# LIFE E-VIA

**E**lectric **V**ehicle no**I**se control by **A**ssessment and optimisation of tyre/ road interaction

*www.life-evia.eu*

## LIFE E-VIA PROJECT

## Internal meeting – Reggio Calabria 11th October 2021

## Vienrose Ingegneria

## Responsible for actions B5, D1 and D2

**Raffaella Bellomini**, Sergio Luzzi, **Chiara Bartalucci**, **Sara Delle Macchie**, Lucia Busa, Francesco Borchi, Gianfrancesco Colucci

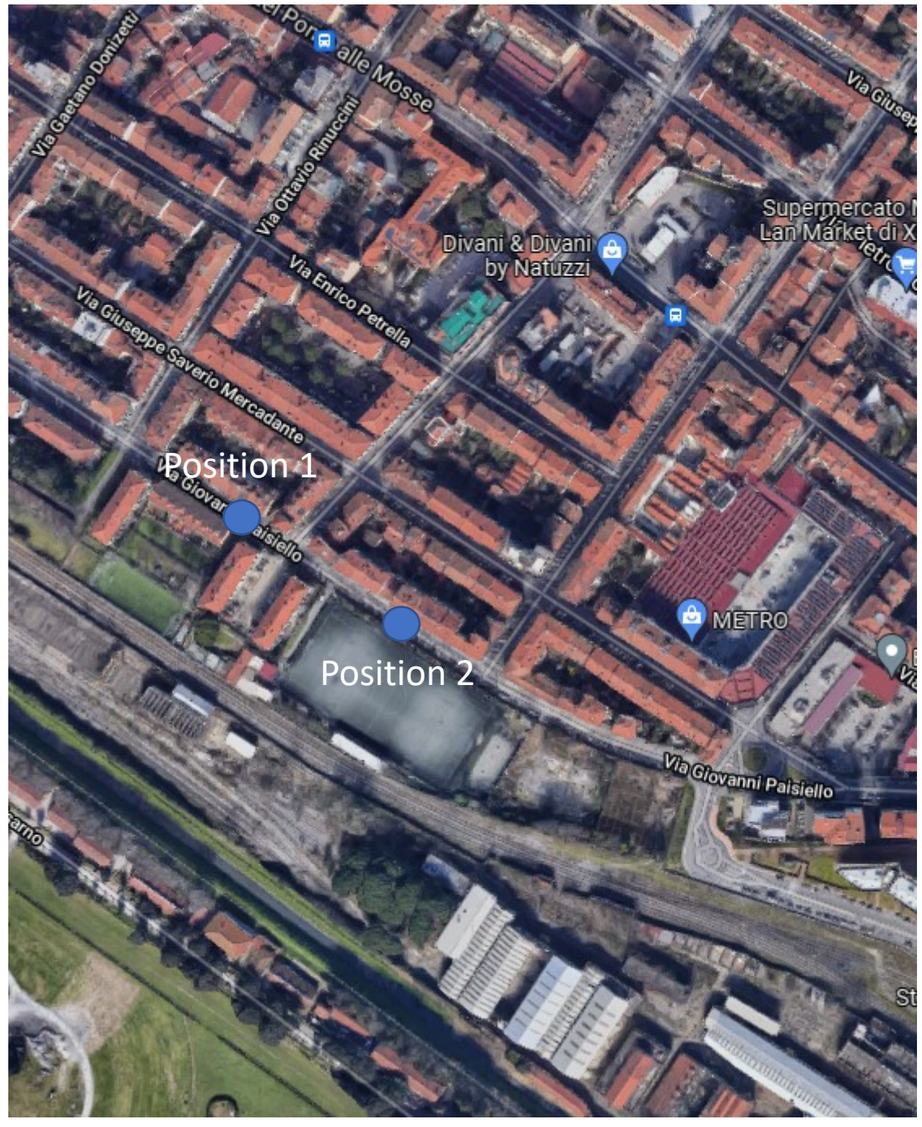
With the contribution of the LIFE programme of the European Union

**LIFE18 ENV/IT/000201**

# ACTION B3

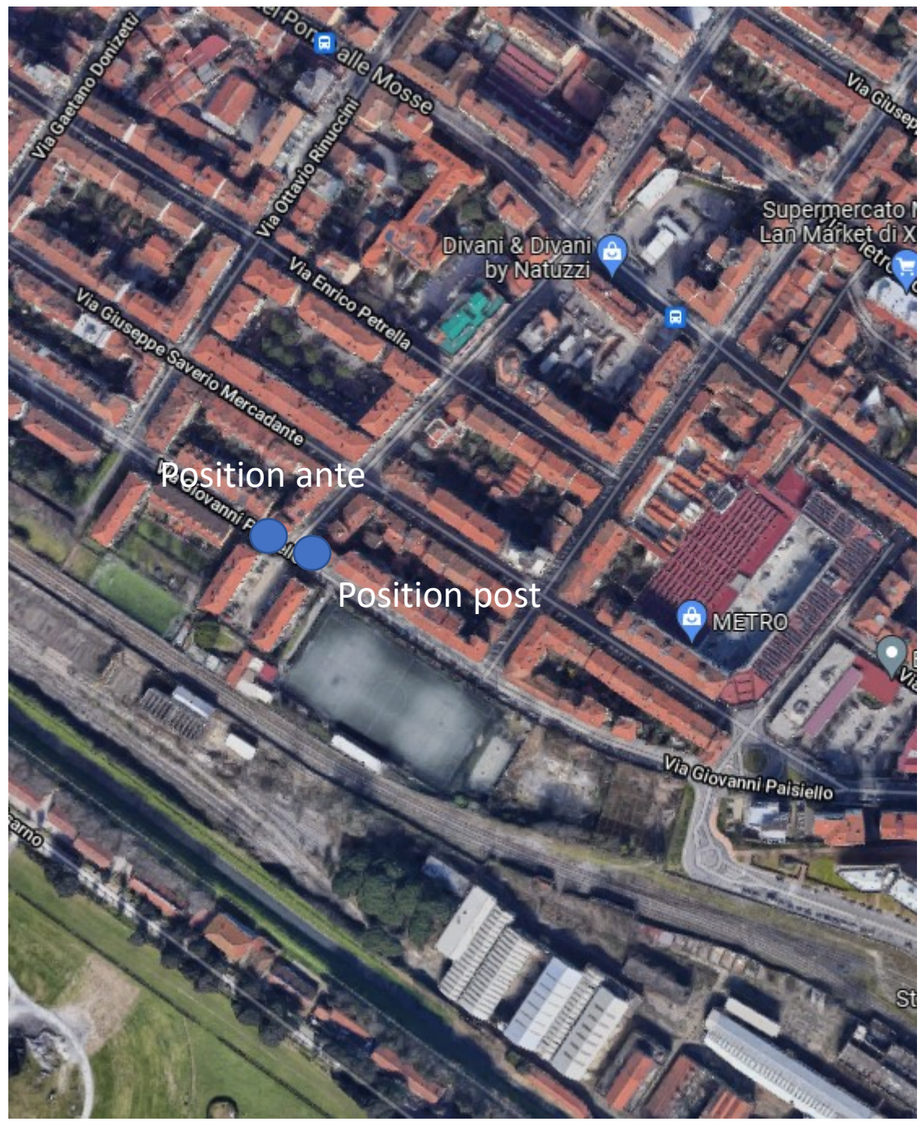
# Ante and post-operam noise measurements campaign

Although not foreseen in the original project proposal, a long-term (2 weeks) ante and post- noise monitoring campaign has been carried out in two different monitoring positions.
1 monitoring position has been established in correspondence to the section of the road that has been interested by the LIFE E-VIA asphalt and the other one in correspondence to the section of the road interested by the new but standard asphalt.

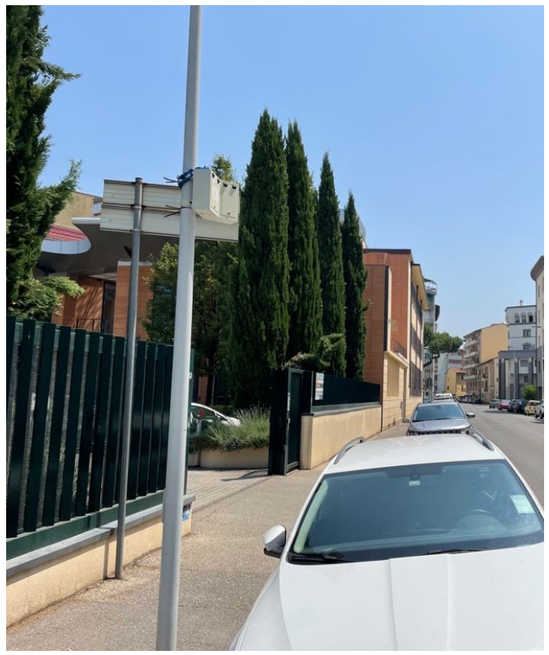


# Ante and post-operam noise measurements campaign

A traffic counter has been positioned on light poles both in the ante and post-operam phase in similar positions, in order to be able to weight measured noise levels according to traffic flows in different periods.



# Ante and post-operam noise measurements campaign



Ante-operam noise measurement campaign has been carried out by VIENROSE

Period: 23rd June – 1st July 2021

Post-operam noise measurement campaign has been carried out by I-POOL

Period: 17-28th September 2021

## Data analysis (VIENROSE): ONGOING

**Results are expected within the current week**


# ACTION B5

Three different templates in Italian/English language have been drafted, they will be optimized as soon as activities will be definitively planned:

**B5.1 Soundwalks and interview during the EV festival**

**B5.2 Interview in the pilot road on an electric taxi**

**B5.3 Interview on E[illegible]ent road pavements**

**B5.3 Ante- and post-operam interviews with residents**

**LIFE E-VIA**

"Electric Vehicle noIse control by Assessment and optimisation of tyre/road interaction"

LIFE18 ENV/IT/000201

| | |
|---|---|
| **Deliverable** | Report on Action B5 |
| **Content** | Three questionnaire formats |
| **Action/Sub-action** | B5.1/B5.2/B5.3 |
| **Status - date** | 30-09-2020 |



| | |
|---|---|
| **Authors** | Raffaella Bellomini, Sergio Luzzi, Francesco Borchi, Lucia Busa, Sara Delle Macchie, Gianfrancesco Colucci |
| **Beneficiary** | VIENROSE |
| **Contact person** | Raffaella Bellomini |
| **E-mail** | raffaella.bellomini@vienrose.it |
| **Project Website** | https://life-evia.eu/ |

# B5.3 Ante- and post-operam interviews with residents

COMUNE DI FIRENZE

DIREZIONE AMBIENTE
SERVIZIO Rifiuti, Igiene Pubblica, Ambientale e del Territorio

P.O. Igiene Pubblica, Ambientale e Vivibilità Urbana

Firenze, 2 luglio 2021

**Oggetto: Avviso somministrazione questionario ai residenti di via Paisiello**

Gentile cittadina/o,

il comune di Firenze è il capofila del progetto LIFE E-VIA (Electric Vehicle noIse control by Assessment and optimization of tyre/road interaction/Controllo del rumore dei veicoli elettrici mediante valutazione e ottimizzazione dell'interazione pneumatico/strada – www.life-evia.eu) co-finanziato dall'Unione Europea. Il progetto è iniziato nel 2019 e si concluderà ad inizio 2023.

Fra le azioni che verranno realizzate nel progetto, vi è la stesa di un asfalto ottimizzato per la riduzione del rumore in un'area pilota, individuata dal Comune in un tratto di Via Paisiello, compreso tra via Rinuccini e via Vivaldi. Tra i vari obiettivi del progetto vi è anche quello di sensibilizzare i cittadini sui temi dell'inquinamento acustico e sugli effetti sulla salute, spiegando le opportunità offerte dai veicoli elettrici attraverso eventi specifici di divulgazione e promozione e indagando anche sulla la percezione del rumore da parte delle persone, mediante l'utilizzo della metodologia di analisi del paesaggio sonoro.

A tal fine, un incaricato dal comune di Firenze e da Vie en.ro.se Ingegneria si presenterà presso il suo domicilio, nei giorni 6 e 7 luglio 2021 e le consegnerà un breve questionario da compilare al momento, fornendole qualche semplice istruzione. Per la compilazione saranno necessari al massimo 5 minuti. Il questionario sarà poi ritirato dallo stesso incaricato. Si precisa che l'incaricato non accederà alla sua abitazione, ma sosterà all'esterno e sarà dotato di tesserino di riconoscimento.

