

PROJET LIFE COOL & LOW NOISE ASPHALT

SUIVI DES PERFORMANCES ACOUSTIQUES DES REVÊTEMENTS DE CHAUSSÉES À FAIBLE BRUIT DANS LE CENTRE-VILLE DE PARIS

Journées Techniques Acoustique et Vibrations 8 juin 2021





LIFE PROJECT: COOL & LOW NOISE ASPHALT

- **Period: 01/07/2017-30/06/2023**
- **Coordinator: City of Paris**
- **Associated partners: Bruitparif / Colas / Eurovia**
- □ Budget: 2,345 M€
- **Cofunding at 60% by the European Commission**
- **www.life-asphalt.eu**











LIFE PROJECT: COOL & LOW NOISE ASPHALT

Noise aspect

- Reduce the noise pollution generated by road traffic on urban roads thanks to these new pavements
- ✓ By reducing the noise emitted by the contact of vehicle tires with the asphalt (rolling noise)

Thermal aspect

- ✓ Mitigate the effect of Urban Heat Islands (UHIs)
- ✓ By testing the surface water retention capacities, the micro-climatic impacts generated by their spraying with non-potable water during hot periods, and the effects of their color (albedo) on heat restitution.
- The new coatings tested present a micro-granularity allowing to retain a water film which will refresh the air by evaporating

Durability aspect

- Reinforce the durability of these coatings in terms of their sound, mechanical and thermal properties
- While limiting their additional cost compared to conventional coatings, in order to promote the dissemination of these solutions in urban areas



LIFE PROJECT: COOL & LOW NOISE ASPHALT



de résistance mécanique

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DES BÉNÉFICES RÉELS ET DURABLES POUR LES PARISIENS





Un cadre de vie plus serein, favorable aux déplacements doux Un sommeil amélioré et une santé préservée

LIFE PROJECT: COOL & LOW NOISE ASPHALT

3 pilot sites in Paris

- ✓ Oriented E/W for the thermal purposes
- ✓ Strong noise exposure
- ✓ High density of population
- ✓ Speed limitation : 50 km/h
- ✓ Road works already planned
- ✓ Other criteria (light or no slope, non-drinkable water available...)
- **400 m long per site**
 - ✓ 200 m standard pavement
 - ✓ 200 m with experimental formula
- Long-term monitoring
 - ✓ Continuous meteorological sensors
 - ✓ Continuous acoustic sensors on facades
 - + periodic campaigns using CPX method
 - Periodic mechanical tests in order to monitor the durability of the new asphalts









Noise aspect

- Reduce the noise pollution generated by road traffic on urban roads thanks to these new pavements
- ✓ By reducing the noise emitted by the contact of vehicle tires with the asphalt (rolling noise)
- ✓ CPX measurements
- ✓ Noise façade buildings measurements







LIFE PROJECT: COOL & LOW NOISE ASPHALT The project's objectives

The Close-Proximity Method

Internal Méthod Laboratory PTE.17.ESM

Mesure du bruit de roulement méthode CPX

Zone d'essai Tronçon de chaussée (20 m)

Pas d'acquisition

- Zone d'essai = tronçon de chaussée
- Pas d'acquisition = 2m et caractérisé sur la longueur de chaque tronçon de 20m.

	Mesures CPX champ proche Revêtement Référence	Mesures CPX champ proche Revêtement innovant	Résultats d'évaluation
Mesures initiales	LV	Réf	
2018 Mesures point zéro	LVRéf A0	LVRéf B0	Gains acoustiques juste après la pose référence / initial : LVRéfA0 - LVRéf formulation test / initial : LVRéfB0 - LVRéf formulation test / référence : LVréfB0 - LVRéf A0

Initial measurements carried out in May 2017 and May 2018

Measurements after installation in 2019:

- Rue de Courcelles: nuit du 26 au 27 mars 2019 (M+5)
- Rue de Frémicourt: nuit du 27 au 28 mars 2019 (M+5)
- Rue Lecourbe: nuit du 01 au 02 avril 2019 (M+6)

Measurements in 2020:

