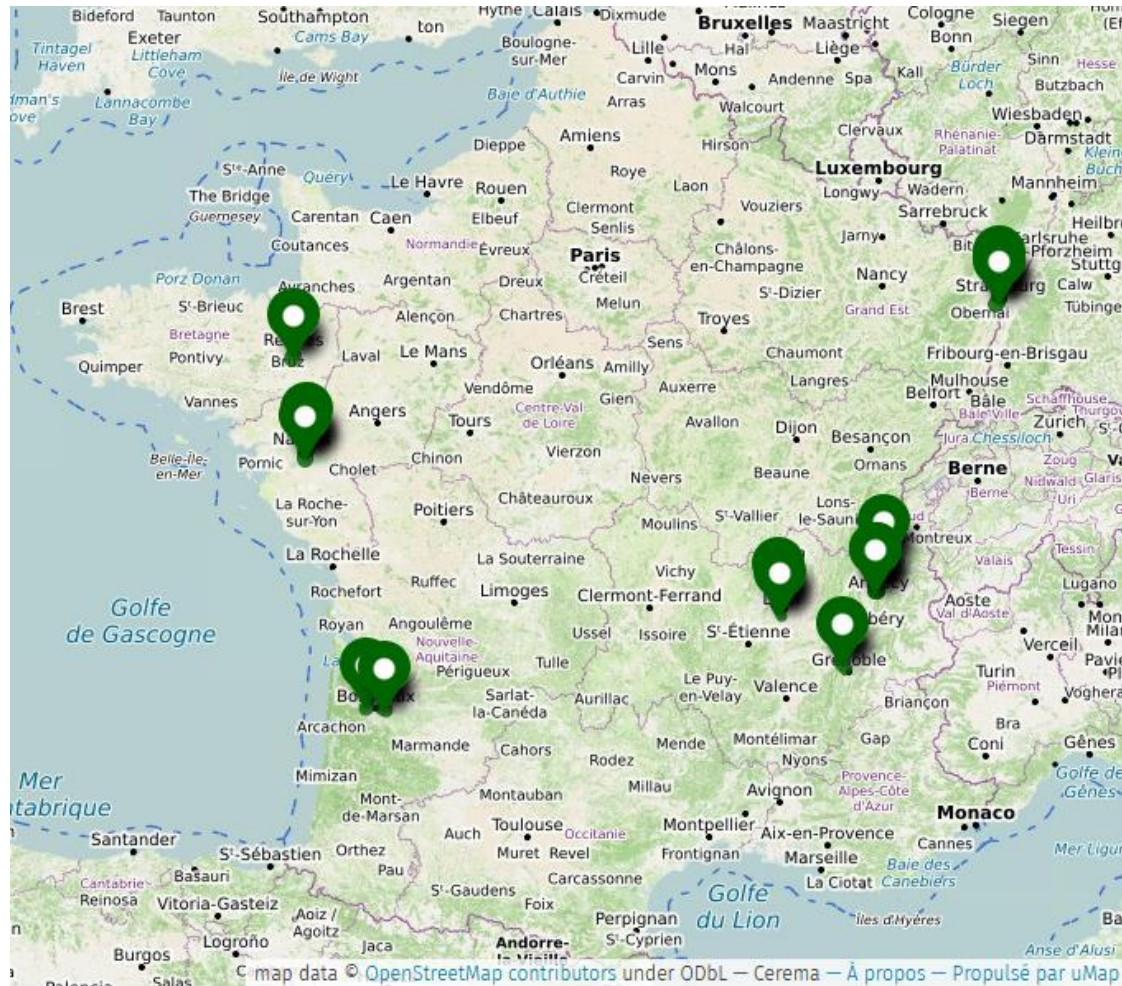# IMPROVEMENT OF OCCUPANCY SENSOR FOSTERS HOV LANE ENFORCEMENT IMPLEMENTATION

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5th – 7th November 2024

1

HOV lanes in France

Voies réservées au covoiturage
- A48 – Grenoble
- A48 – Grenoble
- A83 – Les Sorinières
- A83 – Les Sorinières
- Bd Prairie Mauves – Nantes
- Bd Prairie Mauves – Nantes
- D936
- D936
- Douane Thonex-Vallard
- Douane Thonex-Vallard
- M6 Lyon
- M6 Lyon
- M7 Lyon
- M7 Lyon
- Mérignac
- Mérignac
- N137 – Rennes
- N137 – Rennes
- RD1508/RD3508 – Annecy
- RD1508/RD3508 – Annecy

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State of enforcement in France

- Educational enforcement : while waiting for a semi-automatic or automatic control ;

- Video enforcement : done by a sworn person before issueing penalties. It is working since this year ;

