# INTERNATIONAL CONFERENCE : NVH 2025

# Environmental noise model updating using real world road quality data

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# 01

## Context and objectives

https://www.eea.europa.eu/publications/environmental-noise-in-europe

# Context : Noise Pollution

## (European Environment agency, 2020)

**25%**

Of Europeans are submitted to road traffic noise over WHO limit 55dB Lden

**Annoyance**


**20 000 000**

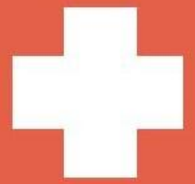
Almost 20 million Europeans are annoyed by environmental noise.

**Sleep disturbance**


**8 000 000**

At least 8 million Europeans suffer sleep disturbance due to environmental noise.

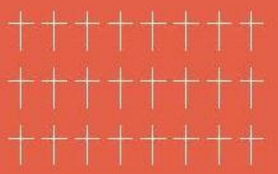
**Health impacts**



**43 000**

Noise pollution causes 43 000 hospital admissions in Europe per year.

**Premature deaths**



**10 000**

Noise pollution causes hypertension and cardiovascular disease, leading to an estimated 10 000 premature deaths annually in Europe.

# NOISE POLLUTION

## Sources Standards and Regulations

Air

Road

Rail

**Transport**

**Neighborhood**

**Occupational noise**

## Environmental noise regulations

Urban Soundscape

Housing devaluation

Health and life quality

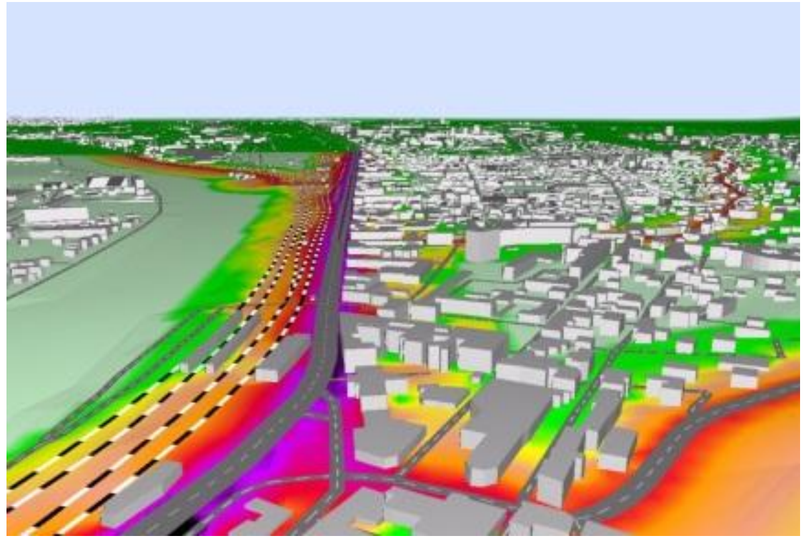
Compliance

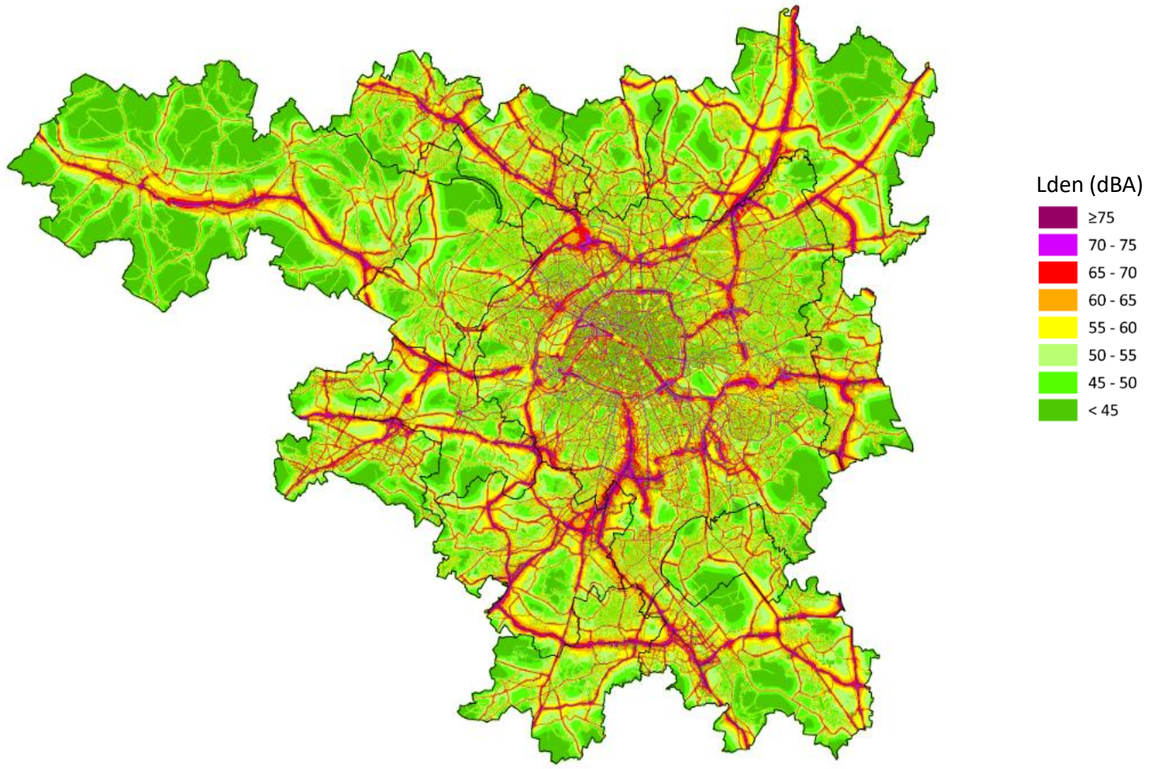
# THE REGULATORY FRAMEWORK: EUROPEAN DIRECTIVE 2002/49/EC

## Objectives:

- Assessment of noise exposure using harmonized methods (CNOSSOS): Strategic Noise Maps.
- Drawing up of five-year action plans (Environmental noise prevention plan)
- Public information

A noise map is produced by computer modeling, using descriptive data on topography (relief, buildings, noise barriers, tunnels, bridges, etc.) and noise sources (average traffic, speeds, traffic composition, type of road surface, etc.).





# SOCIAL COST OF ROAD NOISE = 81 MDS€/ YEAR (FRANCE 2021)

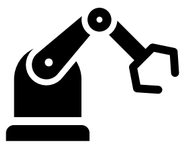
Air: 6,1

road: 81

Transport : 97,8

Rail : 11,1

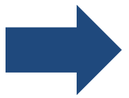
Neighborhood : 26,3



Occupational: 21

**146 Md€ total Incl. 81 Md€ Road**

80% : **Health impacts** => # years in good health lost

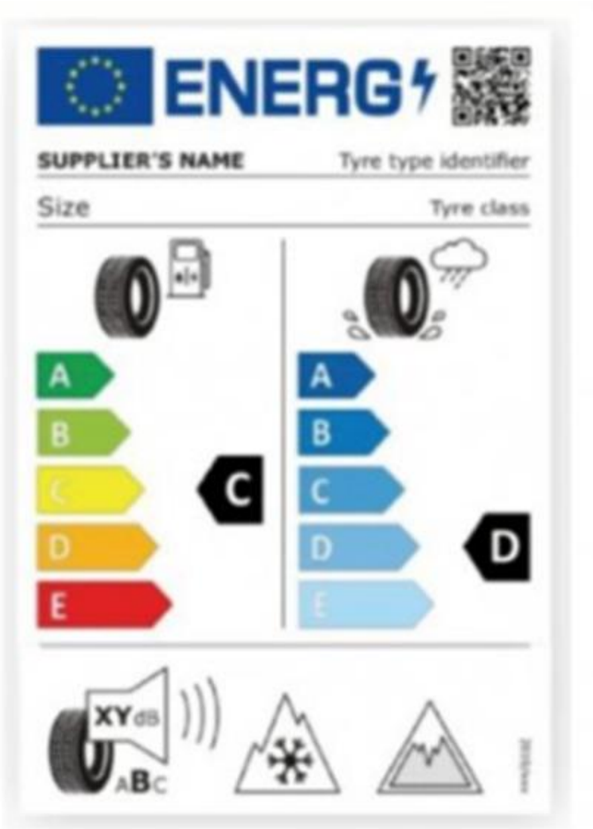


20% : real estate devaluation

Reference : Social cost of noise for FRANCE 2021, ADEME
https://librairie.ademe.fr/cadic/6130/rapport-cout-social-bruit-2021.pdf

# ROAD NOISE : THE MOST EFFICIENT COUNTERMEASURE IS ROAD SURFACE

Pass by noise (UN-R51)



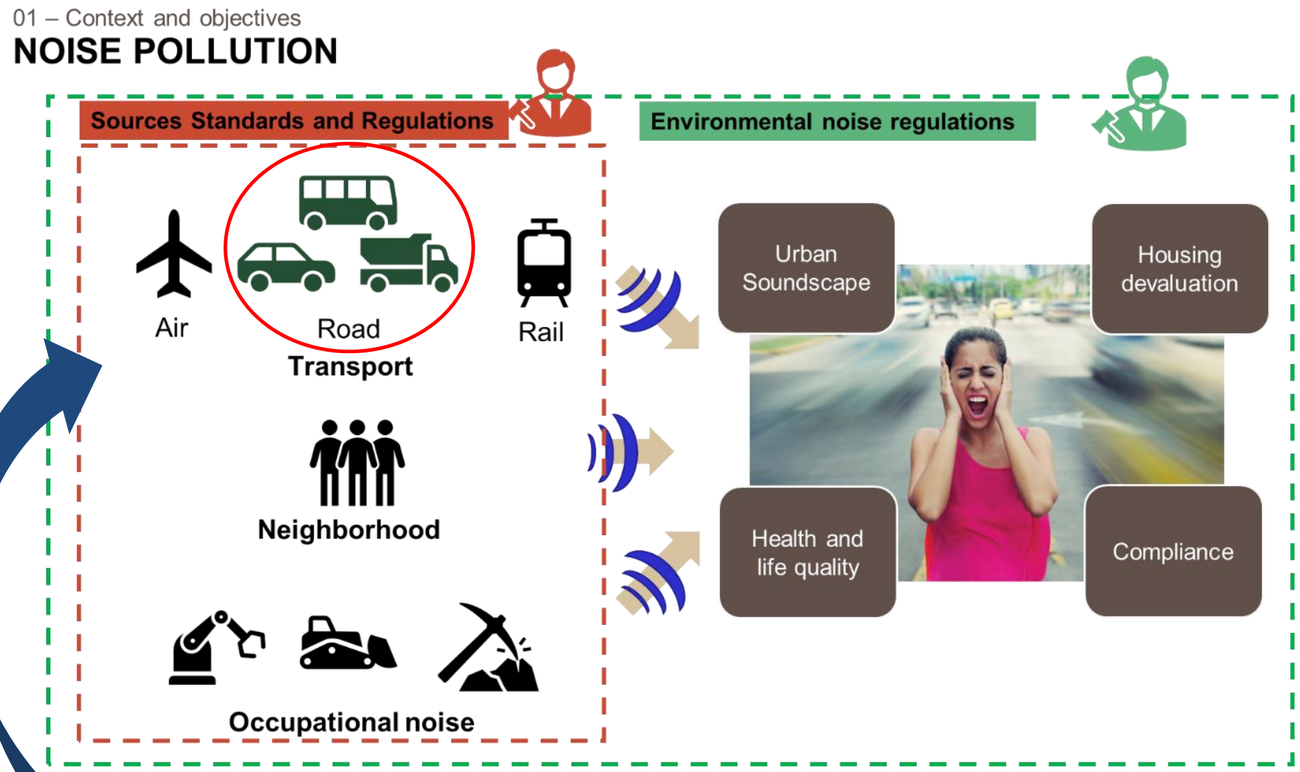

Tire noise (UN-R117)