Il trattamento dei dati personali avverrà in modo riservato e la successiva pubblicazione dei risultati sarà realizzata con modalità tali da non consentire la riconducibilità delle risposte espresse alla persona intervistata.

La ringraziamo anticipatamente per la cortese e preziosa collaborazione.

Per ulteriori informazioni:

Ing. Chiara Bartalucci – 055 4379140

Dott.ssa Gessica Pecchioni – 055 2625360

**Il Responsabile**

**Dr. Arnaldo Melloni – Direzione Ambiente comune di Firenze**

A couple of days before the questionnaires' delivering, an informative letter has been provided to residents.

# B5.3 Ante-operam interviews with residents

COMUNE DI FIRENZE

DIREZIONE AMBIENTE
SERVIZIO Rifiuti, Igiene Pubblica, Ambientale e del Territorio

P.O. Igiene Pubblica, Ambientale e Vivibilità Urbana

Firenze, 7 luglio 2021

**Oggetto: Compilazione e ritiro questionario progetto LIFE E-VIA**

Gentile cittadina/o,

come da comunicazione scritta ricevuta lo scorso 5 luglio, nell'ambito del progetto europeo LIFE E-VIA – www.life-evia.eu) coordinato dal comune di Firenze, è in corso un'indagine sulla percezione del rumore rivolta ai residenti di via Paisiello.

Alleghiamo alla presente il questionario che le chiediamo gentilmente di compilare. Le chiediamo, inoltre, di contattare l'incaricato dal comune di Firenze e da Vie en.ro.se Ingegneria (Ing. Chiara Bartalucci – Dott.ssa Giulia Iannuzzi, tel. 055 4379140, e-mail chiara.bartalucci@vienrose.it) per concordare il ritiro del questionario.

Nel caso in cui abbia già ricevuto il questionario nei giorni 6 e 7 luglio 2021 e lo abbia già compilato, le chiediamo, analogamente, di contattare l'incaricato dal comune di Firenze e da Vie en.ro.se Ingegneria (Ing. Chiara Bartalucci – Dott.ssa Giulia Iannuzzi, tel. 055 4379140, e-mail chiara.bartalucci@vienrose.it) per concordare il ritiro.

Ricordiamo che il trattamento dei dati personali avverrà in modo riservato e la successiva pubblicazione dei risultati sarà realizzata con modalità tali da non consentire la riconducibilità delle risposte espresse alla persona intervistata.

La ringraziamo anticipatamente per la cortese e preziosa collaborazione.

Per ulteriori informazioni:

Ing. Chiara Bartalucci – 055 4379140

Dott.ssa Gessica Pecchioni – 055 2625360

**Il Responsabile**

**Dr. Arnaldo Melloni – Direzione Ambiente comune di Firenze**

*LIFE/ENV/IT000201 LIFE E-VIA*

COMUNE DI FIRENZE  Vie en.ro.se. Ingegneria

**THE PROJECT**

Exposure data from the European Environment Agency demonstrate that more than 100 million EU citizens are affected by high noise levels negatively impacting human health. Traffic noise alone is harmful to the health of almost every third person in the World Health Organization European Region. 20% of Europeans are regularly exposed to night sound levels that could significantly damage health, especially in urban areas. The introduction of electric mobility is widely viewed as having the potential to reduce noise in urban areas, but the noise generated by tyres rolling on the road nevertheless needs careful study and further reduction. As emerged in Noise in Europe Conference (April 2017) and in the WHO guidelines published in October 2018, the increased stringency of EU at source standards needs to be balanced against other effective measures such as road surface and/or tyre improvements and urban planning measures as well. One of the solutions universally recognized as the best to reduce noise in urban areas, from both the point of view of noise and air quality, is the introduction of electric mobility. Therefore, the project **LIFE E-VIA** (Electric Vehicle noise control by Assessment and optimization of tyre/road interaction– www.life-evia.eu) intends to: - tackle noise pollution from road traffic noise focusing on a future perspective in which electric and hybrid vehicles will be a consistent portion of flow; - combine knowledge of road optimization and tyre development in order to test an optimized solution for reducing noise in urban areas and Life Cycle Cost with respect to actual best practices . The Project LIFE E-VIA, co-financed by the European Union through the Life programme, started in July 2019 and will end in January 2023. Il Progetto, co-finanziato dall'Unione Europea attraverso il Programma LIFE, ha avuto inizio a luglio 2019 e terminerà a gennaio 2023. The project is coordinated by the Municipality of Florence and involves as partners the Mediterranean University of Reggio Calabria, Continental, Vie en.ro.se Ingegneria, University Gustave Eiffel and I-POOL.

**THE SURVEY**

*The goal of this questionnaire is to collect data on the perception of the soudscape. In addition to some initial general questions, we kindly ask you to answer 10 questions related to the perception of the soundscape close to your home. Your personal data* ***will be treated as strictly confidential and the publication of the survey results will ensure the non****-recognition of the responses. Please answer all questions in order, following the instructions provided.*

**PERSONAL INFORMATION**

I1. Age: ☐ 18-25 ☐ 26-40 ☐ 41-55 ☐ 56-65 ☐ 66-75 ☐ >75

I2. Gender: ☐ Female ☐ Male

I3. Education: ☐ Primary school ☐ Middle School ☐ High School ☐ Bachelor's Degree ☐ Ph.D. ☐ Master

I4. Occupation: _____

I5. City of Residence: _____

I6. Nationality: _____

**D1. Does your home have windows overlooking via Paisiello?** ☐ No ☐ Yes

**D2. If so, which are the rooms that overlook via Paisiello?**
(Make an X mark in the box for each room overlooking via Paisiello)

# B5.3 Ante-operam interviews with residents

| *Room* | *Overlooking via Paisiello* |
|---|---|
| Bedroom | ☐ |
| Single Bedroom | ☐ |
| Livingroom | ☐ |
| Kitchen | ☐ |
| Bathroom | ☐ |
| Other: ..... (Please specify) | ☐ |

**D3. How do you assess the intensity of the following four types of sound in the soundscape around you?**
(make an X mark for each type of sound in the box that best matches your opinion)

| *Type of sound* | *Very Low* | *Low* | *Fair* | *High* | *Very High* |
|---|---|---|---|---|---|
| ***Traffic*** (eg. Cars, motorcycles, clacson ...) | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Mechanical/electrical sounds*** (es. music, industries, sirens, constructions...) | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Anthropic sounds*** (es. voices, laughter, children, steps...) | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Nature sounds*** (es. wind, rustling leaves, birds ...) | ☐ | ☐ | ☐ | ☐ | ☐ |

**D4. How do you assess the quality of the soundscape around you?**
(Please, tick the box that best matches your opinion)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Very Bad*** | | | | | | | | | | ***Excellent*** |

**D5. Do you think the soundscape around you is appropriate for this place?**
(Please, tick the box that best matches your opinion)

| ***Absolutely inappropriate*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Completely appropriate*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**D6. To what extent does it agree with the following statements about the sound environment around it??**
(Please tick the box that best matches your opinion for each row)

| The soundscape is: | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|
| ***Enjoyable*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Chaotic*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Interesting*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Boring*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Relaxing*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Disturbing*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Lively*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Monotonous*** | ☐ | ☐ | ☐ | ☐ | ☐ |

**D7. How do you assess the quality of the urban landscape around you?**
(Please tick the box that best matches your opinion)

| ***Very Bad*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Excellent*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**D8. Do you think that implementation of interventions for the reduction of noise could increase the value of your home?**
(Please tick the box that best matches your opinion)

| ***Not at all*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Surely*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**D9. Do you think that your health can be affected by the reduction of noise levels close to your home?**
(Please tick the box that best matches your opinion)

| ***Not at all*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Surely*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**D10. How do you assess your sensitivity to sounds?**
(Please tick the box that best matches your opinion)

| ***Very low*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Very High*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

# B5.3 Post-operam interviews with residents

COMUNE DI FIRENZE

DIREZIONE AMBIENTE
SERVIZIO Rifiuti, Igiene Pubblica, Ambientale e del Territorio

P.O. Igiene Pubblica, Ambientale e Vivibilità Urbana

Firenze, 20 settembre 2021

**Oggetto: Compilazione e ritiro questionario post-operam progetto LIFE E-VIA**

Gentile cittadina/o,

come da comunicazione scritta ricevuta lo scorso 5 luglio, nell'ambito del progetto europeo LIFE E-VIA – www.life-evia.eu) coordinato dal comune di Firenze, è in corso un'indagine sulla percezione del rumore rivolta ai residenti di via Paisiello.

In aggiunta al questionario da lei gentilmente compilato a luglio prima che venisse realizzata la stesa di un asfalto ottimizzato per la riduzione del rumore in un tratto di Via Paisiello, le chiediamo cortesemente di compilare un nuovo breve questionario che alleghiamo alla presente.

Per qualsiasi dubbio riguardo alla compilazione può contattare l'incaricato dal comune di Firenze e da Vie en.ro.se Ingegneria (Ing. Chiara Bartalucci e-mail chiara.bartalucci@vienrose.it – Dott.ssa Giulia Iannuzzi e-mail giulia.iannuzzi@vienrose.it, tel. 055 4379140).

Una volta compilato da lei ed eventualmente dai suoi familiari, le chiediamo gentilmente di lasciare i/il questionari/o nella cassetta delle lettere dell'impianto sportivo M. Pacini dell'A.S.D.L.F. Firenze Calcio, in via Paisiello 15r, entro il 28/09/2021.

Ricordiamo che il trattamento dei dati personali avverrà in modo riservato e la successiva pubblicazione dei risultati sarà realizzata con modalità tali da non consentire la riconducibilità delle risposte espresse alla persona intervistata.

La ringraziamo anticipatamente per la cortese e preziosa collaborazione.

Per ulteriori informazioni:

Ing. Chiara Bartalucci (Vie en.ro.se Ingegneria) – 055 4379140

Dott.ssa Gessica Pecchioni (Comune di Firenze) – 055 2625360

**Il Responsabile**

**Dr. Arnaldo Melloni – Direzione Ambiente comune di Firenze**

*LIFE/ENV/IT000201 LIFE E-VIA*
*Progetto co-finanziato dalla Commissione Europea nell'ambito del Programma LIFE+2018.*

COMUNE DI FIRENZE — Vie en.ro.se. Ingegneria

**THE PROJECT**

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**PERSONAL INFORMATION**

I1. Age: ☐ 18-25 ☐ 26-40 ☐ 41-55 ☐ 56-65 ☐ 66-75 ☐ >75

I2. Gender: ☐ Female ☐ Male

I3. Education: ☐ Primary school ☐ Middle School ☐ High School ☐ Bachelor's Degree ☐ Ph.D. ☐ Master

I4. Occupation: _____

I5. City of Residence: _____

I6. Nationality: _____

**D1. Does your home have windows overlooking via Paisiello?** ☐ No ☐ Yes

**D2. If so, which are the rooms that overlook via Paisiello?**
(Make an X mark in the box for each room overlooking via Paisiello)

# B5.3 Post-operam interviews with residents

| *Room* | *Overlooking via Paisiello* |
|---|---|
| Bedroom | ☐ |
| Single Bedroom | ☐ |
| Livingroom | ☐ |
| Kitchen | ☐ |
| Bathroom | ☐ |
| Other: ..... (Please specify) | ☐ |

**D3. How do you assess the intensity of the following four types of sound in the soundscape around you?**
(make an X mark for each type of sound in the box that best matches your opinion)

| *Type of sound* | *Very Low* | *Low* | *Fair* | *High* | *Very High* |
|---|---|---|---|---|---|
| ***Traffic*** (eg. Cars, motorcycles, clacson ...) | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Mechanical/electrical sounds*** (es. music, industries, sirens, constructions...) | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Anthropic sounds*** (es. voices, laughter, children, steps...) | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Nature sounds*** (es. wind, rustling leaves, birds ...) | ☐ | ☐ | ☐ | ☐ | ☐ |

**D4. How do you assess the quality of the soundscape around you?**
(Please, tick the box that best matches your opinion)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Very Bad*** | | | | | | | | | | ***Excellent*** |

