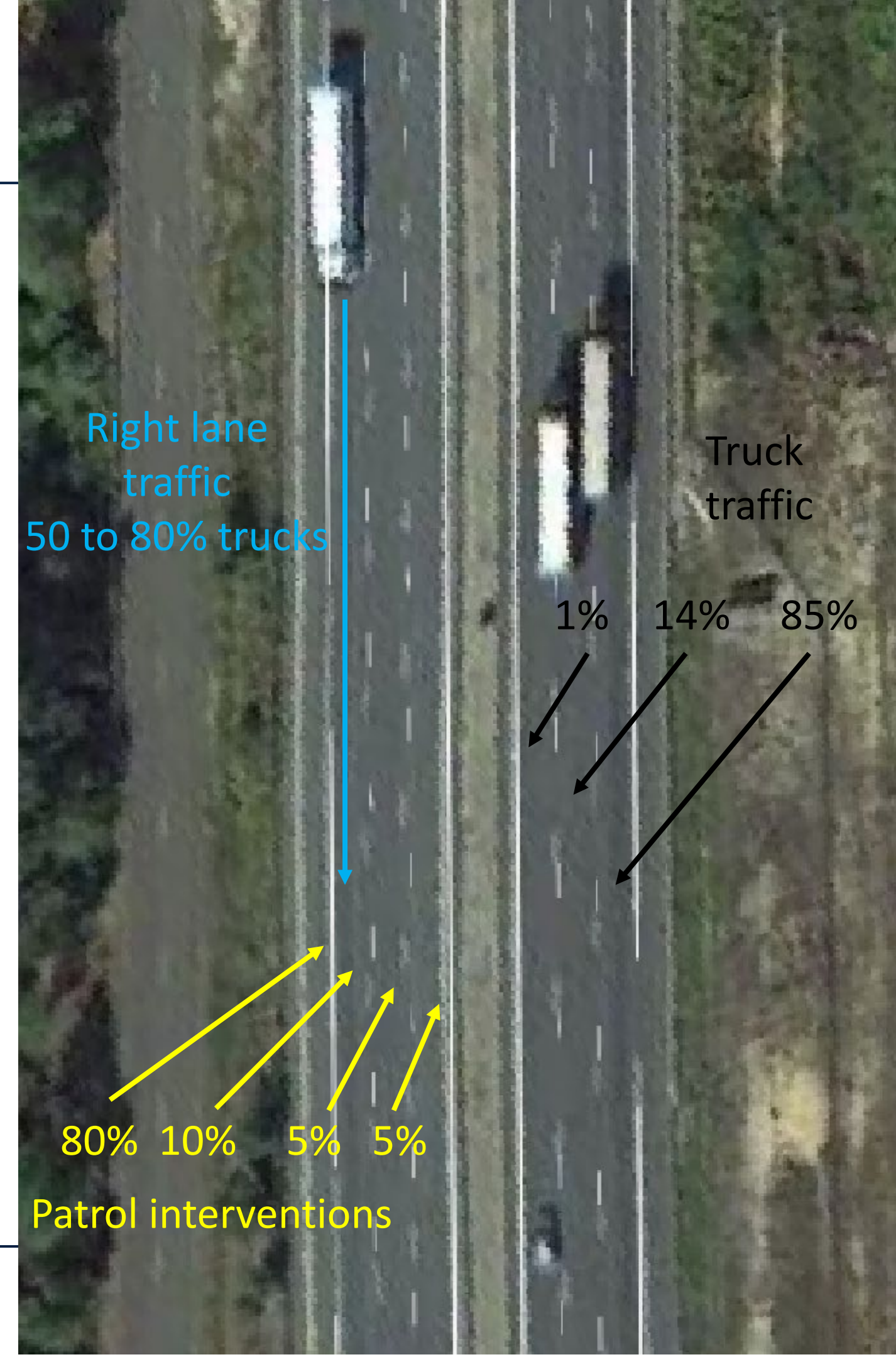