Road surface acoustic performance
: usually unknown

-2dBA / 4 years

≈ -10 dBA / 1 month

# CONCLUSIONS




MANAGING #1 NOISE POLLUTION SOURCE IS ABOUT MASTERING ROAD SURFACE CHARACTERISTICS (best cost/benefit ratio)

# 02

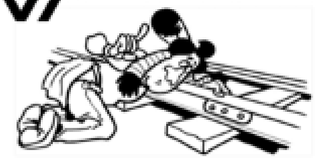
## BRUITPARIF x RENAULT Partnership

# RENAULT / BRUITPARIF PARTNERSHIP (2024)

## RENAULT

- Installation of APACHE systems on vehicles.
- Geomatics pre-processing
- Delivery of geo-tagged road acoustics data
- Analysis of energy consumption
- Mapping of Ile de France road acoustic state

RENAULT



APACHE

Auscultation du Profil Acoustique des Chaussées et de leur Efficacité Energétique
Assessment of Pavement Acoustic Characteristics & Energy efficiency

## BRUITPARIF

- Investment in APACHE technology
- Model update of Ile De France noise map
- Development of innovative simulation tools for dynamic mapping (periphérique) and dedicated observatories.

## INNOVATION

-Turning the car into a sensor
(Renault patent)
- Assessment of road surface acoustic class
- Noise pollution control new connected service

BRUITPARIF

# THE CAR TURNS INTO A ROAD SENSOR

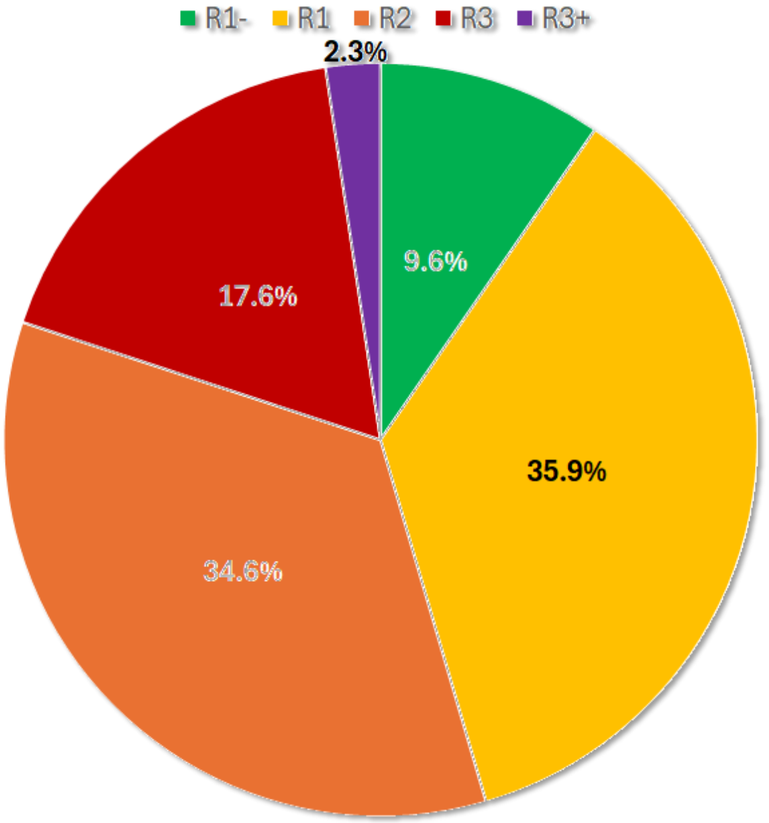


Decibel d'or 2024

## DEDICATED SCANNING OR LONG TERM MONITORING: EVERYWHERE, ALL THE TIME

**PATENTED TECHNOLOGY BY RENAULT**

# EXPLOITATION FOR DOCUMENTATION OF THE PARIS RING ROAD (2024)




ROLLING NOISE (TIRE/ROAD CONTACT NOISE)
- MAJOR COMPONENT OF ROAD NOISE
- 2 APACHE MEASUREMENT SETS USED (MARCH 2024 AND NOVEMBER 2024)
- CLASSIFICATION OF EACH SECTION FROM LEAST NOISY (R1-) TO NOISIEST (R3+)

BRUITPARIF

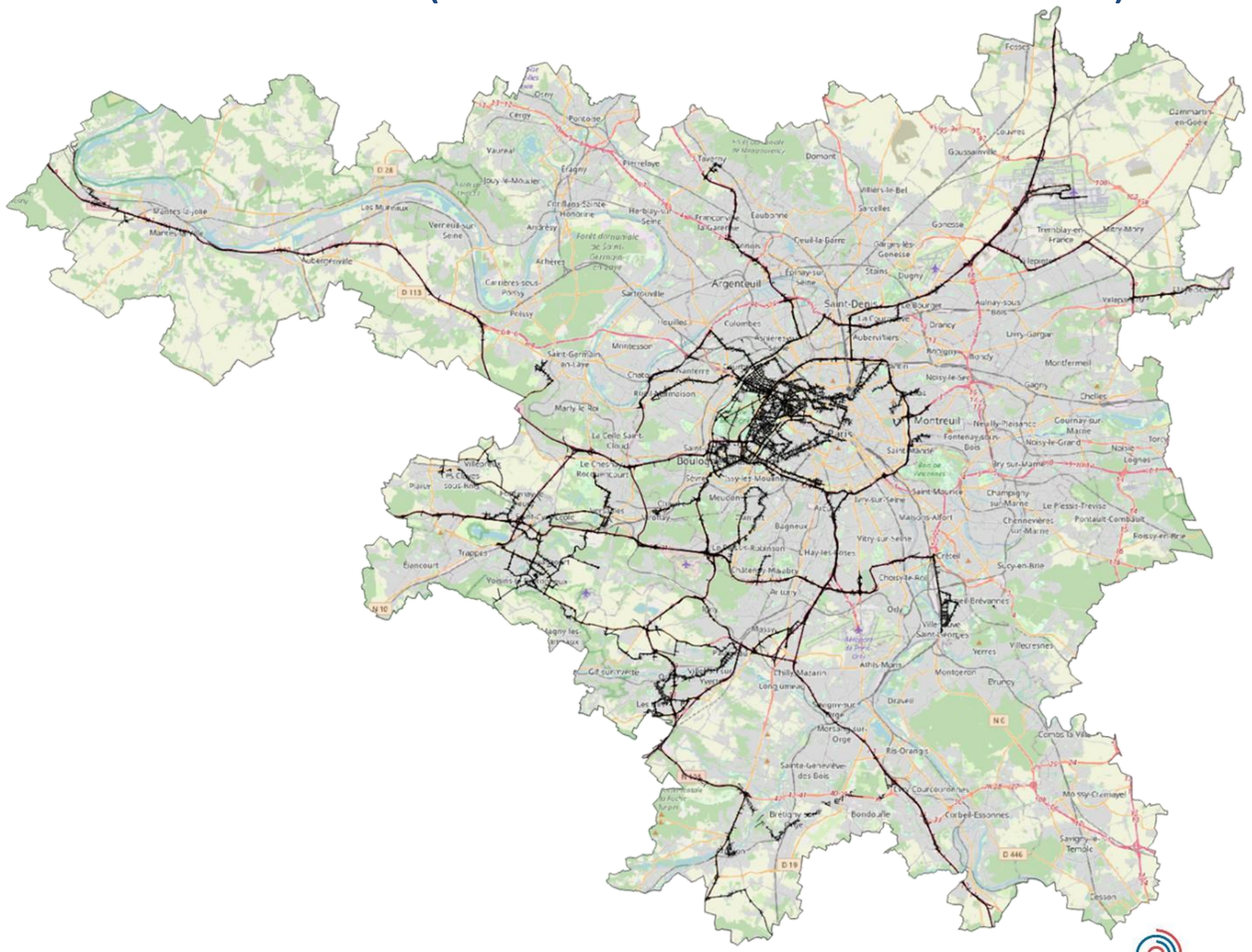
# USE FOR THE PRODUCTION OF STRATEGIC NOISE MAPS (2025)

## DIRECTIVE 2002/49/EC (ROAD NOISE - 5TH DEADLINE - 2027)

## ELABORATION OF A REGISTER OF THE STATE OF THE ROAD INFRASTRUCTURE AT THE SCALE OF THE PARIS AGGLOMERATION (... UNDER CONSTRUCTION)