**D5. Do you think the soundscape around you is appropriate for this place?**
(Please, tick the box that best matches your opinion)

| ***Absolutely inappropriate*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Completely appropriate*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**D6. To what extent does it agree with the following statements about the sound environment around it??**
(Please tick the box that best matches your opinion for each row)

| The soundscape is: | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|
| ***Enjoyable*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Chaotic*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Interesting*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Boring*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Relaxing*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Disturbing*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Lively*** | ☐ | ☐ | ☐ | ☐ | ☐ |
| ***Monotonous*** | ☐ | ☐ | ☐ | ☐ | ☐ |

**D7. How do you assess the quality of the urban landscape around you?**
(Please tick the box that best matches your opinion)

| ***Very Bad*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Excellent*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**D8. To what extent has the noise of traffic you perceived changed in the past months?**
(Please tick the box that best matches your opinion)

| ***Increased*** | | | | | ***Stable*** | ***Decreased*** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Very much | | fairly | | slightly | | Slightly | | Fairly | | Very much |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

**D9. How do you assess the effects of the re-paving of via Paisiello with the new asphalt on the traffic sound you perceive from your home?**
(Please tick the box that best matches your opinion)

| ***Negative*** | | | | | ***Irrelevant*** | ***Positive*** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Very much | | fairly | | slightly | | Poco | | Abbastanza | | Molto |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

**D10. Do you think that the implementation of a low-noise asphalt has increased the value of your home?**
(Please tick the box that best matches your opinion)

| ***Not at all*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Surely*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**D11. Do you think that your health can be improved by the recent reduction of noise levels close to your home?**
(Please tick the box that best matches your opinion)

| ***Not at all*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Surely*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

**D12. How do you assess your sensitivity to sounds?**
(Please tick the box that best matches your opinion)

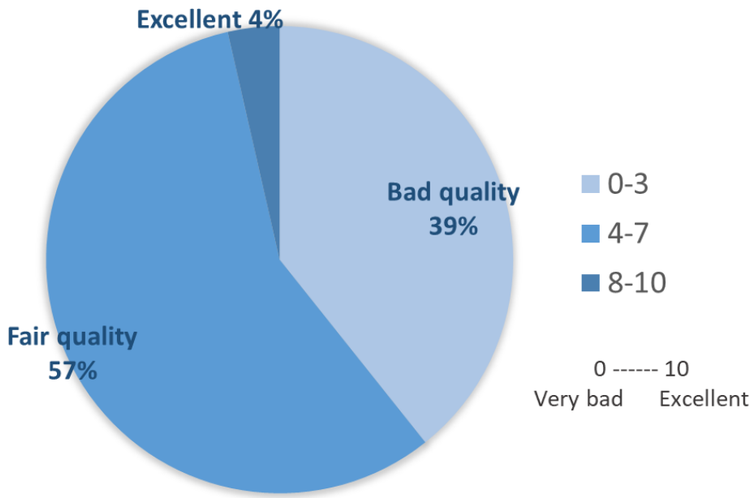
| ***Very low*** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ***Very High*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

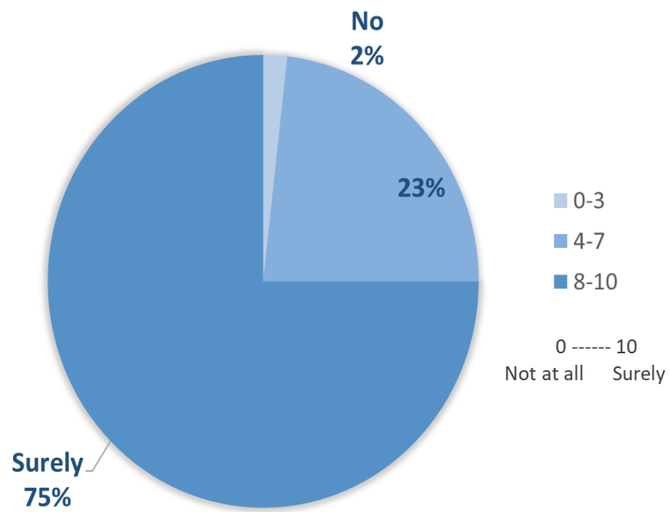
# Collected questionnaires

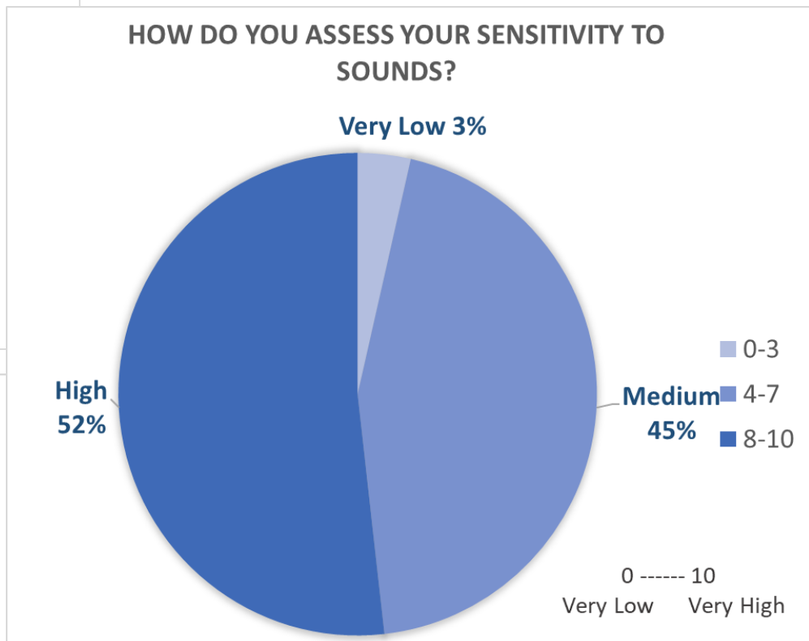
| Ante-operam | | Post-operam | | |
|---|---|---|---|---|
| Delivered | Filled | Delivered | Filled | Expected to be filled |
| 92 | 56 | 101 | 38 | ~ 18 |

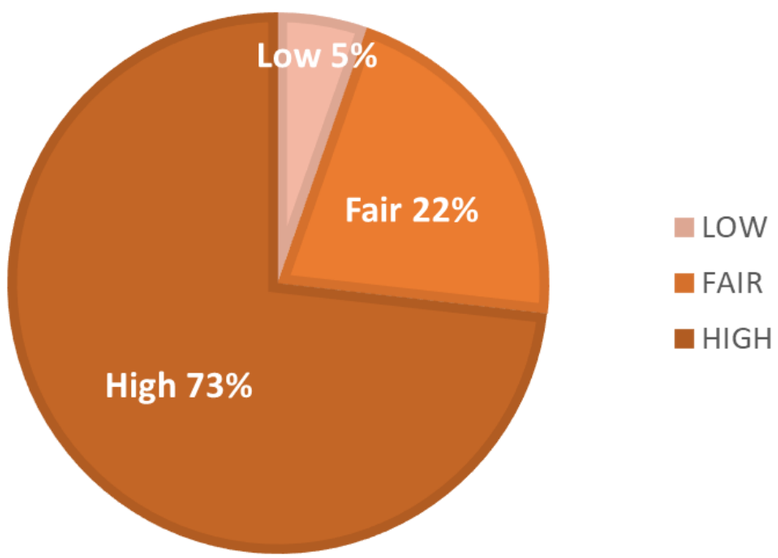
# LIFE18 ENV/IT/000201
# LIFE E-VIA PROJECT
# 11 October 2021 - Vie en.ro.se Ingegneria