- Rue de Courcelles: nuit du 16 au 17 septembre 2020 (M+23)
- Rue de Frémicourt: nuit du 10 au 11 août 2020 (M+22)
- Rue Lecourbe: nuit du 06 au 07 juillet 2020 (M+22) et du 11 au 12 août 2020

After change of coating PUMA







LIFE PROJECT: COOL & LOW NOISE ASPHALT Results after two year (2020)

Rolling noise reduction with new asphalt mixes (CPX)

Speed 50 km/h	Compared to	the existing	Compared to	the reference
Rolling noise Δ LAeq	2019	2020	2019	2020
LIFE objectives	-5	≤ -3	-3	≤ -2
rue Frémicourt (SMAphon)	-4,4	-2,3	-3,5	-2,2
rue de Courcelles (BBphon+)	-4,7	-2,4	-3,3	-1,5
rue Lecourbe (PUMA)	-2,1	-1,9	-0,1	+0,3

Speed 30 km/h	Compared to	the existing	Compared to	the reference
Rolling noise Δ LAeq	2019	2020	2019	2020
rue Frémicourt (SMAphon)	-3,6	-1,8	-2,9	-1,8
rue de Courcelles (BBphon+)	-4,2	-1,8	-2,3	-0,6
rue Lecourbe (PUMA)	-2,8	-2,4	-0,1	+0,3



• For the PUMA, a reference (ACR 0/10 AC2) that is not representative of reality does not allow the performance of the new pavement to be evaluated (at the end of 2019).



• Reference asphalt (ACR 0/10 AC2) correction work was carried out during the summer of 2020.



LIFE PROJECT: COOL & LOW NOISE ASPHALT Recall : first results (2018)



- Reductions in rolling noise clearly observable during the passage of isolated vehicles at night
- ✓ Road traffic speeds relatively higher
- Other sources of noise reduced (works, human activity, etc.)
- LA10 22h-6h indicator clearly reflects the reduction associated with rolling noise
- ✓ For the other periods of the day, the acoustic indicators show a reduced benefit









LIFE PROJECT: COOL & LOW NOISE ASPHALT Recall : first results (2018)

• LAeq, LA95, LA90, LA50, LA10 et LA05

- Hour period
- o Periods 6h-18h, 18h-22h, 22h-6h, 6h-22h and 24 hours



The LA5 and LA90 indicators correspond to the sound levels reached or exceeded during respectively 5 and 90% of the measurement time (1 h in our case).

The LA10 and LA05 levels correspond to the noise peaks.

During the night, on the LIFE COOL & LOW NOISE ASPHALT experimental sites, they correspond to the passages of isolated vehicles.





14

Monitoring the acoustic performance of low-noise pavements

LIFE PROJECT: COOL & LOW NOISE ASPHALT Recall : first results (2018)

Traffic conditions : rue de Courcelles

Average flow (south to north)

Average speed (Floating Car Data)

Cycle horaire journalier moyen



rue de Courcelles - tous jours confondus ■MOY 30 25 20 Vitesse (km/h) 1.5 10 5 22h-23h 23h-24h 410-40C 01 h-02h 02h-03h 03h-04h 04h-05h 06h-07h 07h-08h 08h-09h 09h-10h 111-401 11h-12h 12h-13h 13h-14h 14h-15h 15h-16h 16h-17h 17h-18h 18h-19h 19h-20h 20h-21h 05h-06h 21h-22h



LIFE PROJECT: COOL & LOW NOISE ASPHALT Results after one year (2019)

Rolling noise reduction with new asphalt mixes





LIFE PROJECT: COOL & LOW NOISE ASPHALT Results after one year (2019)

Rolling noise reduction with new asphalt mixes



LIFE PROJECT: COOL & LOW NOISE ASPHALT Results after one year (2019)

Rolling noise reduction with new asphalt mixes



BBphon+ vs REFERENCE



LIFE PROJECT: COOL & LOW NOISE ASPHALT Results after one year (2019)

Rolling noise reduction with new asphalt mixes



LIFE PROJECT: COOL & LOW NOISE ASPHALT Results after one year (2019)