**As of march 2025**

**about 1000km/month/car**

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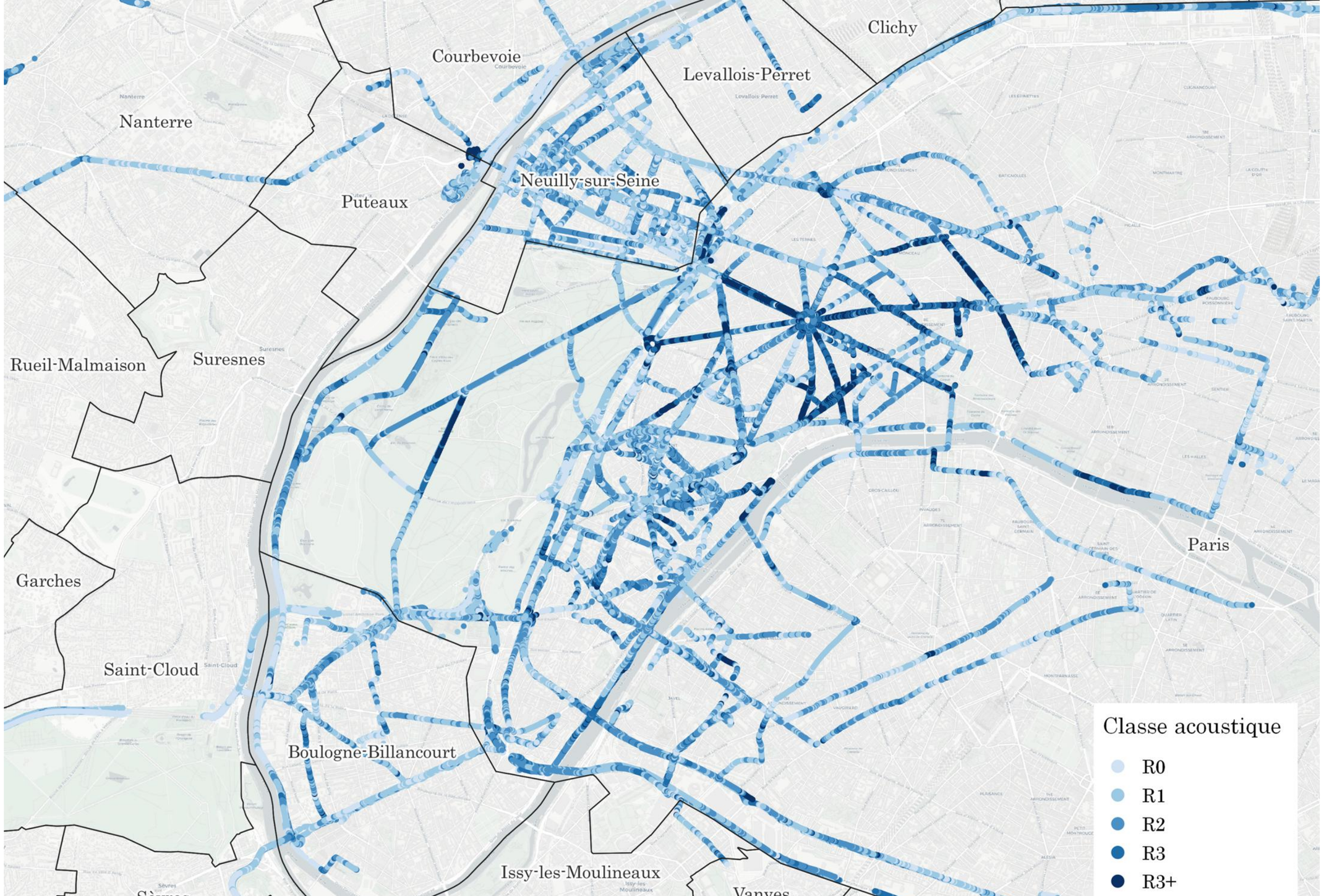


# COMPARISON WITH PERMANENT MONITORING STATIONS

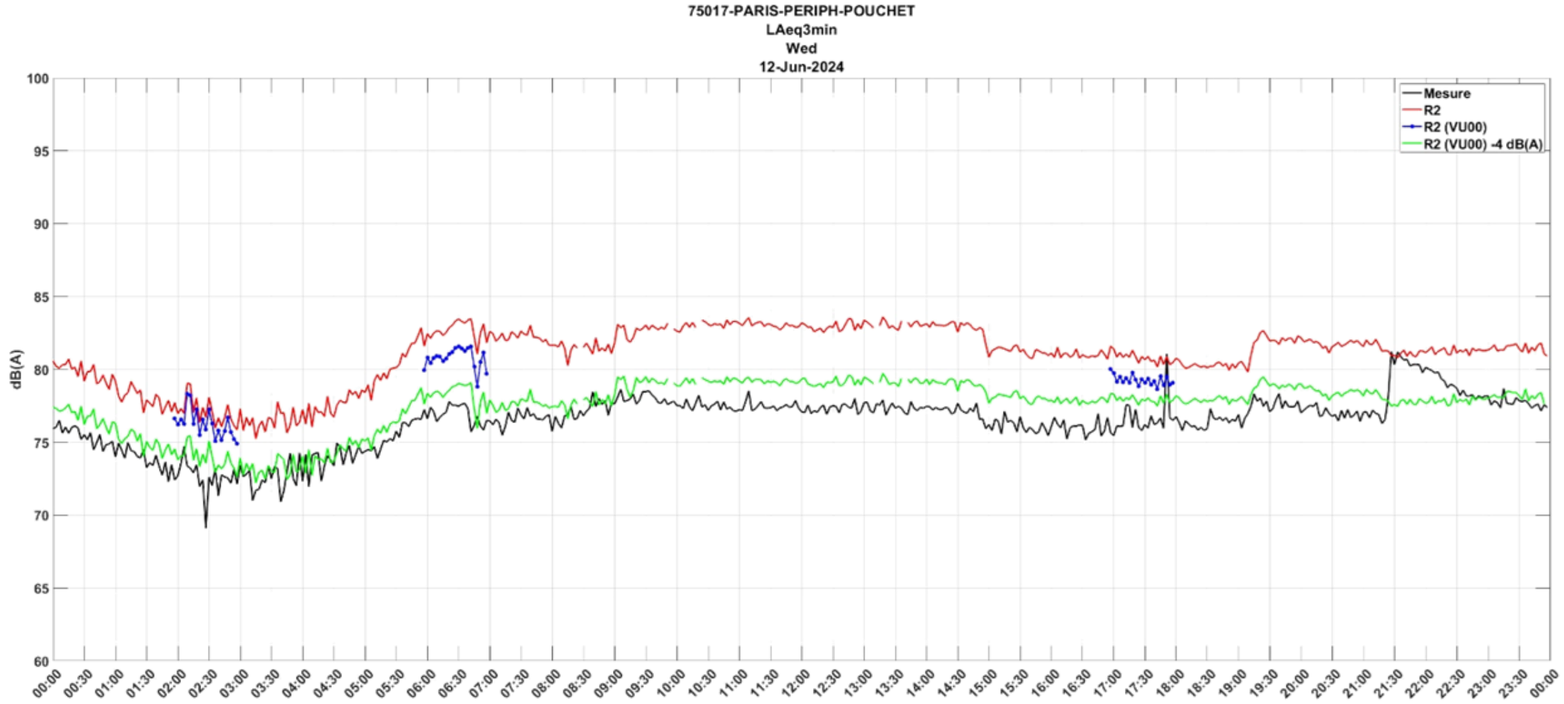
75017-PARIS-PERIPH-POUCHET

Wednesday, June 12, 2024

02h-03h / 06h-07h / 17h-18h

✓ Significant influence of the road surface

✓lane V3 measured by APACHE system (Renault)





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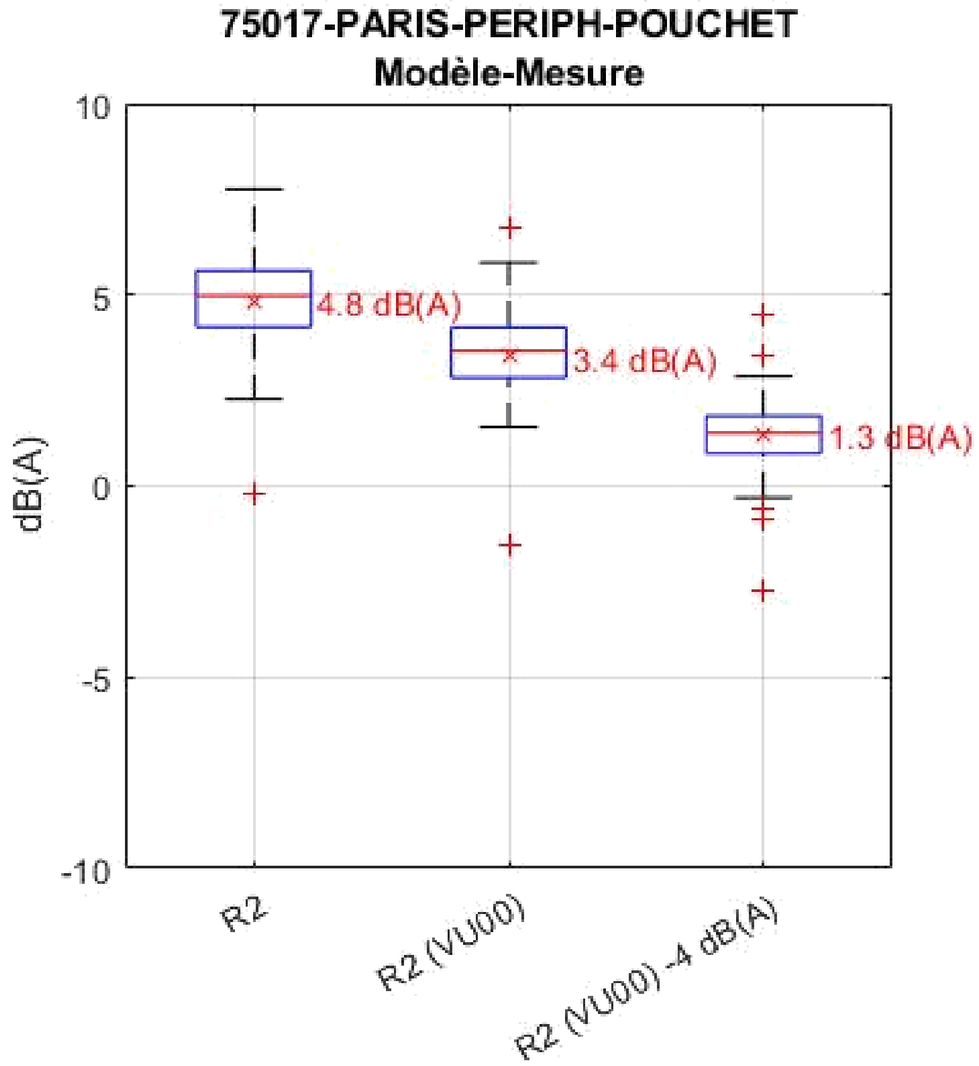
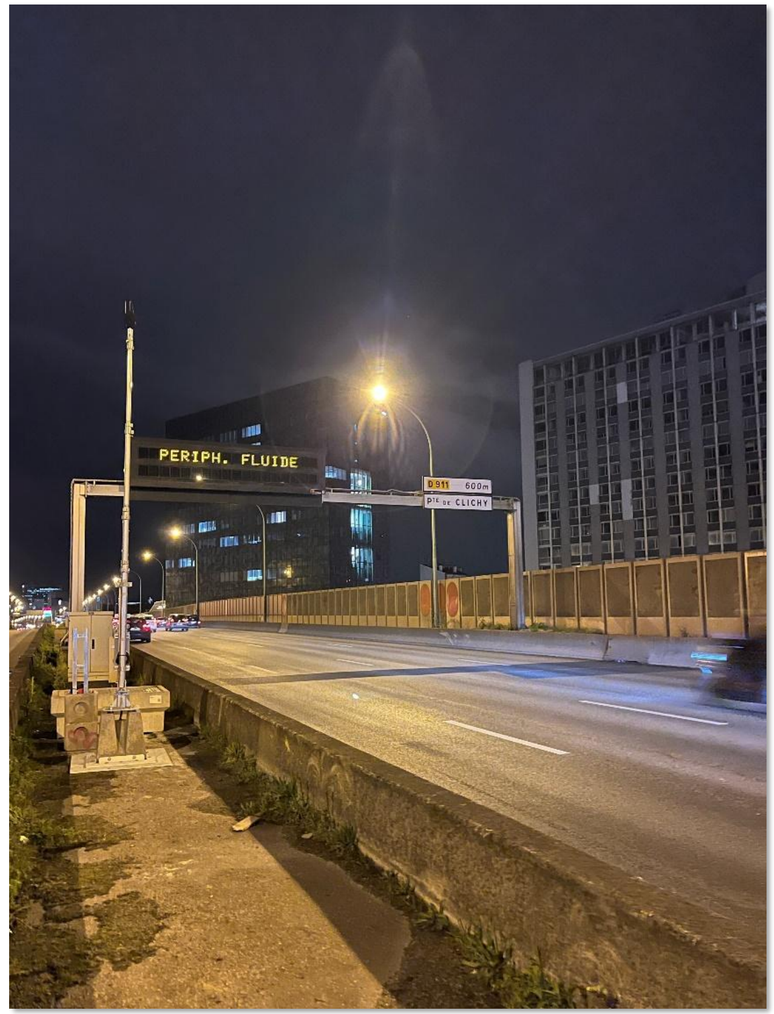
# COMPARISON WITH PERMANENT MONITORING STATIONS