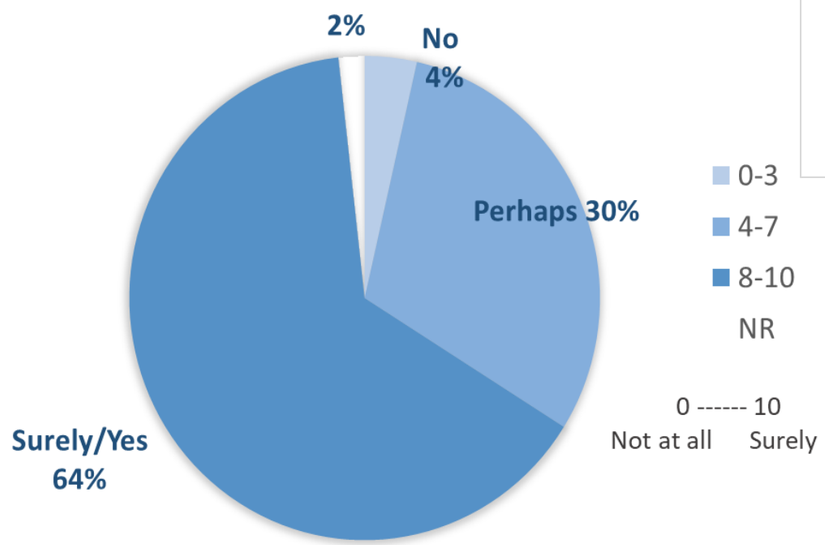
## Ante-operam analysis



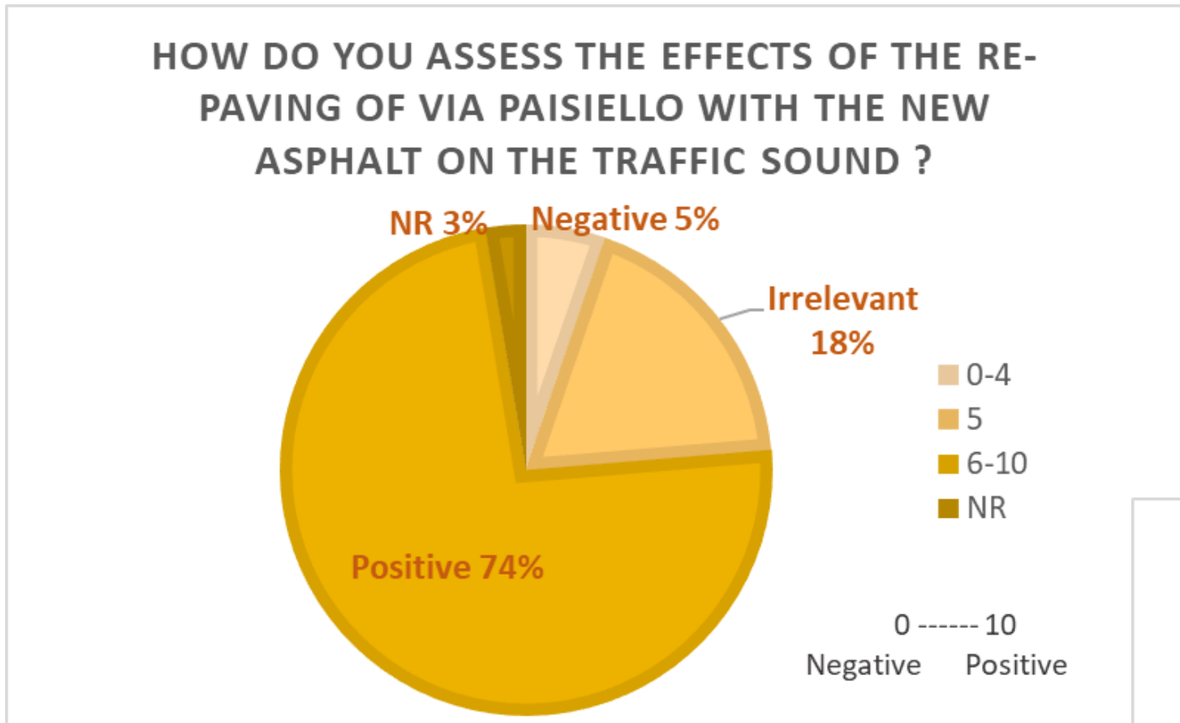



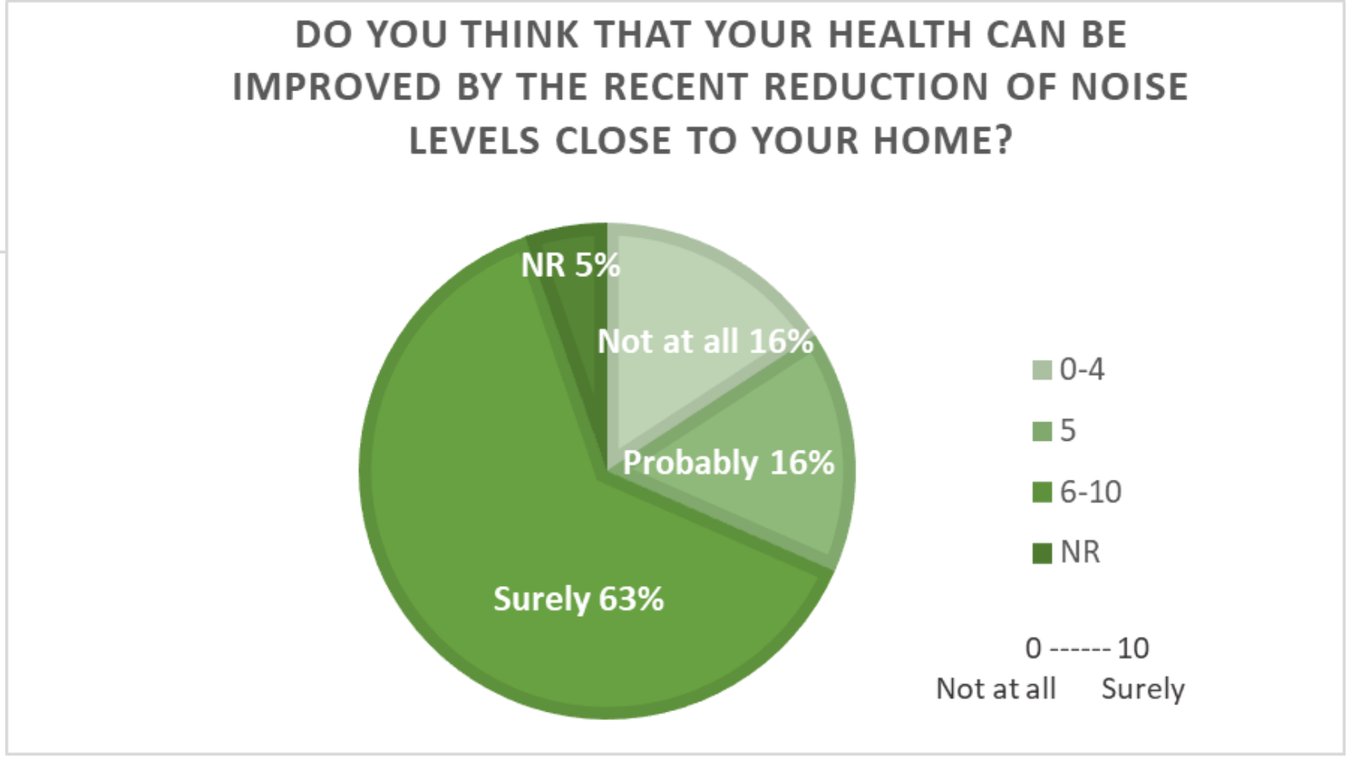



# LIFE18 ENV/IT/000201
# LIFE E-VIA PROJECT
# 11 October 2021 - Vie en.ro.se Ingegneria

## Preliminary post-operam analysis

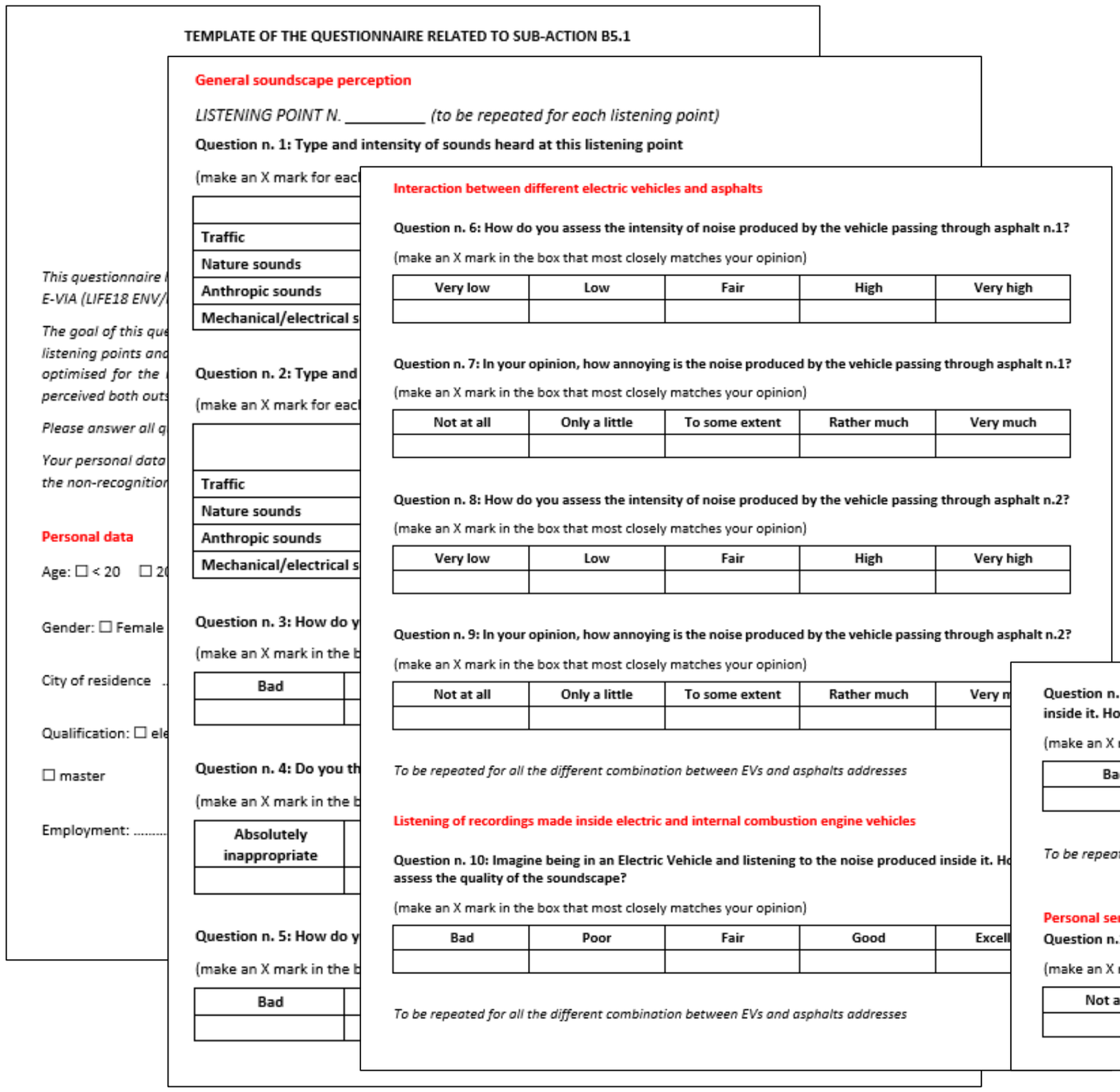



The overall analysis should be completed by mid-November.

# LIFE18 ENV/IT/000201
# LIFE E-VIA PROJECT
# 11 October 2021 - Vie en.ro.se Ingegneria

## B5.1 Soundwalks and interview



TEMPLATE OF THE QUESTIONNAIRE RELATED TO SUB-ACTION B5.1

*This questionnaire i*
*E-VIA (LIFE18 ENV/*

*The goal of this que*
*listening points and*
*optimised for the*
*perceived both outs*

*Please answer all q*

*Your personal data*
*the non-recognition*

**Personal data**

Age: ☐ < 20 ☐ 2

Gender: ☐ Female

City of residence ..

Qualification: ☐ ele

☐ master

Employment: .....

**General soundscape perception**

*LISTENING POINT N. _____ (to be repeated for each listening point)*

**Question n. 1: Type and intensity of sounds heard at this listening point**

(make an X mark for eac

| | |
|---|---|
| **Traffic** | |
| **Nature sounds** | |
| **Anthropic sounds** | |
| **Mechanical/electrical s** | |

**Question n. 2: Type and**

(make an X mark for eac

| | |
|---|---|
| **Traffic** | |
| **Nature sounds** | |
| **Anthropic sounds** | |
| **Mechanical/electrical s** | |

**Question n. 3: How do y**

(make an X mark in the b

| Bad | |
|---|---|
| | |

**Question n. 4: Do you th**

(make an X mark in the b

| Absolutely inappropriate | |
|---|---|
| | |

**Question n. 5: How do y**

(make an X mark in the b

| Bad | |
|---|---|
| | |

**Interaction between different electric vehicles and asphalts**

**Question n. 6: How do you assess the intensity of noise produced by the vehicle passing through asphalt n.1?**

(make an X mark in the box that most closely matches your opinion)

| Very low | Low | Fair | High | Very high |
|---|---|---|---|---|
| | | | | |

**Question n. 7: In your opinion, how annoying is the noise produced by the vehicle passing through asphalt n.1?**

(make an X mark in the box that most closely matches your opinion)

| Not at all | Only a little | To some extent | Rather much | Very much |
|---|---|---|---|---|
| | | | | |

**Question n. 8: How do you assess the intensity of noise produced by the vehicle passing through asphalt n.2?**

(make an X mark in the box that most closely matches your opinion)

| Very low | Low | Fair | High | Very high |
|---|---|---|---|---|
| | | | | |

**Question n. 9: In your opinion, how annoying is the noise produced by the vehicle passing through asphalt n.2?**

(make an X mark in the box that most closely matches your opinion)

| Not at all | Only a little | To some extent | Rather much | Very n |
|---|---|---|---|---|
| | | | | |

*To be repeated for all the different combination between EVs and asphalts addresses*

**Listening of recordings made inside electric and internal combustion engine vehicles**

**Question n. 10: Imagine being in an Electric Vehicle and listening to the noise produced inside it. Ho assess the quality of the soundscape?**

(make an X mark in the box that most closely matches your opinion)

| Bad | Poor | Fair | Good | Excell |
|---|---|---|---|---|
| | | | | |

*To be repeated for all the different combination between EVs and asphalts addresses*

**Question n. 11: Imagine being in an Internal Combustion Engine Vehicle and listening to the noise produced inside it. How do you assess the quality of the soundscape?**

(make an X mark in the box that most closely matches your opinion)

| Bad | Poor | Fair | Good | Excellent |
|---|---|---|---|---|
| | | | | |

*To be repeated for all the different combination between ICEVs and asphalts addresses*

**Personal sensibility**

**Question n.12: Do you feel sensitive to noise?**

(make an X mark in the box that most closely matches your opinion)

| Not at all | Only a little | To some extent | Rather much | Very much |
|---|---|---|---|---|
| | | | | |

This activity is going to be anticipated.
Next steps:

1) Purchasing of instrumentation to carry out binaural recording and reproduction

2) Recording of acoustic climate inside EV and ICE vehicles

3) Organization of soundwalks and recordings' reproduction

# LIFE18 ENV/IT/000201
# LIFE E-VIA PROJECT
# 11 October 2021 - Vie en.ro.se Ingegneria

## B5.2 Interview in the pilot road on an electric taxi during the EV Festival

**TEMPLATE OF QUESTIONNAIRE RELATED TO SUB-ACTION B5.2**

Florence, *date*

***Interview about "LIFE E-VIA t***
***managed by Vie en.ro.se Ingegne***

*This questionnaire has been designed and it will be distributed by Vie e*
*E-VIA (LIFE18 ENV/IT/000201) European project co-funded by the Eur*

*The goal of this questionnaire is to collect data on the perception of c*
*taxi, particularly, after its passing through three different types of asp*
*is perceived both outside and inside the vehicle (making people listen*

*Please answer all questions in order, following the instructions provid*

*Your personal data will be treated as strictly confidential and the pub*
*the non-recognition of the responses.*

**Personal data**

Age: ☐ < 20 ☐ 20-35 ☐ 36-50 ☐ 51-65 ☐ 66-80 ☐ >80

Gender: ☐ Female ☐ Male

City of residence .....

Qualification: ☐ elementary diploma ☐ middle school diploma ☐

☐ master

Employment: .....