- Automatic enforcement : by 2026…

# Stage 1: Educational control already installed with several tests planned in 2023/24

- **Roadside unit with**
  - Occupancy counter
  - ANPR
- **Variable Message Board**
  - Displays message to violators
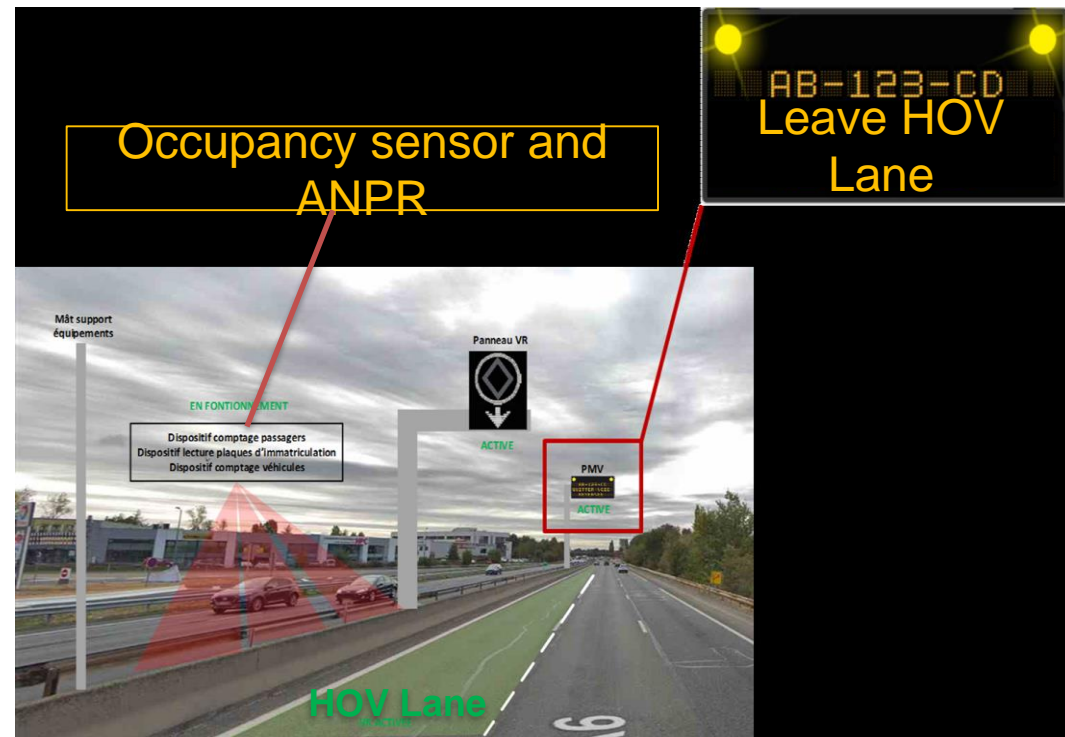
Stage 2: Semi-automated sporadic enforcement in 2024

- **Roadside unit with**
  - Occupancy counter
  - ANPR

- **Personal data processing to inform users**

- **Manual image review by police officers**
  - Display images for review

- **Central French "ticket" issuance system**
  - Centralised database and ticket issuance for the whole country (PVe)