- ✓ 75017-PARIS-PERIPH-POUCHET
- ✓ mercredi 12 juin 2024
- ✓ 02h-03h / 06h-07h / 17h-18h

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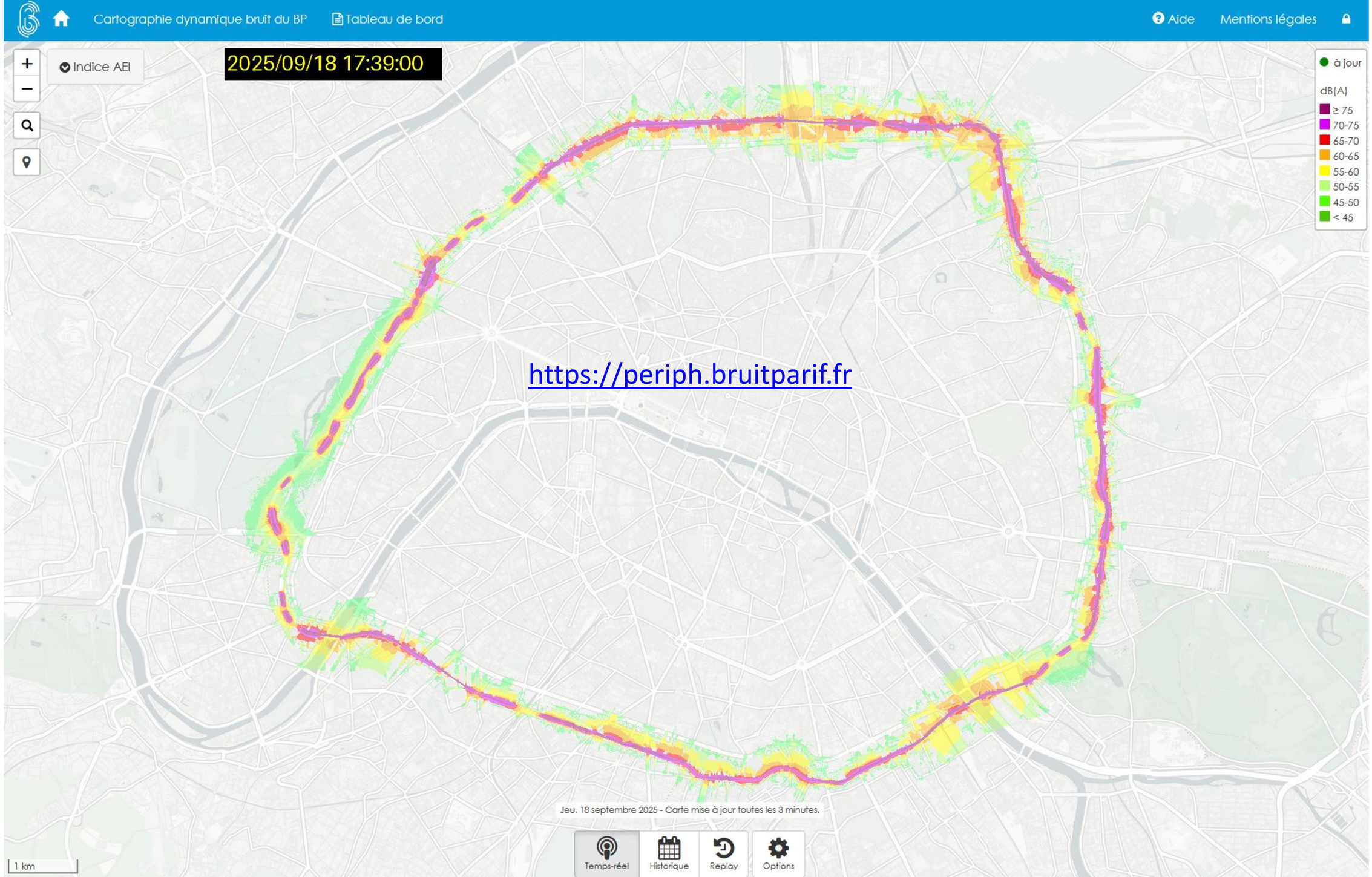


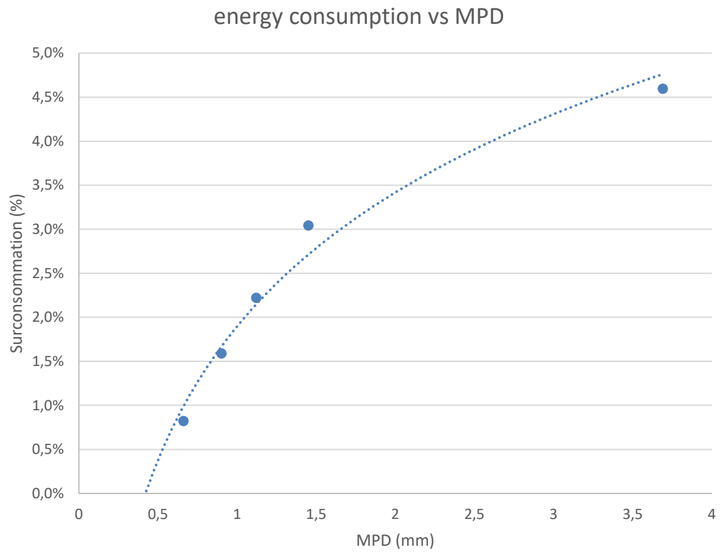
# VISION – NOISE POLLUTION

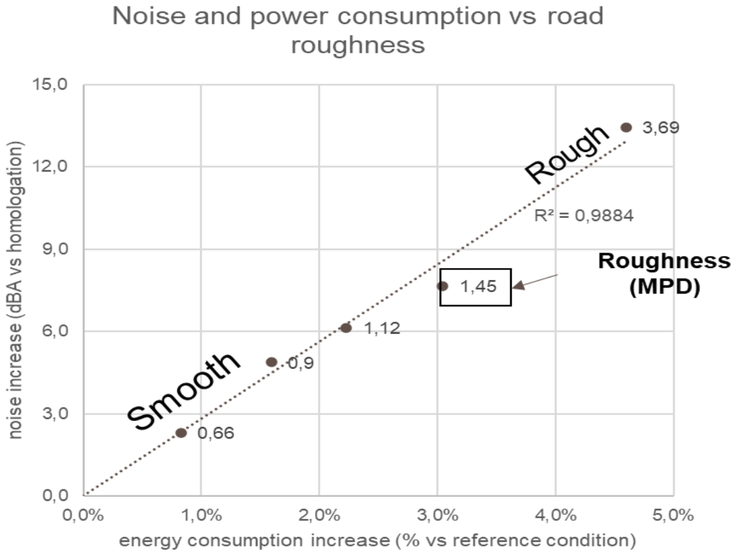
Future urban soundscape is going to be greatly modified by increased electrification.

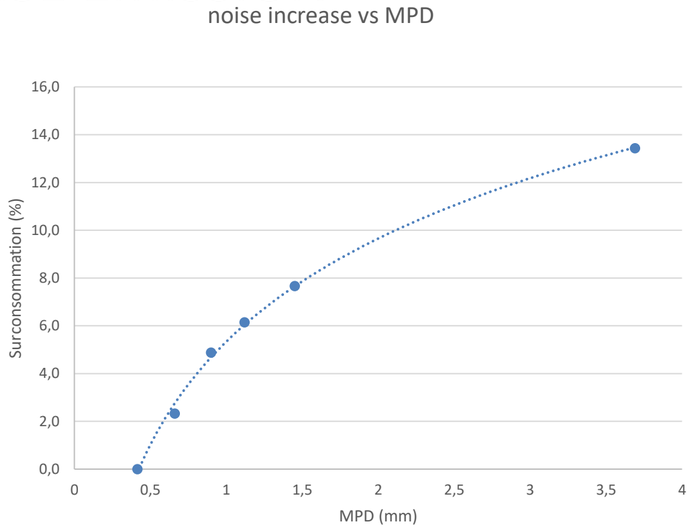
**The main local environmental impact of an EV is noise**

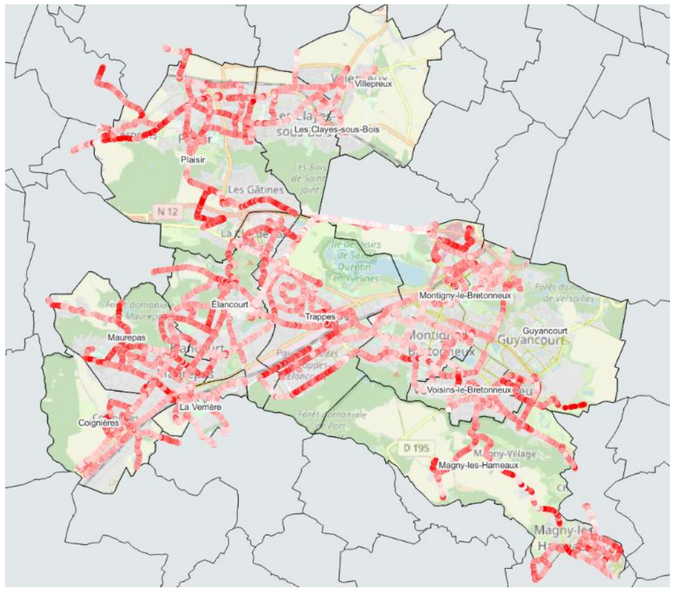
**If we want to benefit from electrification impact we must work on the road**