**Interaction between different electric vehicles and asphalts**

**Question n. 1: How do you assess the intensity of noise produced by the vehicle passing through asphalt n.1?**

(make an X mark in the box that most closely matches your opinion)

| Very low | Low | Fair | High |
|---|---|---|---|
| | | | |

**Question n. 2: In your opinion, how annoying is the noise produced by the vehicle**

(make an X mark in the box that most closely matches your opinion)

| Not at all | Only a little | To some extent | Rather mu |
|---|---|---|---|
| | | | |

**Question n. 3: How do you assess the intensity of noise produced by the vehicle**

(make an X mark in the box that most closely matches your opinion)

| Very low | Low | Fair | High |
|---|---|---|---|
| | | | |

**Question n. 4: In your opinion, how annoying is the noise produced by the vehicle**

(make an X mark in the box that most closely matches your opinion)

| Not at all | Only a little | To some extent | Rather mu |
|---|---|---|---|
| | | | |

**Question n. 5: How do you assess the intensity of noise produced by the vehicle**

(make an X mark in the box that most closely matches your opinion)

| Very low | Low | Fair | High |
|---|---|---|---|
| | | | |

**Question n. 6: In your opinion, how annoying is the noise produced by the vehicle**

(make an X mark in the box that most closely matches your opinion)

| Not at all | Only a little | To some extent | Rather mu |
|---|---|---|---|
| | | | |

**Listening of recordings made in open field condition**

**Question n. 7: Listen to the recording made in open field condition along this road and related to the noise produced by an Electric Vehicle. How do you assess the quality of the soundscape?**

(make an X mark in the box that most closely matches your opinion)

| Bad | Poor | Fair | Good | Excellent |
|---|---|---|---|---|
| | | | | |

*To be repeated for all the different combination between EVs and asphalts addresses*

**Question n. 8: Listen to the recording made in open field condition along this road and related to the noise produced by an Internal Combustion Engine Vehicle. How do you assess the quality of the soundscape?**

(make an X mark in the box that most closely matches your opinion)

| Bad | Poor | Fair | Good | Excellent |
|---|---|---|---|---|
| | | | | |

*To be repeated for all the different combination between ICEVs and asphalts addresses*

**Personal sensibility**

**Question n.9: Do you feel sensitive to noise?**

(make an X mark in the box that most closely matches your opinion)

| Not at all | Only a little | To some extent | Rather much | Very much |
|---|---|---|---|---|
| | | | | |

# ACTION C1

# Communication, dissemination, awareness raising

1. Awareness raising

a) **Number of entities/individuals reached/made aware**

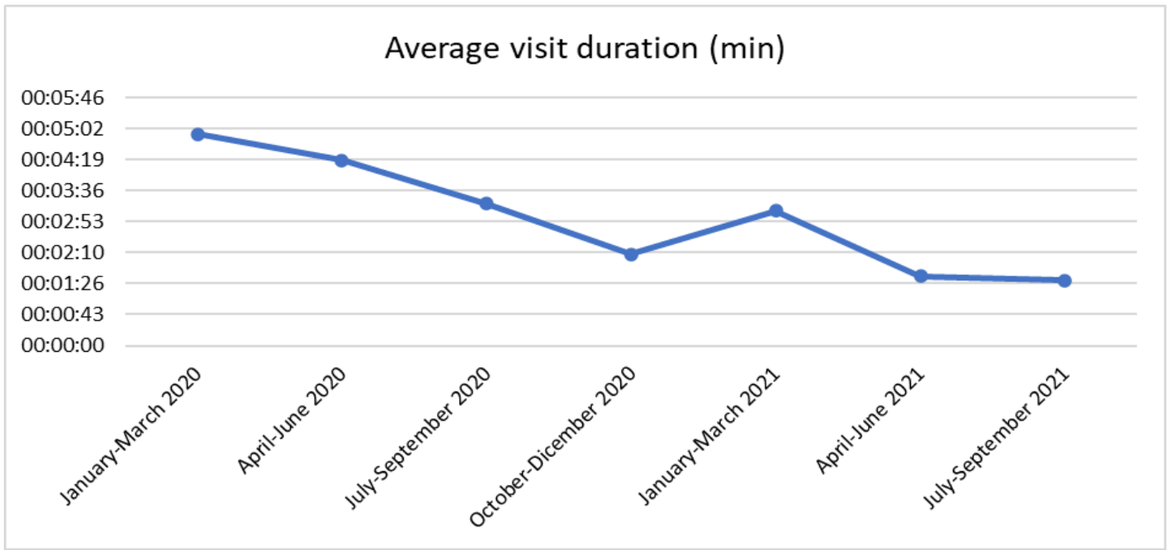
For the evaluation, the number of people participating to the activities foreseen by Action D.1 will be considered mainly according to the number of:

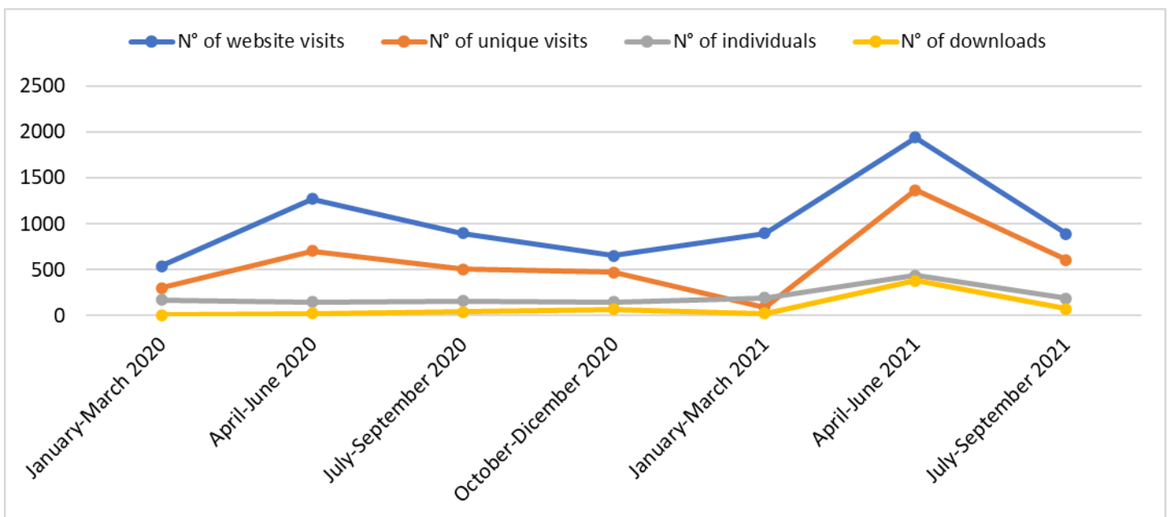
- **people visiting the project's website**
- people participating in the INAD (International Noise Awareness day) initiatives organized every year
- followers of the project's social network (Fb, twitter, Linkedin)
- people participating to the "Week of Sound" initiative
- people participating to the EV Festival
- listeners to the radio campaign
- **participants to workshops/events fully dedicated to the project**

In order to calculate the above-reported number, depending on the typology of event, online registration will be foreseen, or paper-based registers will be kept, while dedicated statistics will be used for the website and for social networks.

# Report about website statistics

Updated to **September 2021**




**LIFE E-VIA**

"Electric Vehicle noIse control by Assessment and optimisation of tyre/road interaction"

LIFE18 ENV/IT/000201

| | |
|---|---|
| **Content** | Report on website design and statistics on visits |
| **Action/Sub-action** | C1 |
| **Status - date** | Final Version- 06-10-2021 |



| | |
|---|---|
| **Authors** | Raffaella Bellomini, Chiara Bartalucci, Gianfrancesco Colucci, Sergio Luzzi (Vie en.ro.se) |
| **Beneficiary** | Municipality of Florence |
| **Contact person** | Arnaldo Melloni |
| **E-mail** | arnaldo.melloni@comune.fi.it |
| **Project Website** | https://life-evia.eu/ |

# Participants to workshops/events fully dedicated to the project


N° of participants - about 130

Type of participants - about half of them engineers, about 20% acousticians, the rest architects, university researchers and other technicians and employees of administrations/public bodies (in addition to those from co-organisers)

Technical experts in acoustics who received training credits - 34

Authorities involved (among the participants) - Bolzano Province, Como Province, ARPA, Aosta Valley Region among the main ones, as well as several Italian universities

# ACTIONS D1-D2

# LIFE E-VIA: objectives and actions (DE)

**Issued on: May 2021**

**By: : Continental**

Deadline: 31/12/2022

**NOTICEBOARD IN GERMAN LANGUAGE**

Code: 22_1

LIFE18 ENV/IT/000201

Mit Unterstützung des LIFE-Förderprogramms der Europäischen Union

LIFE E-VIA

Electric Vehicle noIse control by Assessment and optimisation of tyre/road interaction

***Hintergrund***

Belastungsdaten der Europäischen Umweltagentur (EEA) zeigen, dass mehr als 100 Millionen EU-Bürger durch gesundheitsbelastende Geräuschpegel beeinträchtigt sind. Laut Weltgesundheitsorganisation (WHO) ist dabei in etwa jede dritte Person in der Europäischen Region Verkehrslärm ausgesetzt, der ungesund ist. 20 % aller Europäer, insbesondere in urbanen Gebieten, sind regelmäßig nächtlichen Schalldruckpegeln ausgesetzt, die gesundheitsschädlich sein können. Wie in der *Noise in Europe Conference* (April 2017) und den WHO Richtlinien (Okt. 2018) ausgeführt wird, müssen EU-Regeln zur Schallquellennormierung auch mit weiteren effektiven Maßnahmen wie Verbesserungen an Straßenoberflächen oder Reifen, und städtebaulichen Maßnahmen kombiniert werden.
Eine Maßnahme, die allgemein als der beste Ansatz zur Geräuschreduzierung und Minimierung gesundheitsschädlicher Luftverschmutzungen im städtischen Umfeld angesehen wird, ist die Einführung der Elektromobilität. Aufgrund der im Vergleich zu klassischen Verbrennungsfahrzeugen geänderten Eigenschaften von Elektrofahrzeugen (EV) gibt es einen Bedarf zur Untersuchung der Reifen-/Fahrbahninteraktion. Weiterhin fehlen, selbst unter Berücksichtigung der Richtlinie 2002/49/EC, entsprechende Koeffizienten, um das CNOSSOS-Model (Richtlinie 996/2015/EC) für die neuen Fahrzeugtypen und Geräuschspektren anwenden zu können.

***Ziele***

1. Eine Lärmreduzierung für dichtbesiedelte urbane Gebiete durch die Implementierung von Minderungsmaßnahmen die auf **optimierte Straßenbeläge und Reifen für EVs** abzielen. Zwei Straßenoberflächen, mindestens fünf verschiedene Elektrofahrzeuge, ein Referenzfahrzeug mit Verbrennungsmotor und mindestes drei verschiedene Reifen pro Fahrzeugklasse (inkl. spezieller EV-Reifen) werden getestet
2. Eine Abschätzung der **Minderungseffektivität und -potentials** von **Reifen**, **Fahrbahnbelägen** und **Verkehrseigenschaften** (z.B. Verkehrsspektren, Geschwindigkeiten, Fahrweisen) auf einem höheren Verständnisniveau: Lebenszyklus-/Lebenszykluskostenanalyse (**LCA** und **LCCA**) werden durchgeführt um die individuelle und synergetische Effizienz verschiedener Fahrbahnbeläge, Reifen und Fahrzeugen zu zeigen, inkl. eines Vergleichs zwischen reinem Verbrennungs-, Misch- und reinem EV-Verkehr).
3. Beizutragen zur **effektiven Umsetzung von EU-Gesetzgebung** (EU Richtlinien 2002/49/EC und 2015/996/EC) durch die Bereitstellung von speziell für elektrische Fahrzeuge angepasste Rollgeräusch-Koeffizienten für die Common Noise Assessment Methode (**CNOSSOS-EU**). Dies ermöglicht beratenden, planenden und umsetzenden Personen und Organisationen die Betrachtung zukünftiger Szenarien.
4. Beizutragen zur **National-** und **Regionalpolitik** durch die Herausgabe von **Richtlinien** und **Empfehlungen** zur Nutzung und Anwendung der Projektergebnisse. In Kollaboration mit dem Projekt wird beispielsweise durch die regionale Umweltbehörde der Toskana (ARPAT) geschehen. Weitere italienische Kommunen und Regionen haben ebenfalls ihr Interesse bezeugt.
5. Eine **Verbesserung des öffentlichen Bewusstseins** für schädliche Geräuschbelastungen, die daraus resultierenden Gesundheitsgefahren und die damit zusammenhängenden Möglichkeiten der Elektromobilität, mittels zielgerichteter Informationskampagnen und -veranstaltungen, sowie einer Beteiligung der Bevölkerung durch Soundscape-Befragungen und einer der Einbeziehung in die Geräuschdatenerfassung..
6. Das **Demonstrieren** und **Bewerben** eines **nachhaltigen (elektrischen) Straßenverkehrs** durch Reduzierung der Schallbelastung um 5 dB(A) im Bereich der straßenzugewandten Außenfassade bei gleichzeitiger Reduzierung der $CO_2$-Emissionen um 21 % (Werte im Kontext der Gegebenheiten der italienischen Pilotanwendung und des Stands der entsprechenden Literatur)
7. Eine **Förderung** der **Nutzung geräuschoptimierter Straßenoberflächen** in entsprechenden Szenarien **innerhalb** und **außerhalb der EU** durch die Zuschaustellung der Haltbarkeit und Nachhaltigkeit entsprechender Lösungen mittels LCA und LCCA