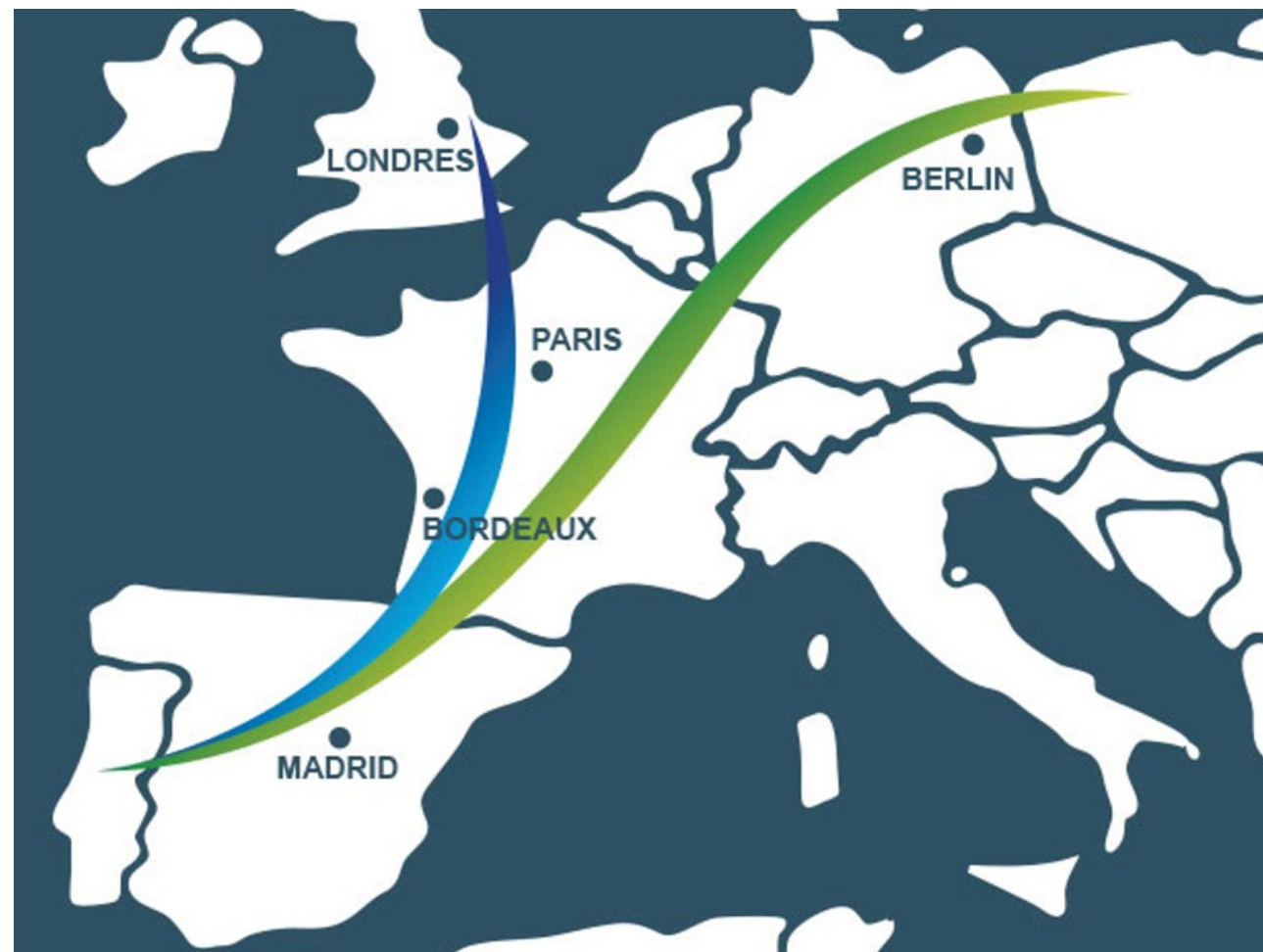