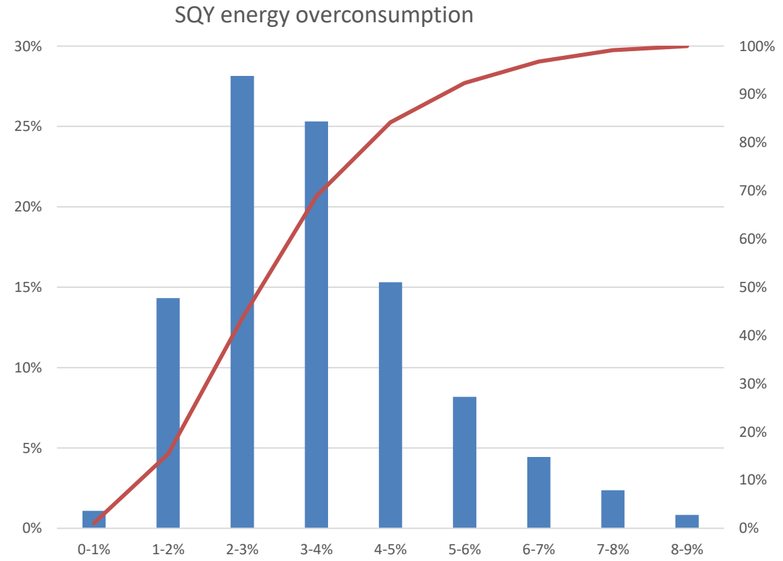
# REMINDER – FUEL ECONOMY AN VEHICLE NOISE EMISSION



# GLOBAL CARBON BALANCE

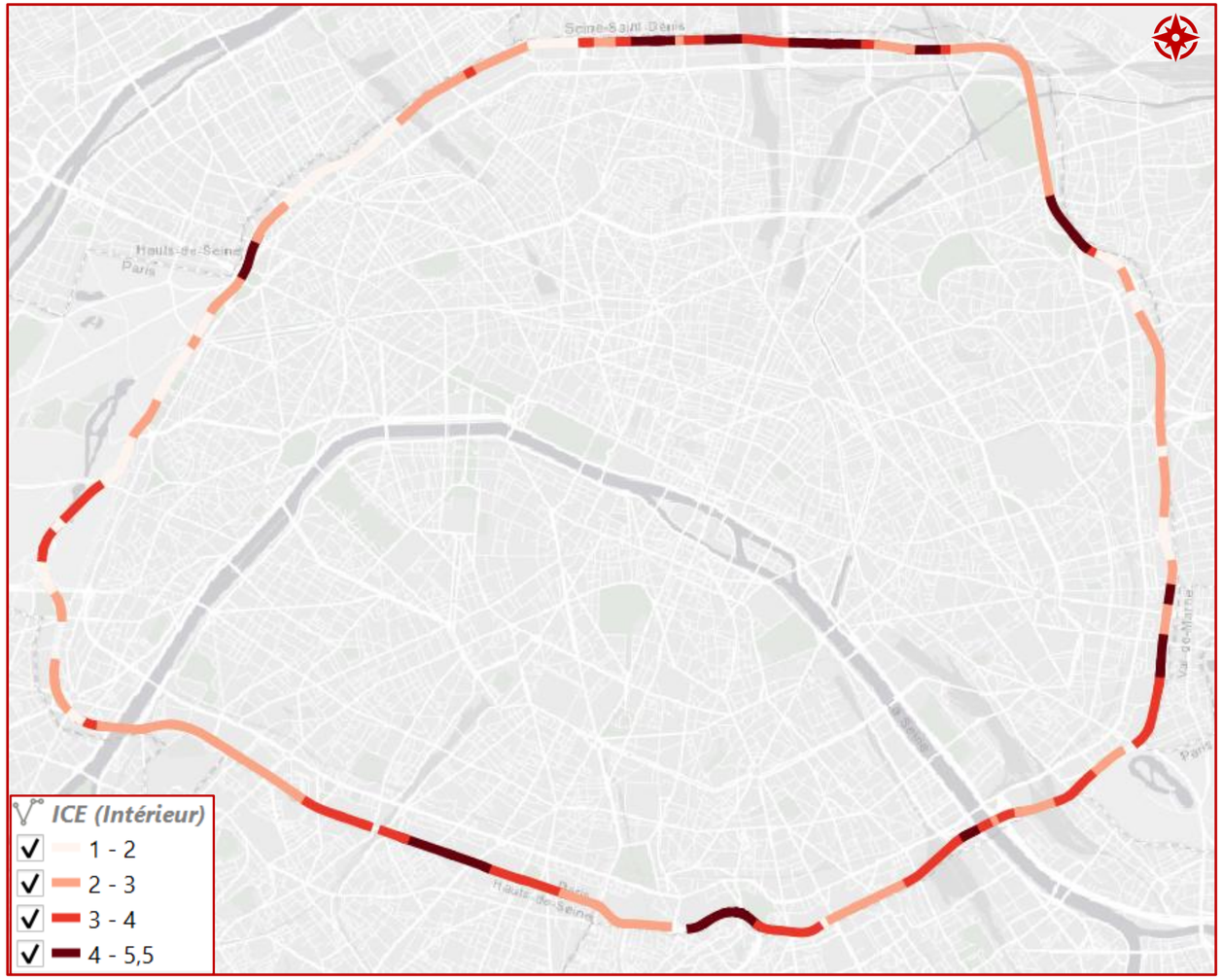
Planning & resurfacing 1km road (every 7 years)
= 184 t CO2


10000 veh/year driving on a smooth road for 7 years
= 184 t CO2

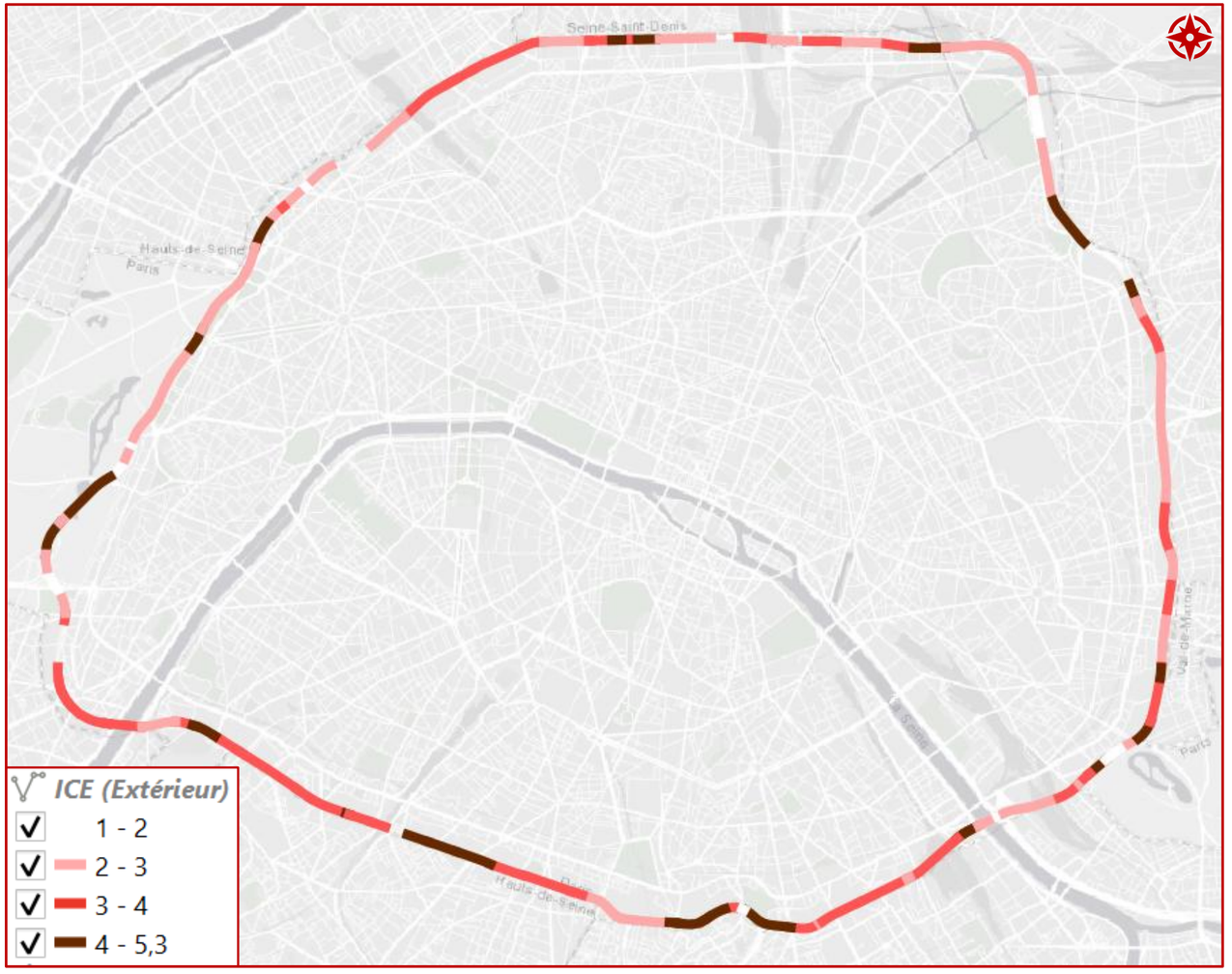
**Quieter Environment**
**Better fuel economy**