***Maßnahmen***

**A. Vorbereitende Maßnahmen**
A1 Elektrofahrzeuge und ihre Geräuschemissionen
A2 Technologien für leise Fahrbahnbeläge und ihre zeitliche Leistungsfähigkeit
A3 Die Rolles des Reifens im neuen Kontext von Elektro- vs. Verbrennungsfahrzeugen

**B. Implementierungsmaßnahmen**
B1 Fahrbahnoberflächendesign
B2 Reifen-/Fahrbahninteraktionsstudie und Prototypimplementierung
B3 Pilotanwendung, Implementierung, Replikation und Transferierbarkeit
B4 Fahrbahneffizienztests im Rahmen der Pilotanwendung
B5 Soundscape-Analyse
B6 Auswertung von EV-Geräuschemissionen
B7 Holistische Leistungseigenschaften von Reifen

**C. Monitoring der Wirkung der Projektmaßnahmen**
C1 Monitoring der Wirkung der Projektmaßnahmen
C2 Lebenszyklusanalyse (LCA) und Lebenszykluskosten (LCC)

**D. Öffentliches Bewusstsein und Verbreitung der Ergebnisse**
D1 Informations- und Sensibilisierungsmaßnahmen
D2 Verbreitungsmaßnahmen and technische Interessengruppen

**E. Projektmanagement**

***Interessengruppen***


Projektwebsite: https://life-evia.eu/

# LIFE E-VIA: objectives and actions (FR)

**Issued on: July 2021**

**By: Vie en.ro.se. Ingegneria**

Deadline: 31/12/2022

**NOTICEBOARD IN FRENCH LANGUAGE**

Code: 21_1

## LIFE E-VIA

Contrôle du bruit des Véhicules Électriques par l'évaluation et l'optimisation de l'interaction pneumatique/chaussée

**Contexte**

Les données d'exposition de l'Agence Européenne pour l'Environnement (AEE) montrent que plus de 100 millions de citoyens de l'UE sont affectés par des niveaux de bruit élevés ayant un impact négatif sur la santé de la population. À lui seul, le bruit de la circulation routière est néfaste pour la santé de près d'une personne sur trois en Europe, d'après l'Organisation Mondiale de la Santé (OMS). 20 % des Européens sont régulièrement exposés à des niveaux sonores nocturnes susceptibles de nuire considérablement à la santé, en particulier dans les zones urbaines. Comme cela a été mis en évidence lors de la conférence *Noise in Europe* (avril 2017) et dans les recommandations de l'OMS publiées en octobre 2018, le durcissement des normes européennes à la source doit être complété par d'autres mesures efficaces telles que l'amélioration des revêtements routiers et/ou des pneumatiques, ainsi que l'aménagement urbain.

L'une des solutions environnementales les plus efficaces pour réduire le bruit en milieu urbain, tant en matière de bruit que de qualité de l'air, est l'introduction de la **mobilité électrique**. Ainsi, pour répondre aux nouvelles exigences des véhicules électriques (VE), il est nécessaire d'approfondir les connaissances sur l'interaction pneumatique/chaussée. De plus, pour la mise en œuvre de la directive européenne 2002/49/CE, les coefficients permettant d'appliquer le modèle CNOSSOS (directive 996/2015/CE) aux nouveaux spectres de trafic et aux nouveaux véhicules restent totalement inexistants.

**Objectifs**

1. **Réduire le bruit** routier au sein des zones urbaines très peuplées par la mise en œuvre d'une solution visant à **optimiser les revêtements routiers et les pneumatiques des véhicules électriques (VE)**. Deux revêtements routiers, au moins 5 modèles de VE, un véhicule à moteur thermique (VMT) de référence et 3 types de pneumatiques (y compris des pneus spécialement conçus pour les VE) seront testés pour chaque technologie de véhicule.
2. Estimer **l'efficacité et le gain potentiel de réduction des pneus, des revêtements et de trafic** (spectre du trafic, vitesses, conditions de conduite) à une échelle plus complète : une Analyse du Cycle de Vie (**ACV**) et une Analyse du Coût du Cycle de Vie (**ACCV**) seront réalisées pour démontrer l'efficacité respective et synergique des revêtements de chaussées, des pneus et des véhicules (y compris la comparaison entre trafics constitués de véhicules thermiques uniquement, de véhicules électriques ou mixtes).
3. Contribuer à la **mise en œuvre effective de la législation européenne** (directives 2002/49/CE et 2015/996/CE), en fournissant des coefficients de bruit de roulement pour la méthode commune d'évaluation du bruit (**CNOSSOS-EU**), spécifiquement adaptés aux VE, données encore non disponibles pour les professionnels, les organismes et les ministères en charge d'élaborer des scénarios futurs.
4. Contribuer aux **politiques nationales et régionales italiennes**, en publiant des **recommandations** sur l'utilisation et l'application de la méthodologie issue du projet, qui seront adoptées par la Région Toscane, via l'Agenzia Regionale pour l'Environnement de Toscane (ARPAT) soutenant le projet. La Région de Calabre et la ville Reggio de Calabre ont également exprimé leur intérêt.
5. **Sensibiliser** le public à la pollution sonore et aux effets sur la santé en expliquant les possibilités offertes par les véhicules électriques par le biais d'événements de communication et de promotion spécifiques, tout en étudiant la perception des personnes vis-à-vis du bruit sous l'angle méthodologique du paysage sonore et en les impliquant dans l'acquisition de données sur le bruit.
6. Démontrer et promouvoir la **mobilité routière durable (électrique)**, en réduisant les émissions sonores de 3 dB(A) en bord de route et simultanément celles de CO2 (21%), sur la base du scénario Italien (véhicules EP'L, EINC, hybrides, électriques, à essence, diesel) et de la littérature spécialisée.
7. **Encourager la mise en œuvre de revêtements à faible niveau de bruit dans d'autres scénarios européens et extra-européens**, en démontrant leur durabilité et leur pérennité, grâce à une analyse du cycle de vie (ACV) et une évaluation du coût du cycle de vie (CCV) spécifiques.

**Actions**

**A. Actions préparatoires**
A1 Les véhicules électriques et leurs émissions sonores
A2 Les technologies de chaussées peu bruyantes et la pérennité de leurs performances
A3 Le rôle du pneumatique dans le nouveau contexte des VE et des VMT

**B. Actions de mise en œuvre**
B1 Conception de la formulation du revêtement de chaussée
B2 Étude du couplage pneumatique-chaussée et réalisation du prototype
B3 Zone pilote : Mise en œuvre, Reproductive et transférabilité
B4 Tests d'efficacité des voies dans la zone pilote
B5 Analyse du paysage sonore
B6 Évaluation des émissions sonores des VE
B7 Performance holistique des pneumatiques

**C. Suivi de l'impact des actions du projet**
C1 Suivi de l'impact des actions du projet
C2 Analyse du cycle de vie (ACV) et coût du cycle de vie (CCV)

**D. Sensibilisation du public et diffusion des résultats**
D1 Activités d'information et de sensibilisation
D2 Activités de diffusion technique auprès des parties prenantes

**E. Gestion du projet**

***PARTIES PRENANTES***


Site web du projet: https://life-evia.eu/



LIFE E-VIA

Electric Vehicle noise control by Assessment and optimisation of tyre/road interaction

# WEBINAR: ‘Mobilità elettrica e asfalti a bassa emissione di rumore: il progetto LIFE E-VIA e altri contributi’

**Issued on: May 2021**

**By: Comune di Firenze, Vie en.ro.se. Ingegneria, UNIRC**

**EVENTS**
Code: E_3

*LIFE/ENV/IT000201 LIFE E-VIA*
*Project co-funded by the European Commission into the LIFE+2018 Programme.*

COMUNE DI FIRENZE — Vie en.ro.se. Ingegneria — Università degli Studi Mediterranea di Reggio Calabria

**Con il patrocinio di**

Associazione Italiana di Acustica

organizzano il

**WEBINAR**

**Mobilità elettrica e asfalti a bassa emissione di rumore: il progetto LIFE E-VIA e altri contributi**

**14 maggio 2021 h 14.00-16.10**

In modalità online sulla piattaforma Microsoft Teams

**In collaborazione con**

HEAD acoustics — P.E.S.C.A.S. — ecopneus — nereide

**2 ore di aggiornamento per Tecnici Competenti in Acustica**

L’aggiornamento per i TCA è riservato ai primi 36 iscritti

Il corso è riconosciuto dalla Regione Toscana con Prot. n. 0177764 del 21/04/2021

# EUROCITIES: ENVIRONMENTAL FORUM
## Issued on: April 2021
## By: Comune di Firenze

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# EEF: people and planet for the green transition (28-30 April)

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| **date** | 17-03-2021 |
| **publication date** | 17-03-2021 |
| **document type** | |
| **start date** | 28-04-2021 |
| **end date** | 30-04-2021 |

We are delighted to announce the theme of our EEF hosted online by Porto and Guimaraes as "people and planet for a green transition". Join us for three mornings between **28, 29 and 30 April** as we discuss what it means to transition to a healthy and thriving city for all, explore case studies and analyse how we can achieve the status of a thriving city moving forward.

Registrations will open very soon. Watch this space! A hint of what's to come? Oh alright…

**Driving the green transition through recovery**

*Wednesday 28 April @ 09.30-13.30 CET*

What does it mean to have a 'green transition'? How can we use recovery strategies to drive the green transition?

*Join us as we explore what is means to transition, hold a high-level political debate on driving the transition through recovery and network with our cities to learn how we can localise the European Green Deal through a city showcase (open call – got something to showcase? Get in touch!).*

**How to enact the green transition locally**

*Thursday 29 April @ 09.30-12.20 CET*

http://members.eurocities.eu/eurocities/calendar/events_list/EEF-people-and-planet-for-the-green-transition-28-30-April-WEBP-BZ7C6B

# Paper submitted to AIA Congress
# "IL PROGETTO LIFE E-VIA"

**Issued on: May 2021**

**By: Comune di Firenze, Vie en.ro.se. Ingegneria, UNIRC**

Deadline: 31/03/2023

**SCIENTIFIC PAPERS**
Code: 36_7

Associazione Italiana di Acustica
47° Convegno Nazionale
24-28 maggio 2021

## IL PROGETTO LIFE E-VIA: CONTROLLO DEL RUMORE DEI VEICOLI ELETTRICI MEDIANTE VALUTAZIONE E OTTIMIZZAZIONE DELL'INTERAZIONE PNEUMATICO/ASFALTO

Raffaella Bellomini (1), Chiara Bartalucci (1), Arnaldo Melloni (2), Filippo G. Praticò (3)

1) Vie en.ro.se. Ingegneria s.r.l., Firenze, raffaella.bellomini@vienrose.it – chiara.bartalucci@vienrose.it
2) Comune di Firenze, Firenze, arnaldo.melloni@comune.fi.it
3) Università Mediterranea di Reggio Calabria, Regio Calabria, filippo.pratico@unirc.it

**SOMMARIO**

Il progetto Life E-VIA "Electric Vehicle noIse control by Assessment and optimisation of tyre/road interaction", co-finanziato nell'ambito dell'obiettivo prioritario del Programma Life2018 collegato all'inquinamento acustico, affronta la problematica del rumore da traffico stradale, ponendosi in una prospettiva futura in cui i veicoli elettrici e ibridi saranno una parte consistente del traffico stradale e combinando asfalti a bassa rumorosità con pneumatici specifici per i veicoli elettrici.