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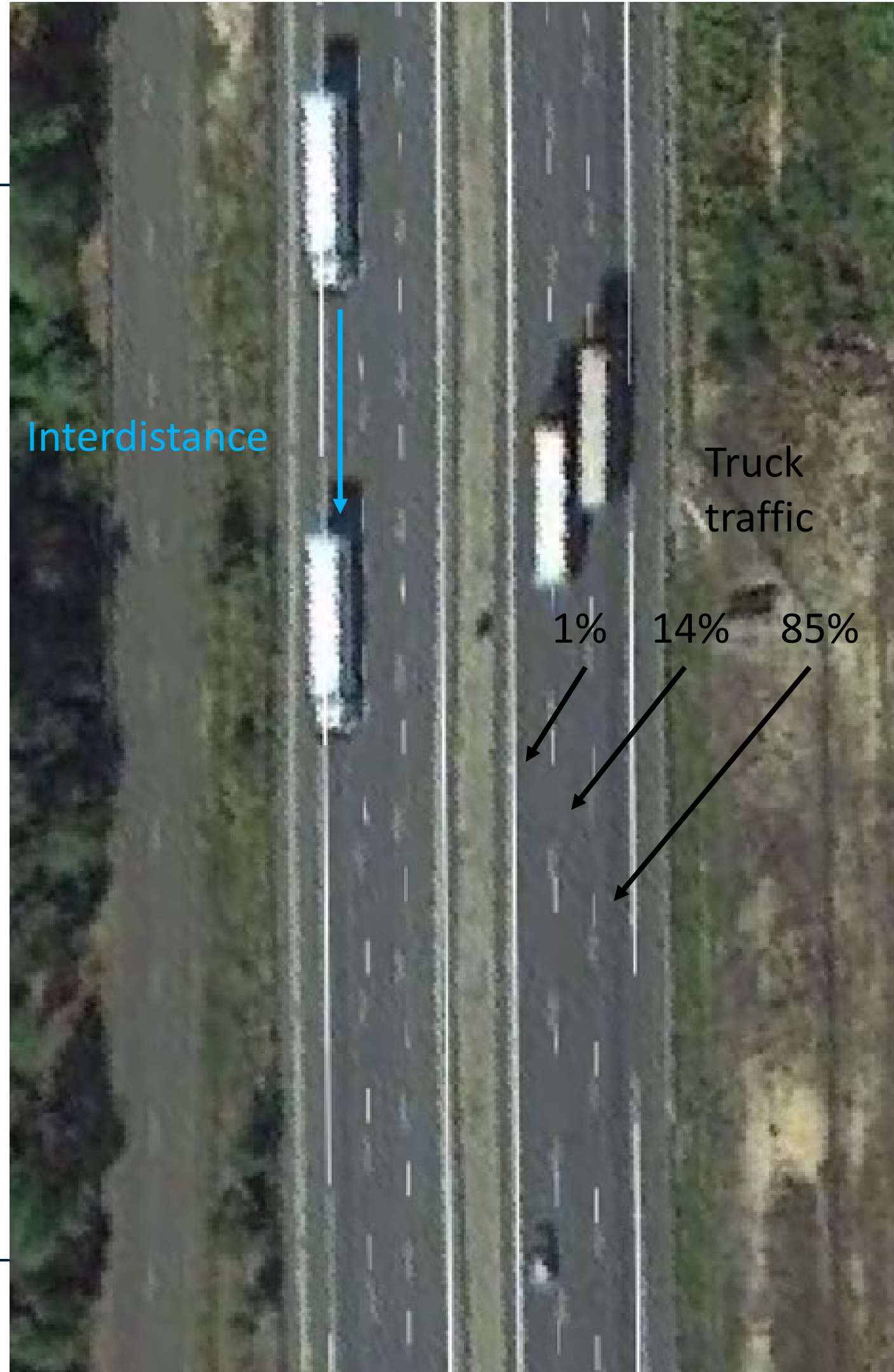
Risk analysis : traffic location A63