# LA SURCONSOMMATION SUR LE PÉRIPHÉRIQUE

**Périphérique intérieur**

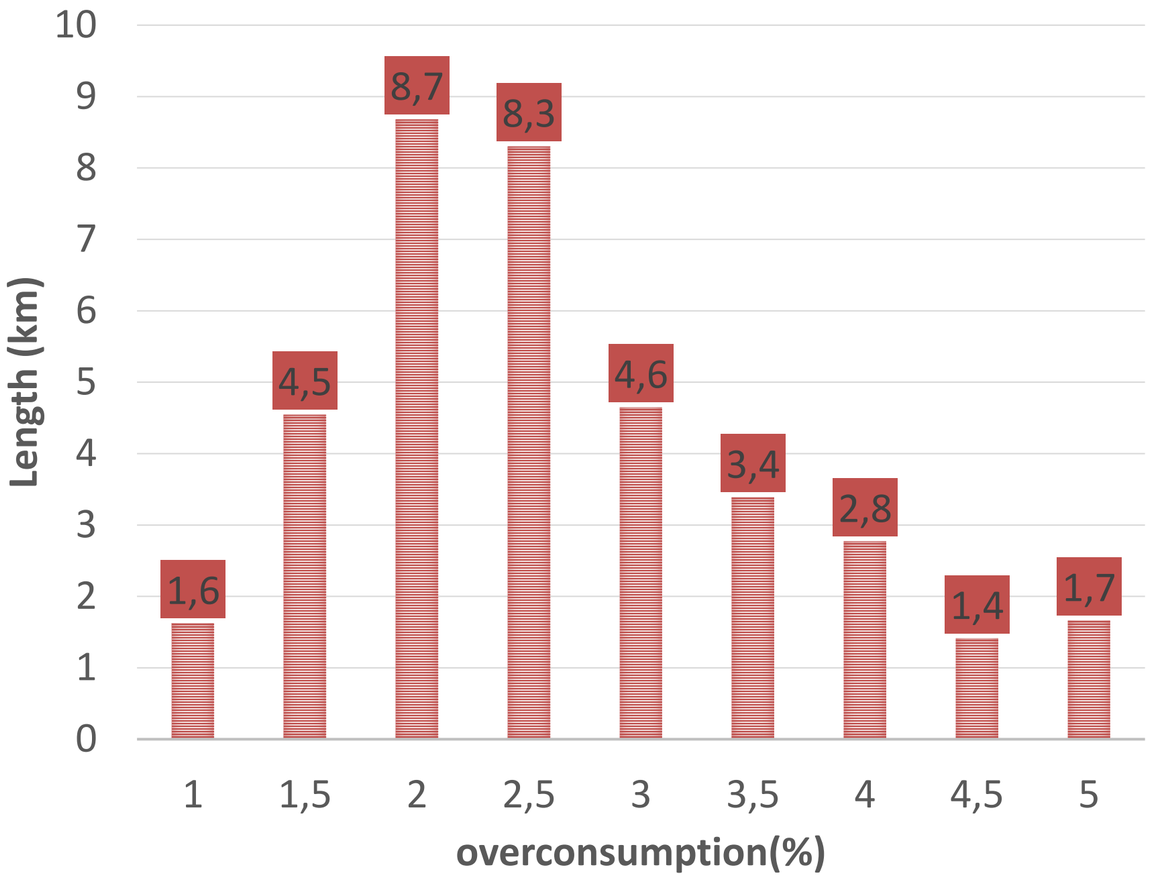



**Périphérique extérieur**

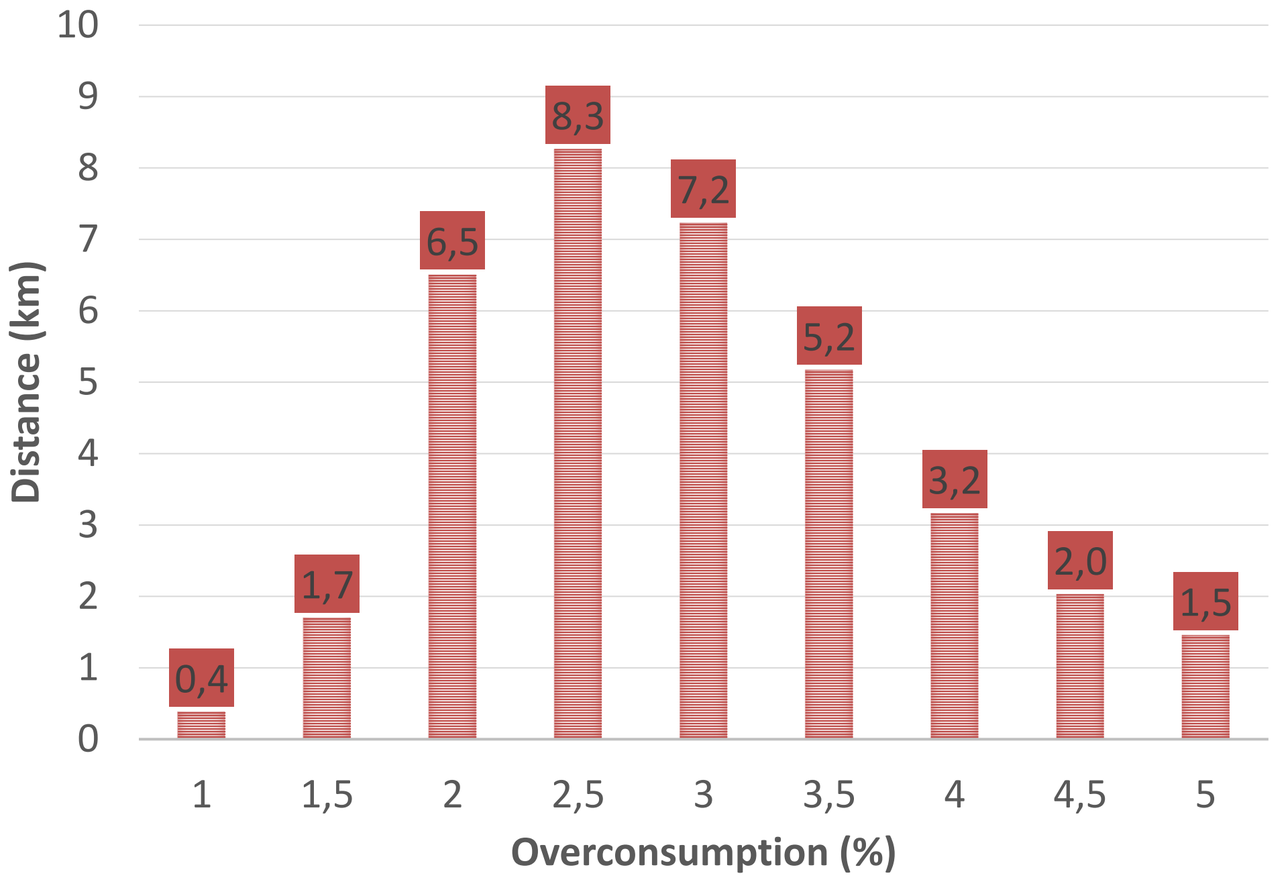


# FUEL ECONOMY ON THE PARIS RING

**Inner ring**




**Outer ring**




**From a first approach, resurfacing the Paris Ring would lead to an immediate 5dB decrease (average) , and would be carbon compensated within 3 years**

# NOISE & FUEL ECONOMY

## Inner ring

- **8,30 km** du périphérique intérieur font surconsommer à hauteur de **1,5% .**
- **20 T** de sur émission de CO2 par jour
- **7521 T** de sur émission de CO2 par an
- Ce qui correspondrait à **10km de réfection par an** *

## Périphérique extérieur

- **7,23 km** du périphérique extérieur font surconsommer à hauteur de **2% .**
- **23,5 T** de sur émission de CO2 par jour
- **8569 T** de sur émission de CO2 par an
- Ce qui correspondrait à **11km de réfection par an** *

**En première estimation une réfection de l'intégralité du périphérique serait compensée en carbone en un peu plus de 3 ans tout en réduisant les nuisances sonores d'environ 5dB en moyenne.**

** Sur la base d'une évaluation de 184 T de CO2/km de voirie, « le coût environnemental de la réfection des chaussées » Thomas Elliot, Alan Carter, Annie Levasseur, ETS Montréal , Mai 2023*

# CONCLUSION

Noise pollution is a consequence of a systemic issue of energy consumption (quantity and efficiency).

Noise is a sensible and sensitive indicator of CO2 emission for roads transportation.

The enemy may be invisible, but it is not silent

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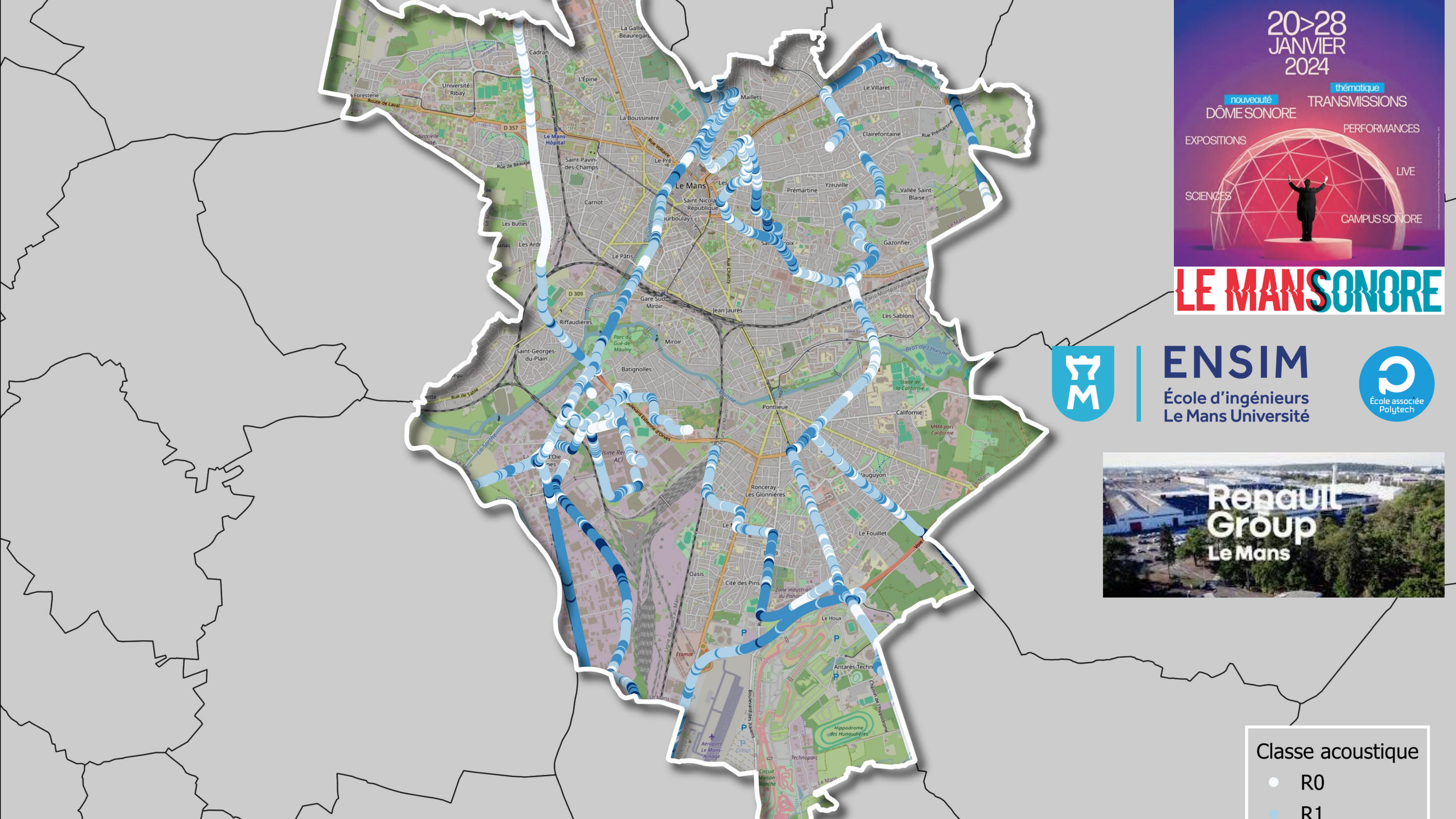
# A newcomer in the APACHE tribe