# Presentation of the project to the European Tire and Rim Technical Organisation (ETRTO)

**Issued on: May 2021**

**By: Continental**

Deadline: 31/03/2023

**SCIENTIFIC PAPERS**

Code: 36_8

LIFE E-VIA

Electric Vehicle noIse control by Assessment and optimisation of tyre/road interaction

LIFE18 ENV/IT/000201
With the contribution of the LIFE programme of the European Union

Carsten Hoever – Continental Reifen Deutschland GmbH
*carsten.hoever@conti.de*

## Objectives

1. To **reduce noise** for roads inside very populated urban areas through the implementation of a mitigation measure aimed at **optimizing road surfaces and tyres of EVs**.





## Objectives

3. To contribute to **EU legislation effective implementation** providing rolling noise coefficients within the Common Noise Assessment Method (**CNOSSOS-EU**), specifically tuned for EVs, aiming at helping to developing **future scenarios.**



## Pilot Area Florence

- As a pilot implementation a section of a road in Florence will be paved with the new low-noise road surface.
- The pilot area will be the focus of further actions relating to
  - performance and wear/ageing monitoring of the new surface,
  - LCA/LCAA analysis,
  - Soundscape analysis,
  - …
- The re-pavement of the road will also be linked to an EV festival planned to be held in Florence which shall promote Electric Mobility.

# Lesson carried out by CRD to students the University of Applied Sciences in Hanover

**Issued on: June 2021**

**AWARENESS ACTIVITIES**

LIFE E-VIA

Electric Vehicle noIse control by Assessment and optimisation of tyre/road interaction

LIFE18 ENV/IT/000201
With the contribution of the LIFE programme of the European Union

Carsten Hoever – Continental Reifen Deutschland GmbH
*carsten.hoever@conti.de*

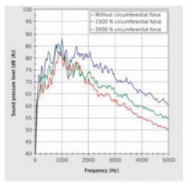
## Warum besondere Anforderungen an Reifen und Straße für Elektrofahrzeuge?

LIFE18 ENV/IT/000201

Im Vergleich zu Fahrzeugen mit Verbrennungsmotoren…

Akustische Aspekte
Weitere relevante Aspekte

- …sind EVs schwerer.
  - Höhere Reifenlast → höheres Rollgeräusch.
  - Stärkere Abnutzung von Reifen und Straße.
- …haben EVs in einem weiten Drehzahlbereich ein höheres Drehmoment.
  - Zusätzliche Rollgeräusch-Anregemechanismen.
  - Stärkere Abnutzung von Reifen und Straße.
- …gibt es einen nochmals verstärkten Fokus auf niedrigem Rollwiderstand.
  - Niedrigerer Rollwiderstand →höhere Fahrzeugreichweite →höhere Kundenakzeptanz.



Quelle: F. Stalter et al.: Influence of driving torque on tyre noise, Auto Tech Review 10/2013, 34-38.

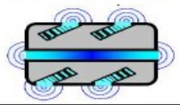


## Absorbierende Straßenbeläge

LIFE18 ENV/IT/000201

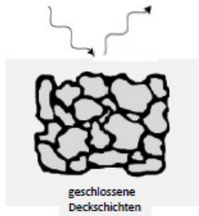
Absorption entlang der Luftschallausbreitung

Minderung von akustischen Resonanzen in der Aufstands-fläche

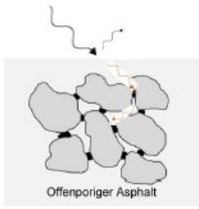


Reduzierung des Horneffektes

Horneffekt: effiziente Abstrahlung aufgrund kontinuierlicher Impedanzanpassung in der Horngeometrie




Auftreffender Schall wird nahezu komplett reflektiert



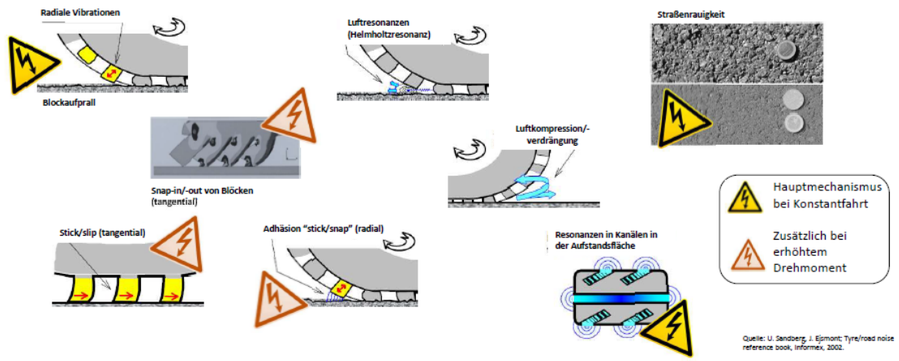

Ein Teil des Schalls dringt in die Deckschicht ein und durch viskose Reibung dissipiert

Nachteile:
- Verstopfung der Poren
- Kürzere mechanische Lebensdauer



## Anregungsmechanismen des Reifen-/ Fahrbahngeräusches

LIFE18 ENV/IT/000201




Quelle: U. Sandberg, J. Ejsmont: Tyre/road noise reference book, Informex, 2002.

**Article published in an open access journal**

**NOISE MAPPING**

**Issued on: June 2021**

**By: Université Gustave Eiffel**

Deadline: 31/12/2022

**ARTICLE IN A TOP RANKED JOURNAL**

Code: 15



# Road surface influence on electric vehicle noise emission at urban speed

*Julien Cesbron, Simon Bianchetti, Marie-Agnès Pallas, Adrien Le Bellec, Vincent Gary and Philippe Klein*

https://doi.org/10.1515/noise-2021-0017

https://doi.org/10.1515/noise-2021-0017

Cite this

DE GRUYTER Noise Mapp. 2021; 8:217–227

Research Article

Julien Cesbron*, Simon Bianchetti, Marie-Agnès Pallas, Adrien Le Bellec, Vincent Gary, and Philippe Klein

Road surface influence on electric vehicle noise emission at urban speed

https://doi.org/10.1515/noise-2021-0017
Received Jan 29, 2021; accepted Apr 23, 2021

**Abstract:** Considering the relative quietness of electric motors, tyre/road interaction has become the prominent source of noise emission from Electric Vehicles (EVs). This study deals with the potential influence of the road surface on EV noise emission, especially in urban area. A pass-by noise measurement campaign has been carried out on a reference test track, involving six different road surfaces and five electric passenger car models in different vehicle segments. The immunity of sound recordings to background noise was considered with care. The overall and spectral pass-by noise levels have been analysed as a function of the vehicle speed for each couple of road surface and EV model. It was found that the type of EV has few influence on the noise classification of the road surfaces at 50 km/h. However, the noise level difference between the quietest and the loudest road surface depends on the EV model, with an average close to 6 dBA, showing the potential effect of the road surface on noise reduction in the context of growing EV fleet in urban area. The perspective based on an average

the European area, where about 2.5 million of electric passenger cars were in circulation at the end of 2020. This figure comprises battery electric vehicles (BEVs) and plug-in electric vehicles (PHEVs). The market share of new EV registrations over the European area has been reaching 9.4% in 2020 against 3.7% in 2019. Depending on projection scenarios [2], it is expected to reach 15% to 30% of the global vehicle fleet by 2030.

A main advantage of EVs is that there is no exhaust emission while driving in pure electric mode, locally improving air-quality. EVs also contribute to the reduction of CO2 emission in the struggle against global warming [3]. Another key asset of EVs is the relative quietness of electric motors. This leads to the predominance of tyre/road noise from about 20 km/h at steady speed [4, 5]. According to EEA [6], in 2019 at least 20% of the European population was still exposed to noise levels that are considered harmful to human health. This burden is mainly due to road traffic noise, with more than 100 million EU citizens affected by high noise levels exceeding WHO recommendation [7]. Therefore, the development of low emission zones

# Journées Techniques Acoustique et Vibrations JTAV 2021

## "Projet LIFE E-VIA : Influence du revêtement de chaussée sur l'émission sonore des véhicules électriques"

**Issued on: June 2021**

**By: : Université Gustave Eiffel**

Deadline: 31/03/2023

**SCIENTIFIC PRESENTATION IN NATIONAL CONGRESS**

Code: 36_9

IFSTTAR Gustave Eiffel Cerema

jt av JOURNEES TECHNIQUES ACOUSTIQUE ET VIBRATIONS

JTAV 2021 - SÉMINAIRE DE TRANSFERT COP ▾ ARCHIVES ▾

Accueil (/jtav-2021-seminaire-de-transfert-cop/) / JTAV 2021 - Séminaire de transfert COP (/jtav-2021-seminaire-de-transfert-cop/) / Programme

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PROGRAMME (/JTAV-2021-SEMINAIRE-DE-TRANSFERT-COP/PROGRAMME/)

ARCHIVES ▾

(/ARCHIVES/JTAV-2020/)

### Programme

Lundi 7 juin (séminaire de transfert COP)

- 9h30 - 9h40 Présentation du COP - Axe 3 *J. Lelong (Univ. G. Eiffel/UMRAE)*
- 9h40 - 10h05 Présentation de l'UMRAE *J. Picaut (Univ. G. Eiffel/UMRAE)*
- 10h05 - 10h45 Elaboration de modèles d'émission sonore représentatifs de nouvelles catégories de sources routières *M.-A. Pallas (Univ. G. Eiffel/UMRAE)*
- 10h45 - 11h25 Amélioration des méthodes de caractérisation des émissions de bruit ferroviaire *O. Chiello & M.-A. Pallas (Univ. G. Eiffel/UMRAE)*
- *Pause*
- 13h30 - 14h30 Présentation de NoiseModelling - Utilisation dans le cadre de la recherche
  - Présentation de NoiseModelling et application *P. Aumond (Univ. G. Eiffel/UMRAE)*
  - Couplage Symuvia/MatSim *A. Can @ V. Lebescond (Univ. G. Eiffel/UMRAE)*
  - Nouveaux développements pour la prise en compte des façades végétalisées *B. Gauvreau (Univ. G. Eiffel/UMRAE)*
- 14h30 - 14h50 Présentation de l'outil PLAMADE et couplage avec NoiseModelling *S. Cariou (Cerema/DTecITM) & D. Ecotière (Cerema/DterEst/UMRAE)*
- 14h50 - 15h30 Impact du bruit des avions sur la santé : le projet DEBATS *A.-S. Evrard (Univ. G. Eiffel/UMRESTTE)*
- 15h30 Table ronde *A. Kavaj & M.-C. Bihoreau (DGITM), Ph. Maraval & F. Leray (DGPR), XX (DGAC)*

Mardi 8 juin (JTAV)

- 9h30 - 9h55 Projet LIFE E-VIA : Influence du revêtement de chaussée sur l'émission sonore des véhicules électriques *J. Cesbron - S. Bianchetti, M.-A. Pallas, A. Le Bellec, V. Gary, Ph. Klein (Univ. G. Eiffel/UMRAE)*
- 9h55 - 10h20 Projet LIFE Cool & Low Noise Asphalt : suivi des performances acoustiques des revêtements de chaussée à faible bruit dans le centre ville de Paris *C. Ribeiro (BruitParif)*
- 10h20 - 10h45 Méthode d'estimation des incertitudes du bruit éolien en conditions favorables à la propagation *B. Kayser (Univ. G. Eiffel/UMRAE)*
- 10h45 - 11h10 Estimation du coefficient d'absorption acoustique moyen par des méthodes de machine learning *C. Foy (Cerema/DterEst/UMRAE) A. Deleforge & D. Di Carlo (INRIA)*
- 11h10 - 11h35 Evaluation environnementale d'une conduite autonome : méthodologie acoustique et vibratoire *Ph. Dunez (Cerema/DterNP/TEER/ABV)*
- *Pause*
- 13h30 -13h55 Création d'une base de données des Points Noirs du Bruit dans les Quartiers Prioritaires du NPNRU *L. Mazouz Cerema/DterNP/TEER/ABV)*
- 13h55 - 14h20 Réseau à grand nombre de microphones et problèmes inverses mis en jeu *Ch. Vanwinsberghe (ISEN Yncréa Ouest)*
- 14h20 - 14h55 Plate-forme expérimentale de mesures acoustiques en temps réel *S. Carra, V. Janillon (Acoucité)*
- 14h55 - 15h20 Prédiagnostic sonore en milieu industriel : développement d'un "kit smartphone" *Isabelle Smith Yamane & A. Alarcon (EDF)*
- 15h20 Questions diverses - clôture des JTAV 2021