- Truck traffic (approx. 10 000/day) is concentrated on the right lane
- As are patrol interventions and many road works



Risk analysis : short spacing

- Interdistances may be too low...



Truck spacing – initial analysis - 2021

Weigh In Motion (WIM) devices give a lot of information, among which very precise timestamp, speed and length information. Those enable a fine spacing and interdistance calculation. In 2020 started with those WIM data a first analysis shared with PIARC, leading to a first publication in Routes & Roads in September 2021.

FEATURES

HGV Spacing and Silhouettes on a Motorway

Olivier Quoy, Atlantes and Bernard Jacob, Université Gustave Eiffel, France
Illustrations © Author

Besides monitoring compliance with regulations on commercial vehicle weight, weigh-in-motion (WIM) devices provide detailed data that are very useful for analysing characteristics of road freight traffic and HGV driver behaviour [1, 2]. This paper presents results on HGV spacing and silhouettes on a French motorway. Detailed, anonymised data from WIM devices on the A63 motorway (illustration 1) were provided by the French Centre of Studies and Expertise on Risks, the Environment, Mobility and Planning (Cerema) to the motorway concession-holder, Atlantes. This work was prompted in part by a preliminary study for planned platooning trials. It provides explanations concerning HGV flow that could help enhance road safety through more detailed analysis of road traffic on the road infrastructure.



Olivier Quoy Bernard Jacob

ANALYSIS OF OBSERVED SPACING

The A63 motorway runs through the French department of «Landes» between Bordeaux and Bayonne as an extension of the A10 motorway (Paris – Bordeaux), and links the western Iberian Peninsula to western and northern Europe. It is used in both directions by approximately 10,000 HGVs every day. WIM devices have been installed in both directions in the right-hand lane, which is most commonly used by HGVs. The data analysed in this paper cover several-month periods between 2016 and 2020 (illustration 1). Full continuity was not possible, since WIM devices were not available during certain periods, partly due to roadworks and partly to WIM data collection problems. However, it was possible to use over 5.5 million records for passing HGVs.

YEAR	DAYS	HGVs*	%
2016	212	1,045	57
2017	202	1,514	83
2018	216	1,592	77
2019	91	730	78
2020	114	667	62

* thousands of HGVs
2nd col: days with valid measurements
3rd col: % HGVs identified

Illustration 1 - Weigh-in-motion (WIM) device and available data on the A63 motorway



Illustration 2 - Sequence of HGVs on the A63

Based on this accurate WIM data, with timestamping to within a hundredth of a second, it was possible to estimate HGV spacing to within less than a metre (0.25m in theory). Accuracy to within a metre is ample for detailed spacing analysis (illustration 2). Accuracy to within 0.25m is useful for silhouette analysis based on overall length and axle spacing. Such accuracy was achieved between 2016 and 2018, and in the final months of 2020.

An analysis of measurements reveals that HGV spacing distribution in the slow lane fits a lognormal curve (illustrations 3a and b), as suggested by [3, 4 and 5]. Data from 2016 to 2020 and for both directions (southbound to Spain and northbound to northern and western Europe) were analysed and show the same distribution patterns, with parameters similar between years, although slightly different between day and night. By day and night, the mode is close to 50m, which is the mandatory spacing.

FEATURES

HGV Spacing and Silhouettes on a Motorway

The daytime mean is between 450 and 500m, rising to approximately 3,000m by night. From 2017 onwards, a small peak occurs at 50m on the X axis (illustration 3c). Its amplitude (height) increases year-on-year.

The non-compliance rate (under 50m spacing) tends to fall from 2017 onwards, from a mean value of almost 12% to less than 8% (day and night), with approximately 5% variation between night and day (illustration 3d). The same trend is observed for very low spacing under 25m, which fell from a mean value of 4.7% to 1.7%, with variations of 1.5% to 2% between day and night. The variation between day and night is explained by HGV drivers' increased risk perception and lower visual distance perception at night, prompting them to maintain safer distances. Moreover, traffic flow is 5 times lower by night, although the motorway is never congested.