20>28
JANVIER
2024
nouveauté
DÔME SONORE
thématique
TRANSMISSIONS
PERFORMANCES
EXPOSITIONS
LIVE
SCIENCES
CAMPUS SONORE
LE MANSONORE
ENSIM
École d'ingénieurs
Le Mans Université
École associée
Polytech
Renault
Group
Le Mans
Classe acoustique
R0
R1
Le Mans
Cadran
L'Épine
Université
Ribay
Foresterie
Route de Laval
D 357
Le Mans-
Hôpital
La Boussinière
Maillets
Le Villaret
Clairefontaine
Rue Prémartine
Saint-Pavin-
des-Champs
Rue Voltaire
Le Pré
Rue de Beaugé
Carnot
Saint-Nicolas
République
Prémartine
Yzeuville
Vallée Saint-
Blaise
Les Buttes
Les Ardr
Le Pâtis
Gazonfier
Rue Chanzy
D 309
Gare Sud-
Miroir
Jean Jaurès
Riffaudières
Les Sablons
Parc du
Gué-de-
Maulny
Miroir
Saint-Georges-
du-Plain
Batignolles
Rue de Sablé
Stade de
la Californie
Pontlieue
Californie
MMA parc
Californie
Ronceray
Les Glonnières
Le Fouillet
Oasis
Cité des Pins
Zone industrielle
du Panon
Le Houx
Etamat
Antarès-Techn
Hippodrome
des Hunaudières
Technoparc
Aéroport
Le Mans-
Arnage
Circuit
Maison
Blanche

# THANK YOU FOR YOUR ATTENTION

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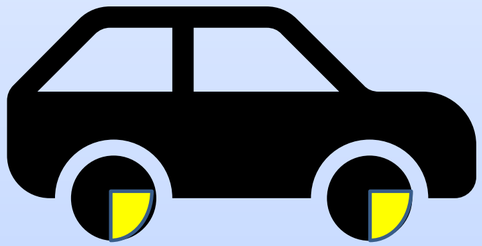
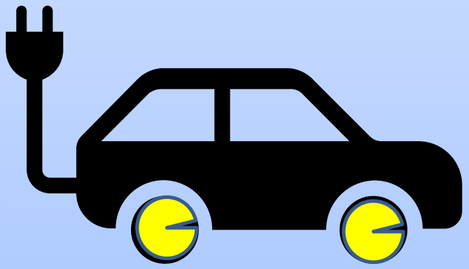
# Annex