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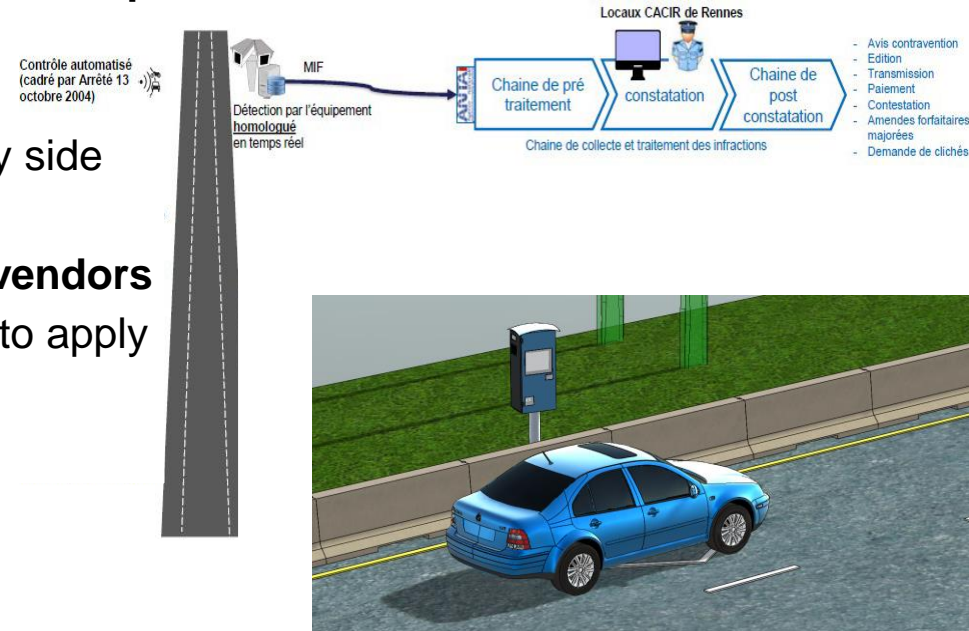
Cerema
CLIMAT & TERRITOIRES DE DEMAIN
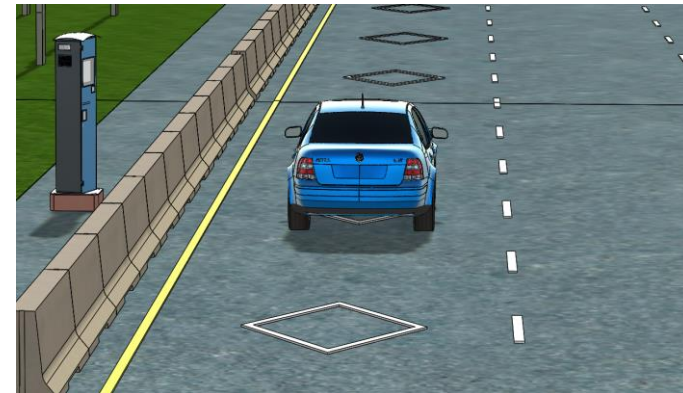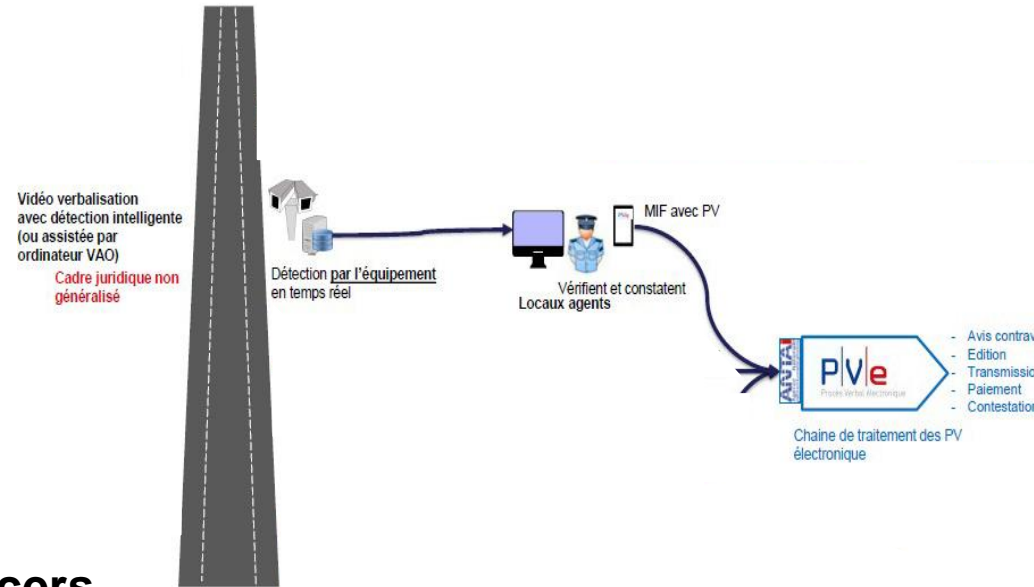
How police officers are working ?

- **Warned of a potentially cheater vehicle**

- **Review all the views of a vehicule to take a decision**

- **If the offense is validaded, they use the terminal to sign a fine**

- **The fine is then issued by ANTAI**

Stage 3: Systematic automated enforcement planned for 2026

- **Requires high performances units with low false positives**

- **Mid-2025: side by side comparison**
  - Multiple vendors will be evaluated side by side

- **Need for a common reference to compare vendors**
  - « Evaluation Methodology » is important to apply comparison

How is Cerema Contributing?

- Developing Systematic Evaluation Frameworks and educating operators

- Evaluated 7 vendors including Conduent, NEC, Pryntec, EGIS, Macq, Invision AI and Cyclope.ai

- Unified formulation for HOV2+ and HOV3+ cases via Confusion Matrices, error breakdowns and uncertainty bounds, known errors, unknown errors and traffic skews.

MATRICE NORMALISEE

		Prédictions (Industriel)					
		X	0-1	2+	Total	Rappel Absolu	Rappel Relatif
Référence Opérateurs	Artefact	0,0	0,0	0,0	0,0		
	Erreur	0,0	0,0	0,0	0,0		
	0-1	0,6	13,9	0,5	15,0	92,6%	96,2%
	2+	3,2	3,8	78,1	85,0	91,8%	95,4%
	Total	3,7	17,6	78,6			
	Precision Normalisée	78,7%	99,3%				

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Results of the evaluation

These indicators below are used during our evaluations :

- TVI (Number of vehicles studied, counted with certainty / Number of vehicles studied) = 87%: This system is distinguished by the superior quality of its images, particularly those captured at the rear of vehicles;

- FP% = 3% and TP = 96.6%: The system demonstrates remarkable efficiency in accurately detecting carpooling behavior and "solitary driving" (autosolisme) on the relevant lanes.

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How many occupants ?

The main occupancy problem

Conclusion

- Carpooling sensors have made remarkable progress in 6 years :

	2018	2024
TVI	75	87
False positives	11 %	3%

- Enabled the implementation of semi-automatic control in 4 locations in France (Lyon, Grenoble, Rennes, and Strasbourg)

- Need to further reduce measurement uncertainties for automatic control

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Thanks for your attention !

Any questions ?