This HGV spacing analysis reveals an improvement in compliance with the minimum mandatory value as well as an emerging HGV sample that maintains a distance of exactly 50m (peak), which is estimated at approximately 0.05% of the total number of HGVs in 2017, 0.1% in 2018 and 0.2% in 2020. This is due to increased use of advanced driving assistance systems and particularly cruise control systems. This growing HGV sample that maintains a distance of 50m may reveal increasing use of speed regulators adjusting spacing to the mandatory

value. This helps improve road safety and may pave the way to partially autonomous driving systems enabling platooning, where spacing is reduced legally and in a controlled manner.

SILHOUETTE AND LIFTED AXLE ANALYSIS

WIM data are primarily used for monitoring compliance with weight requirements and monitoring pavement loading. They therefore help ensure responsible freight transport and sustainable asset management. HGV weight limits are mainly based on vehicles' number of axles. In order to detect suspected overloading and thus trigger alerts, and, where necessary, perform on-site inspections, accurate knowledge of the number of axles on each HGV is therefore required. Moreover, the silhouette, which is essentially defined by the number of axles and axle spacing, is used to classify vehicles (approximately sixty classes in France) and partly to determine transport type, and where possible, the type of freight transported. Finally, most incidents involving HGVs on the A63 motorway are due to punctures or blowouts (61%) caused by wear and tear.

However, widespread use of liftable axles aimed at reducing fuel consumption by limiting friction and saving tyres by reducing their individual mileage causes errors

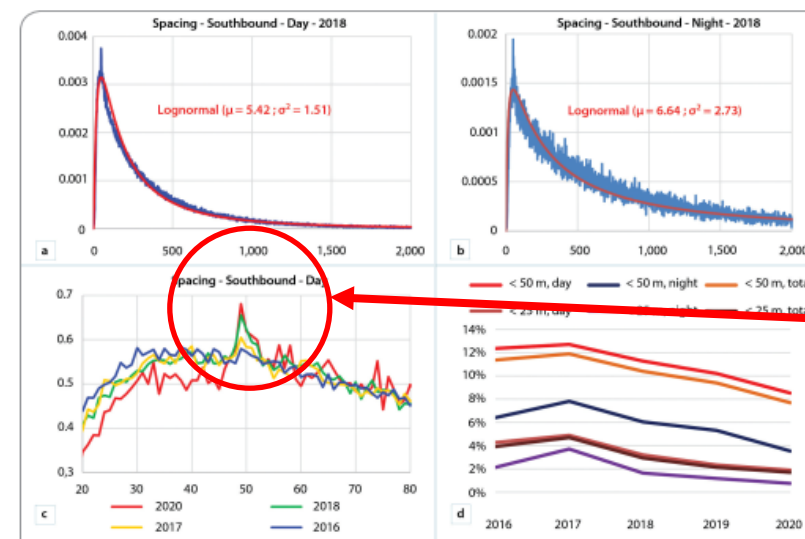


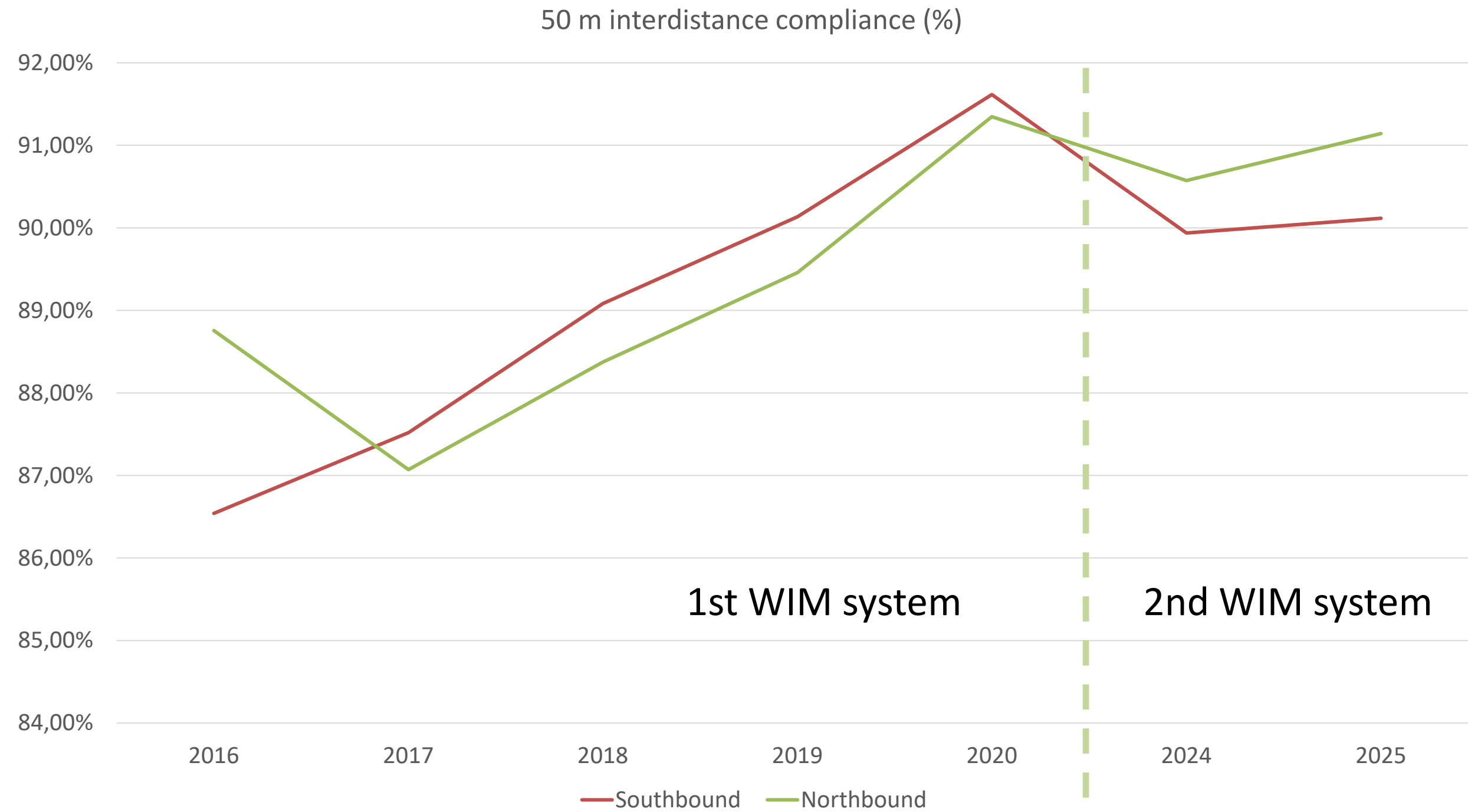
Illustration 3 - (a) and (b) HGV spacing distribution (A63, slow lane, southbound, day and night, 2018). (c) Peak occurring at 50m, (d) Non-compliant spacing rate