# Technical insight for Pass-By Noise Regulation (UN-R51) : Tire/road interaction contribution (for the full PBN test)

**Up to 2020 :72dB (Phase 1)**

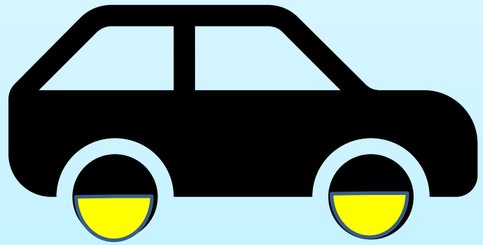


**≈25% from Tire/Road contact**

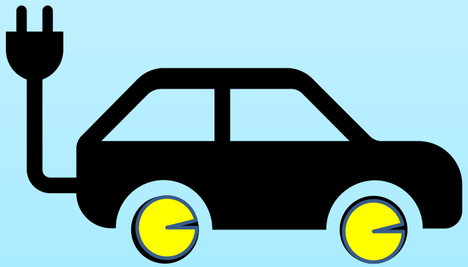


**≈90% from Tire/Road contact**

**Up to 2024 :70dB (Phase 2)**

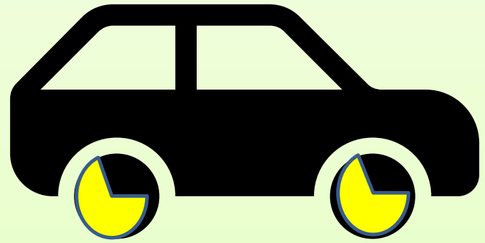


**≈50% from Tire/Road contact**

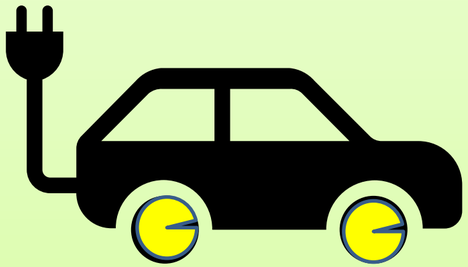


**≈90% from Tire/Road contact**

**From 2024 :68dB (Phase 3)**



**≈70% from Tire/Road contact**

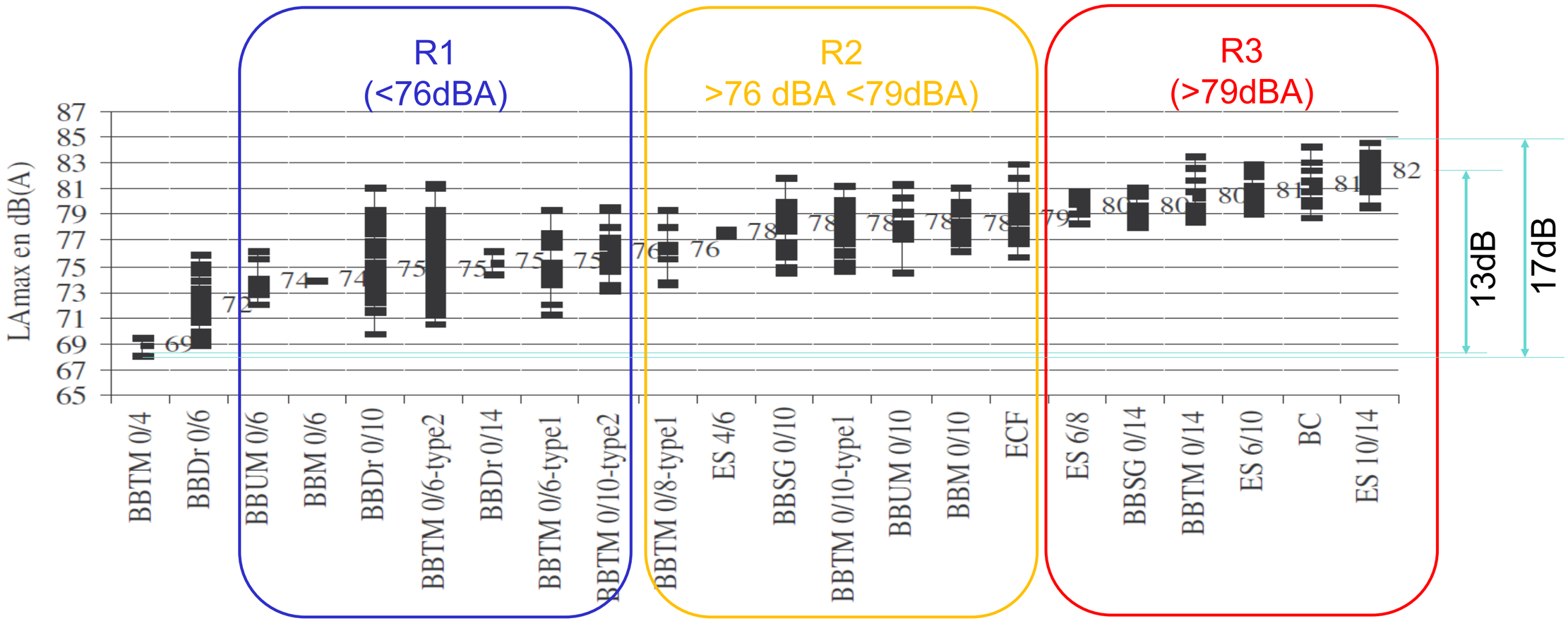


**≈90% from Tire/Road contact**

**(on ISO Tracks in homologation conditions for mean vehicle & mean tire)**

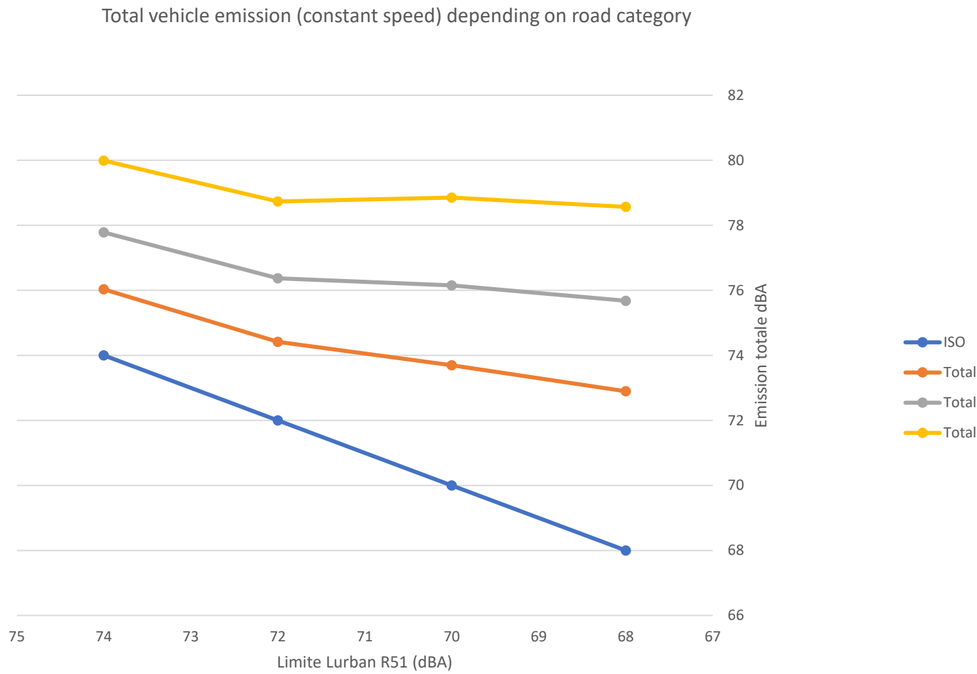
**Source : Renault, 2020**

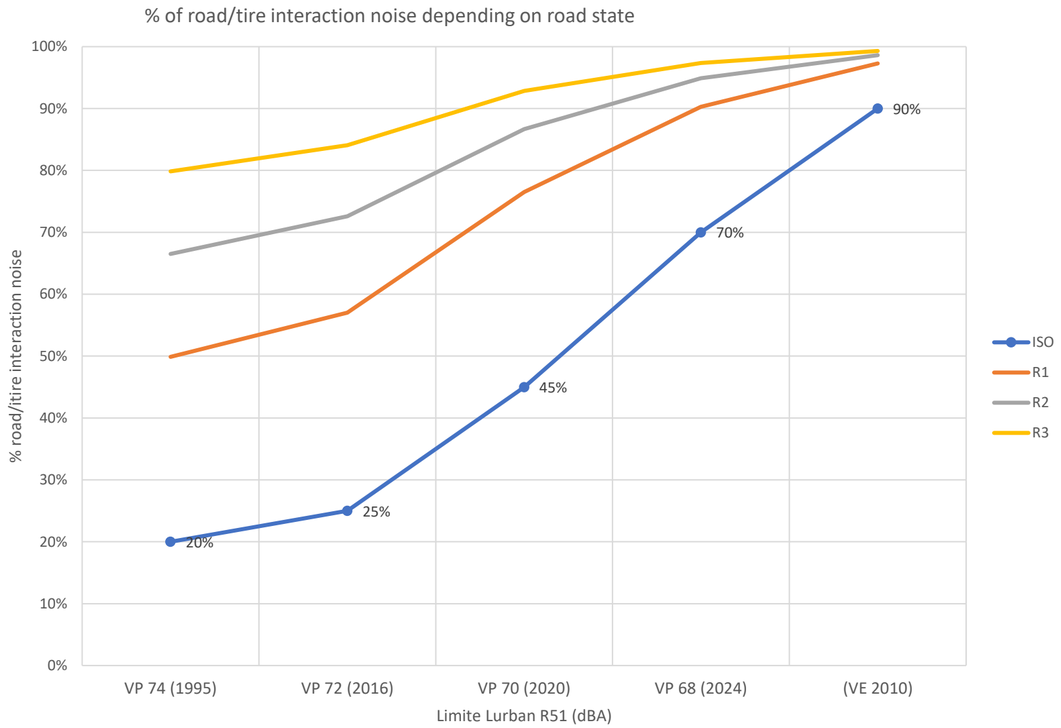
# ROAD ACOUSTICS CATEGORIES




**Maximum noise emmitted by a constant rolling speed car on various surfaces**
**Deufrabase data / NMPB2008**

# COMPARISON BETWEEN ISO HOMOLOGATION AND REAL WORLD

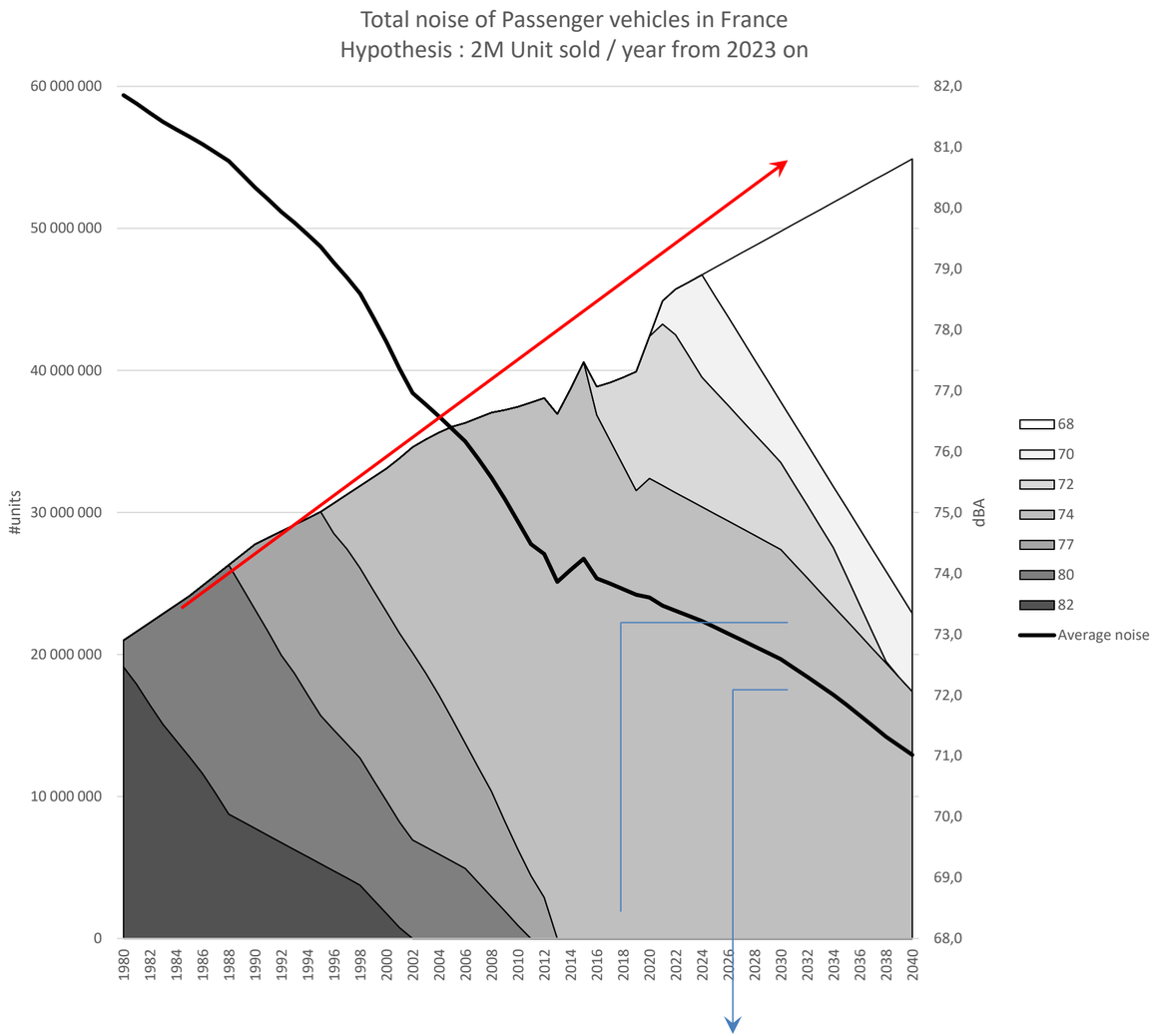


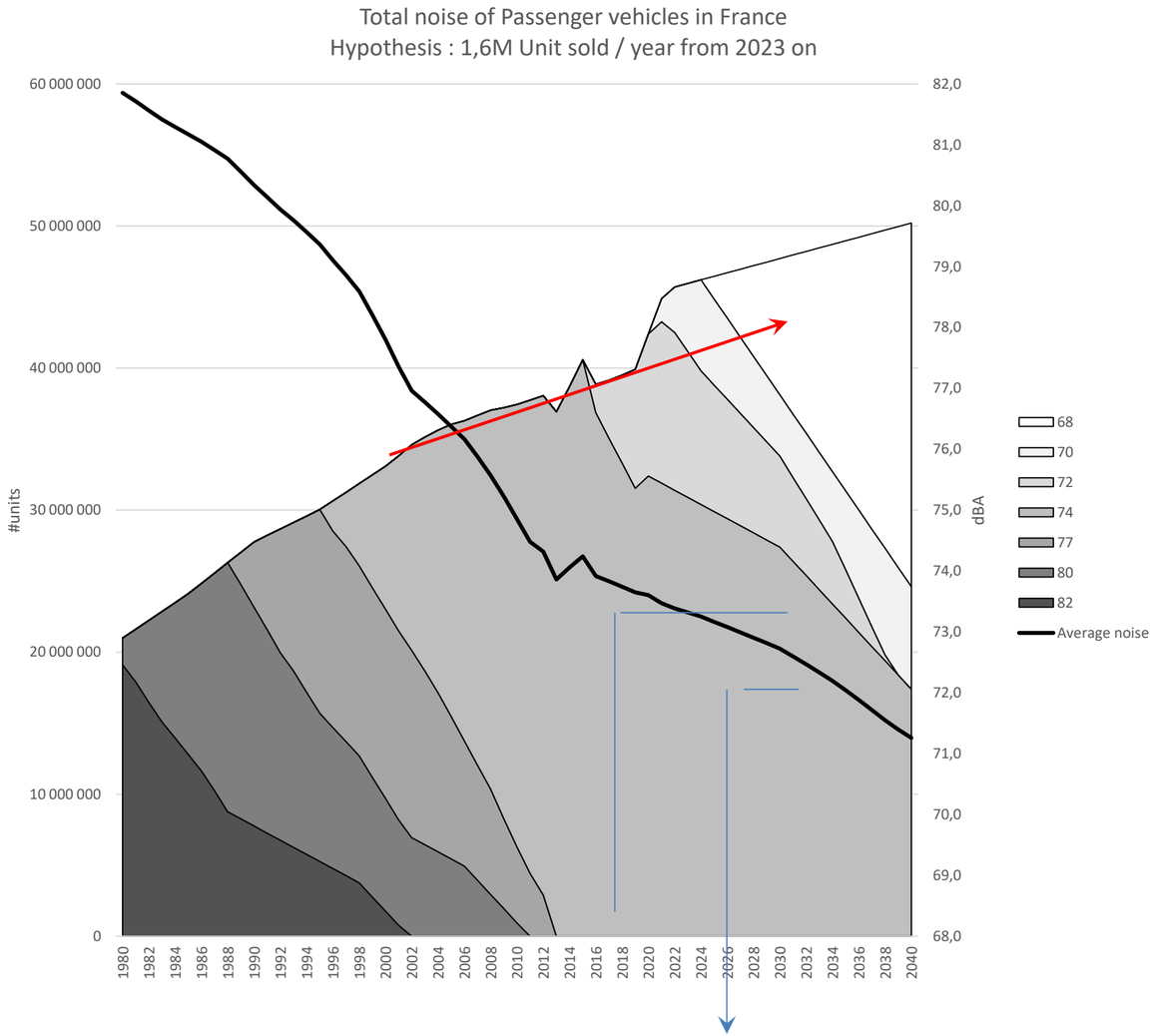

On real roads (R1/2/3), the road/tire interaction is dominant even for old vehicles.
This dominance is even greater with rougher roads

As a result, the total emission of vehicles on real roads is coming to an asymptote : 2 dB gained on homologation is at best 1 dB on the best road, and almost no gain on medium or rough roads.

# FRENCH PASSENGER CAR MARKET PROSPECTIVE




First dB Drop = 2032
(+9 years)




First dB Drop = 2033
(+10 years)