Rolling noise reduction with new asphalt mixes

Rolling noise	Compared to the existing		Compared to the reference	
Δ LA10 22h-6h	After installation (2018)	One year after (2019)	After installation (2018)	One year after (2019)
LIFE objectives	-3	≤ -2	-2	≤ -1
rue Frémicourt (SMAphon)	-4,3*	-3.9*	-2,3	-1.8
rue de Courcelles (BBphon+)	-3,5*	-2.7*	-2,8	-2.6
rue Lecourbe (PUMA)	-1,2*	-1.1*	-	-



* Temperature correction (0,1 dB/°C)

- For the PUMA, a reference (ACR 0/10 AC2) that is not representative of reality does not allow the performance of the new pavement to be evaluated (at the end of 2019).
- Reference asphalt (ACR 0/10 AC2) correction work was carried out during the summer of 2020.
- Long-term monitoring will document the evolution of acoustic performance over time.

Lnight reduction with new asphalt mixes

	Compared to the reference			
Δ Lnight	After installation	One year after		
	(2018)	(2019)		
SMAphon	-1,3	-1,1		
BBphon+	-1,4	-1,1		



LIFE PROJECT: COOL & LOW NOISE ASPHALT Results after one year (2019)

- The first results show a significant reduction in noise levels associated with tire / road contact noise during the night period.
- However, the ability to distinguish sources of noise by the human ear, can make it possible to feel the benefit provided by innovative the innovative asphalt mixes.
- Survey of users and residents of Frémicourt Street (October 2019)
 - ✓ 63% noted a reduction in road noise following the change of road surface
 - Among them, 67% consider this reduction to be medium or significant

□ 6	2 rue de Courcelles	37 rue Fremicourt 236 rue Lecourbe 38 rue de Courcelles	rue Fremicourt rue Lecourbe rue de Courcelle	s
1. Fr	équentation du site			
	Usage occasionnel	Usage fréquent	₩Résident•e	
4. Si	oui, diriez-vous qu'elle corr	espond plutôt à la con	nposante : nt (pneumatique / chauss	ée)
5. Pc	uvez-vous décrire en quelq	ues mots ce qui a char	ngé selon vous ?	
	ncenco de loval			·····

sur le questionnaire en ligne : https://www.life-asphalt.eu



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LIFE PROJECT: COOL & LOW NOISE ASPHALT Works in 2021

Year 2020

- □ Analysis outside the confinement period
- □ Specific analysis of the confinement period
- □ Importance of traffic data (especially speed)

Repair work on the reference asphalt rue Lecourbe

- July 21 to 23, 2020 (rabotage et cloutage)
- **9** septembre 2020 (marquage)
- **Gamma** September 9, 2020 (before and after work)
- **D** PUMA performance analysis vs Reference asphalt

Action C2 : Quantification of socio-economic impacts

- Part 1: Comparative analysis of the cost of new asphalt for a client or a road manager compared to other types of coatings
- **Part 2: Determination of the benefits observed in relation to noise reduction**
- Part 3: Determination of the benefits observed in connection with the reduction of the urban heat island phenomenon and adaptation to heatwave episodes

Publication of results





LIFE PROJECT: COOL & LOW NOISE ASPHALT Results after one year (2019)

- **Example : Bbphon+ (rue de Courcelles)**
- Decrease of 1,1 dB(A) on Lnight
- □ Impact on sleep disturbance

To come: Quantification of socio-economic impacts (action C2)

Exposure-response function for sleep disturbance (HSD)











LIFE PROJECT: COOL & LOW NOISE ASPHALT Oral presentation in Congress by Bruitparif

- □ JTR 2018 (February 2018, Nantes, France)
- **CFA 2018 (April 2018, Le Havre, France)**
- **L** Euronoise 2018 (May 2018, Crete, Greece)
- Assises de la mobilié en Ile-de-France (September 2019, Paris, France)
- **Journée technique CEREMA 2019 (April 2019, Saint-Ouen, France)**
- □ Matinales Route de France (April 2019, Paris, France)
- **E-Congress Forum Acusticum (December 2020, Lyon, France)**
- **JTAV 2021 (June 2021)**
- **Euronoise 2021 (October 2021, Funchal, Madeira, Portugal)**
- □ Assises nationales de l'environnement sonore (France)



Thank you for your attention !

www.bruitparif.fr

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