The interesting and surprising outcome was that when observing spacing distance distribution, a peak seemed to rise for 50m exactly...

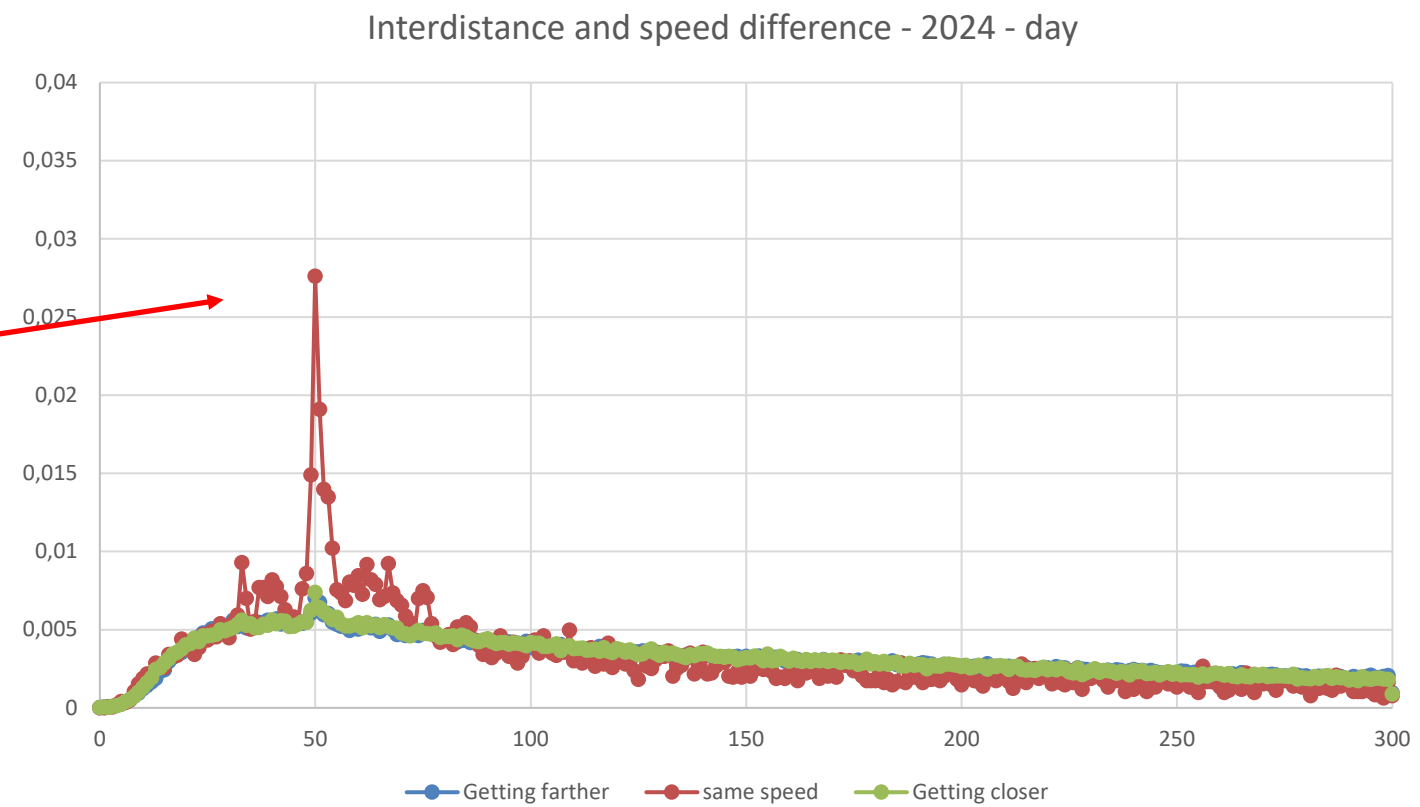
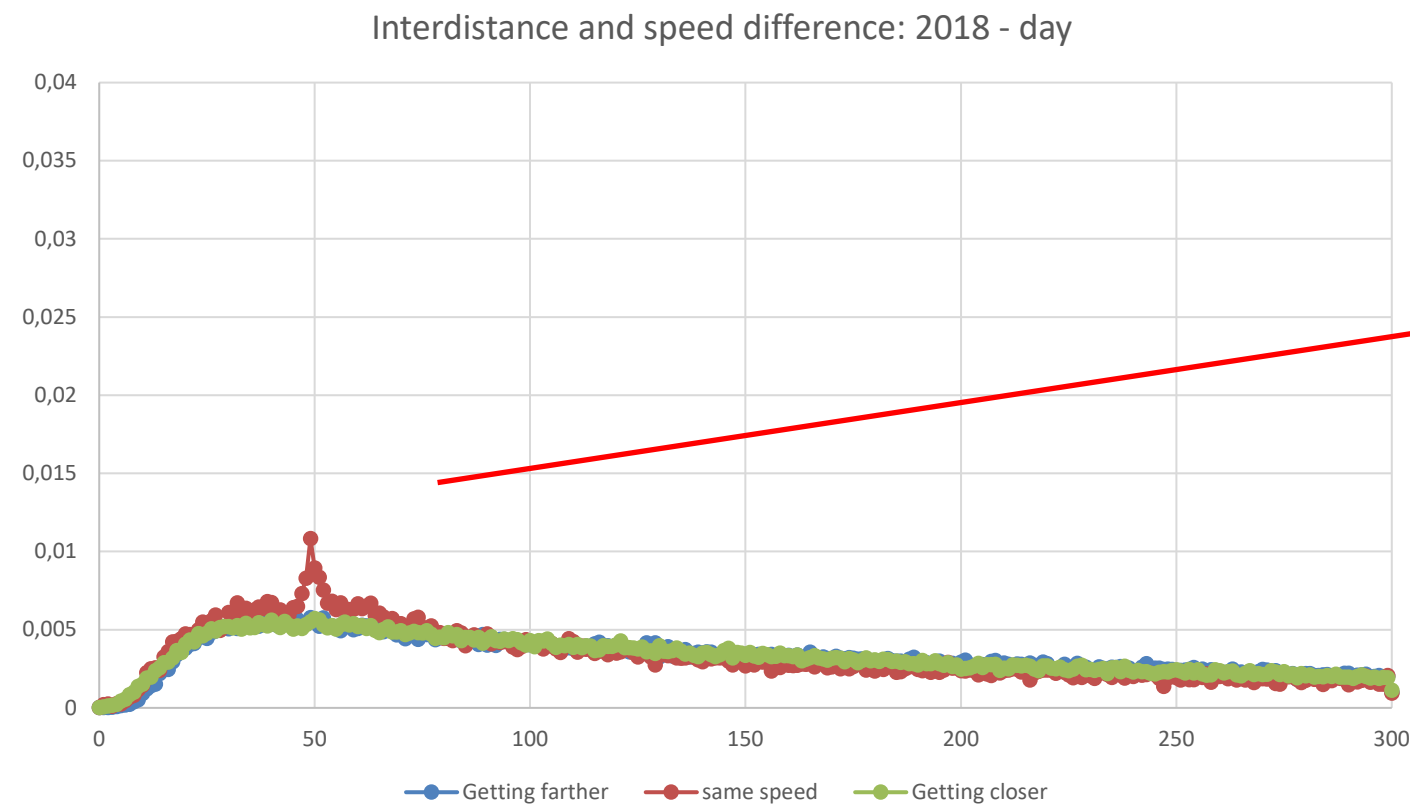
Interdistance analysis

Global results



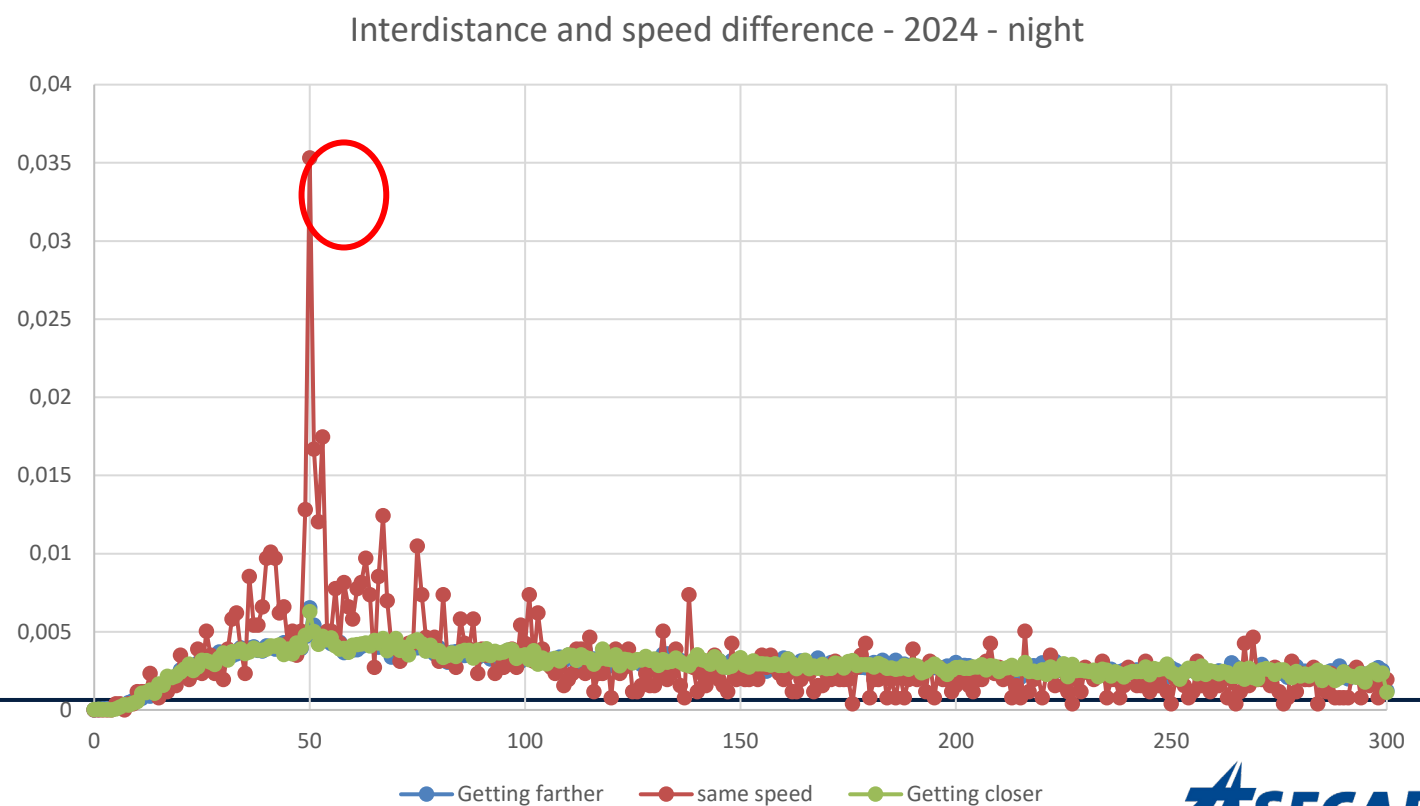
Interdistance analysis

Global results



In 2024 (and 2025 even more), the 50m peak (with no speed difference) is clearly visible...

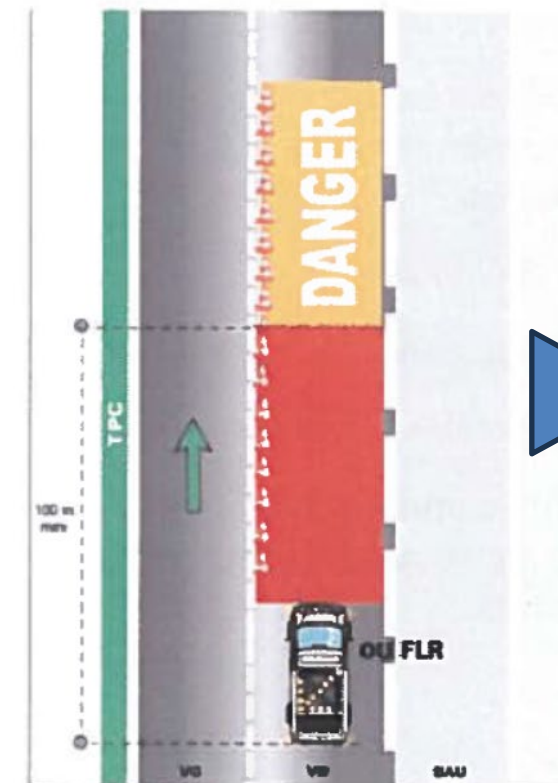
=> Evidence of greater use of distance regulation



Reducing collision risk measures

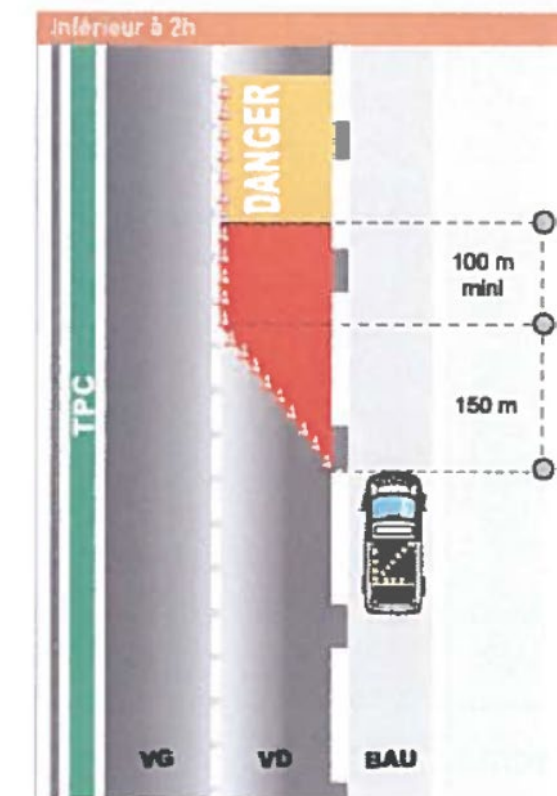
Global results

- Safety corridor:
 - Moving vehicle moves away (1 lane) from obstacle
- Emergency vehicle on emergency lane for right-lane closure
- Distance regulation for roadworks:
 - Good ? (50m)
 - Bad ? (reduced awareness)



Cadre réglementaire

Initial layout



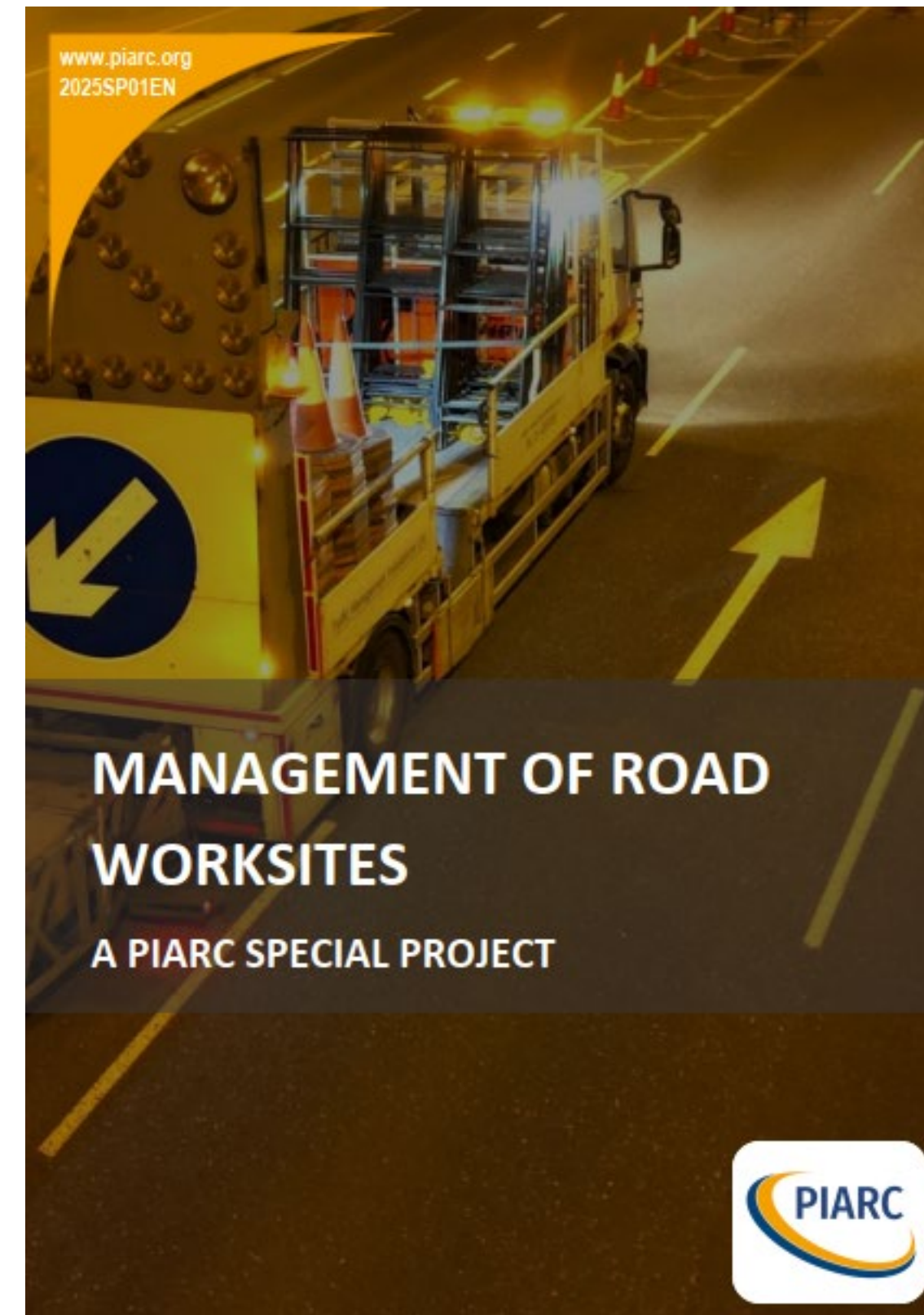
Balisage expérimental

New layout

Focus on worksites: new PIARC report

RECOMMENDATIONS FOR ROAD ADMINISTRATIONS AND DECISION-MAKERS

- Adopt a Formal Policy of Holistic Risk Management to create the authorising environment for a risk-based culture, explicitly recognising the need to balance the competing objectives of project completion, safety, and network functionality.
- Re-engineer Procurement and Contracts to Reward Outcomes, using the contract as the primary lever to change on-site behaviour by making safety a priced, performance-based item linked to independent audits.
- Elevate Safety in Design and Mandate VRU Protection, embedding a "lowest total risk" philosophy in the planning phase and treating continuous, accessible, and physically protected routes for Vulnerable Road Users (VRUs) as a non-negotiable condition of work.
- Establish a Digital Baseline and Procure Technology Based on Evidence, mandating a minimum digital data feed for all worksites and requiring suppliers to provide evidence that their solutions measurably reduce risk in local conditions.



THANK YOU

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