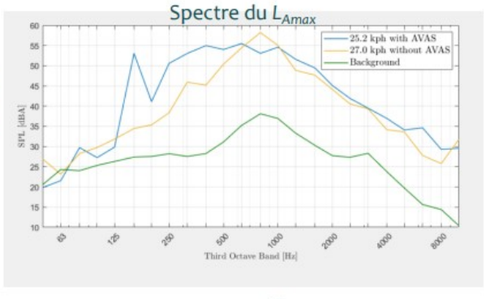
umr ae

## Des recherches en cours à l'UMRAE

- **Projet européen LIFE E-VIA (2019-2023) :**
  - **E**lectric **V**ehicle No**i**se Control by **A**ssessment and Optimisation of Tyre/Road Interaction
  - Julien Cesbron et al., Projet LIFE E-VIA : *influence du revêtement de chaussée sur l'émission sonore des véhicules électriques*, JTAV 2021, 8/06/2021
  - https://life-evia.eu/
- **Signal d'alerte AVAS** : caractérisation sous une approche environnementale
  - Comparaison aux niveaux d'émission CNOSSOS-EU / CNOSSOS-FR

Spectre avec AVAS

Spectre sans AVAS




Séminaire COP - Univ. Eiffel 25 7/06/2021

# Video of the prototype construction in Nantes

## "Low-noise road surface prototype for electric vehicles"

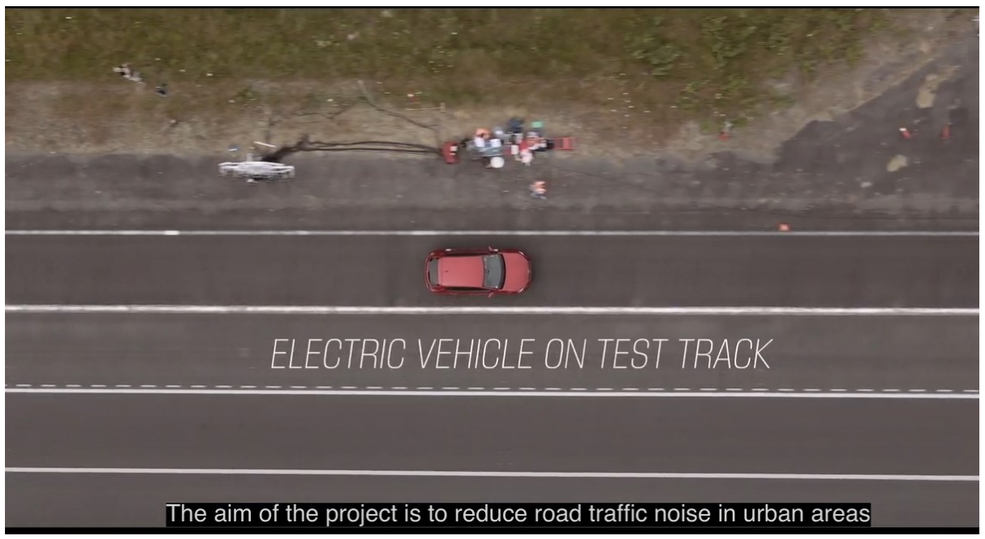
**Issued on: June 2021**

**By: Universitè Gustave Eiffel**

Deadline: 31/12/2022

**VIDEO OF THE PROTOTYPE CONSTRUCTION**
Code: 8







**Video available on the official YouTube channel of UMRAE-UniEiffel and on the UMRAE website**

Low noise road surface prototype for electric vehicles (EU LIFE E-Via project, LIFE18 ENV/IT/000201) - YouTube

MP

Bimestrale

Data 07-2021
Pagina 74
Foglio 1


PROGETTI EUROPEI LIFE NEREIDE E LIFE E-VIA

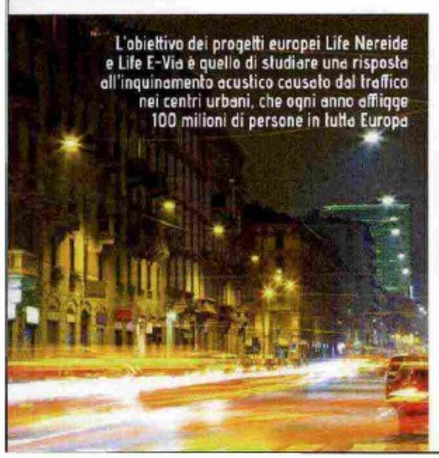
# Asfalti con materiali riciclati contro l'inquinamento acustico e a favore della mobilità elettrica

In Italia sono in corso due progetti europei, Life Nereide e Life E-Via, che intendono proporre soluzioni contro l'inquinamento acustico: uno dei problemi ambientali che toccano maggiormente la salute e la qualità della vita della popolazione europea. L'Agenzia Europea dell'Ambiente (EEA) stima infatti che siano oltre 100 milioni i cittadini europei esposti in maniera prolungata a livelli di rumore eccessivi e che, per questo, rischino conseguenze anche gravi per la salute. Stima inoltre che l'inquinamento acustico stradale notturno, ancora più dannoso per la salute, colpisca almeno il 20% della popolazione europea che vive nelle aree urbane.

Alcune tra le azioni più efficaci introdotte per risolvere questo problema riguardano la realizzazione di pavimentazioni stradali a bassa emissione sonora, ottenute anche con materiali di riciclo, e la progressiva diffusione della mobilità elettrica. Nati per analizzare i benefici possibili derivanti da tali soluzioni, Life Nereide e Life E-Via sono due progetti finanziati dal programma Life, volto a sostenere azioni a favore dell'ambiente e del clima.

Il progetto Life Nereide, che si sta avviando alla conclusione, ha portato alla definizione delle migliori soluzioni per realizzare pavimentazioni estremamente silenziose e sostenibili, capaci di ridurre il rumore del traffico fino a 5 dB grazie a un uso intelligente di materiali quali il polverino di gomma riciclata e il fresato d'asfalto, ottenuto dalla rimozione di vecchie pavimentazioni. Il progetto è guidato dal Dipartimento d'Ingegneria Civile e Industriale dell'Università di Pisa e vede come partner la Regione Toscana e l'agenzia regionale Arpat, il centro di ricerca belga BRRC, l'Idasc-CNR e il consorzio Ecopneus. Grazie al progetto sono state definite 12 differenti mescole bituminose, posate su diverse strade della Toscana; sono state poi effettuate misurazioni acustiche sulle pavimentazioni e indagini sulla popolazione, per conoscere gli effetti concreti su chi vive nei pressi di strade a elevato scorrimento.

Dal canto suo, il progetto Life E-Via si sta invece concentrando sui veicoli elettrici e ibridi, studiandone l'interazione pneumatico-strada per individuare e implementare misure di mitigazione del rumore attraverso l'ottimizzazione sia degli pneumatici sia del fondo stradale, anche attraverso lo sviluppo di un nuovo asfalto "silenzioso" messo a punto grazie a un approccio simile a quello adottato da Life Nereide. Il progetto vede coinvolti il Comune di Firenze, in qualità di coordinatore, e i partner: Continental, iPool, Università Gustave Eiffel, Università degli Studi di Mediterranea di Reggio Calabria e Vie En.Ro.Se. Ingegneria.



L'obiettivo dei progetti europei Life Nereide e Life E-Via è quello di studiare una risposta all'inquinamento acustico causato dal traffico nei centri urbani, che ogni anno affligge 100 milioni di persone in tutta Europa

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LA NAZIONE FIRENZE
Dir. Resp.: Agnese Pini
Tiratura: N.D. Diffusione: 19762 Lettori: 120000 (0005822)

15-LUG-2021
da pag. 1-9 /
foglio 2 / 2


IN VIA PAISIELLO

## Arriva l'asfalto anti rumore

**Sono** iniziati ieri i lavori di asfaltatura in via Paisiello. Non si tratta di semplice bitume, ma di un nuovo asfalto anti rumore che viene sperimentato proprio a Firenze. Un materiale, che permette una riduzione delle emissioni rumorose prodotte dalle auto e rientra nel progetto Life E-Via, che vede Firenze città capofila. I lavori proseguiranno fino a venerdì con restringimenti di carreggiata su via Paisiello tra via Rinuccini e via Lagorio e chiusure delle traverse laterali. «**Grazie** a questo progetto – hanno detto l'assessore all'Ambiente Cecilia Del Re e l'assessore alla Mobilità Stefano Giorgetti – possiamo contribuire a ridurre l'inquinamento acustico nelle aree urbane». L'obiettivo è quello di ottimizzare asfalti e pneumatici per ridurre il rumore. Il Progetto, co-finanziato dall'Unione europea ha avuto inizio a luglio 2019 e terminerà a gennaio 2023.



Un passo avanti per la costruzione del sistema tramviario dell'area metropolitana

# Report INAD Italia 2020-2021 (ITA)

**Issued on: July 2021**

**By: Vie en.ro.se. Ingegneria**

Deadline: 31/12/2022

**REPORT ON YEARLY PARTICIPATION IN INAD**

Code: 25_1

Associazione Italiana di Acustica

**INTERNATIONAL**

**NOISE AWARENESS DAY**

**INAD Italia 2020-21**

***"AscoltiAMO i suoni"***


***Report finale***

É stata inoltre svolta una intensa comunicazione sui social network e attraverso contatti diretti con molte redazioni giornalistiche, con scuole musicali e conservatori italiani.

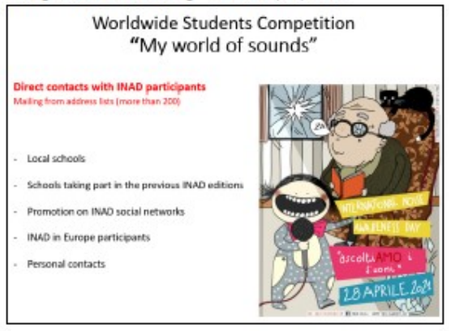
LIFE E-VIA project (LIFE18 ENV/IT/000201): il progetto, finanziato dall'Unione Europea, si concentra sulle potenzialità di utilizzo dei veicoli elettrici ed ibridi, che in futuro avranno un ruolo importante nel mercato automobilistico. Il progetto studia l'interazione pneumatico-strada per individuare ed implementare misure di mitigazione del rumore, attraverso l'ottimizzazione sia degli pneumatici dei veicoli elettrici sia del fondo stradale. Inoltre il progetto prevede un'intensa attività di disseminazione e sensibilizzazione sul tema del rumore, organizzando anche attività negli istituti scolastici, in accordo e in collaborazione anche con l'attività portate avanti nelle diverse Nazioni dei partner del Progetto (Italia, Francia e Germania) nell'ambito di INAD.

L'evento è stato diffuso principalmente attraverso i seguenti canali:

CONVEGNI:

- Convegno Nazionale AIA – Online 24-28/05/2021

- IYS 2020-2021 Steering Committee Meeting – Online 16/01/ 2021




WEB:

- siti internet di: Associazione Italiana di Acustica, EAA, Documenta Acustica, IYS 2020-21
- siti internet delle scuole e degli Enti partecipanti.

SOCIAL NETWORK:

- pagina facebook: INAD Italia;
- gruppo facebook: Noise Awareness Day Italia;
- pagina facebook: Intenational Year of Sound.



https://acustica-aia.it/inad/#1579087438323-0-39cf2-c675844d-d32b

# Paper submitted to ICSV27 “THE INTERNATIONAL YEAR OF SOUND: WORLD WILD PROJECTS AND INITIATIVES”

**Issued on: July 2021**

**By: Vie en.ro.se. Ingegneria**

Deadline: 31/03/2023

**SCIENTIFIC PAPERS**
Code: 36_11

27th International Congress on Sound and Vibration
The annual congress of the International Institute of Acoustics and Vibration (IIAV)
11-16 July, 2021
ICSV27
Annual Congress of the International Institute of Acoustics and Vibration (IIAV)

## THE INTERNATIONAL YEAR OF SOUND: WORLDWIDE PROJECTS AND INITIATIVES

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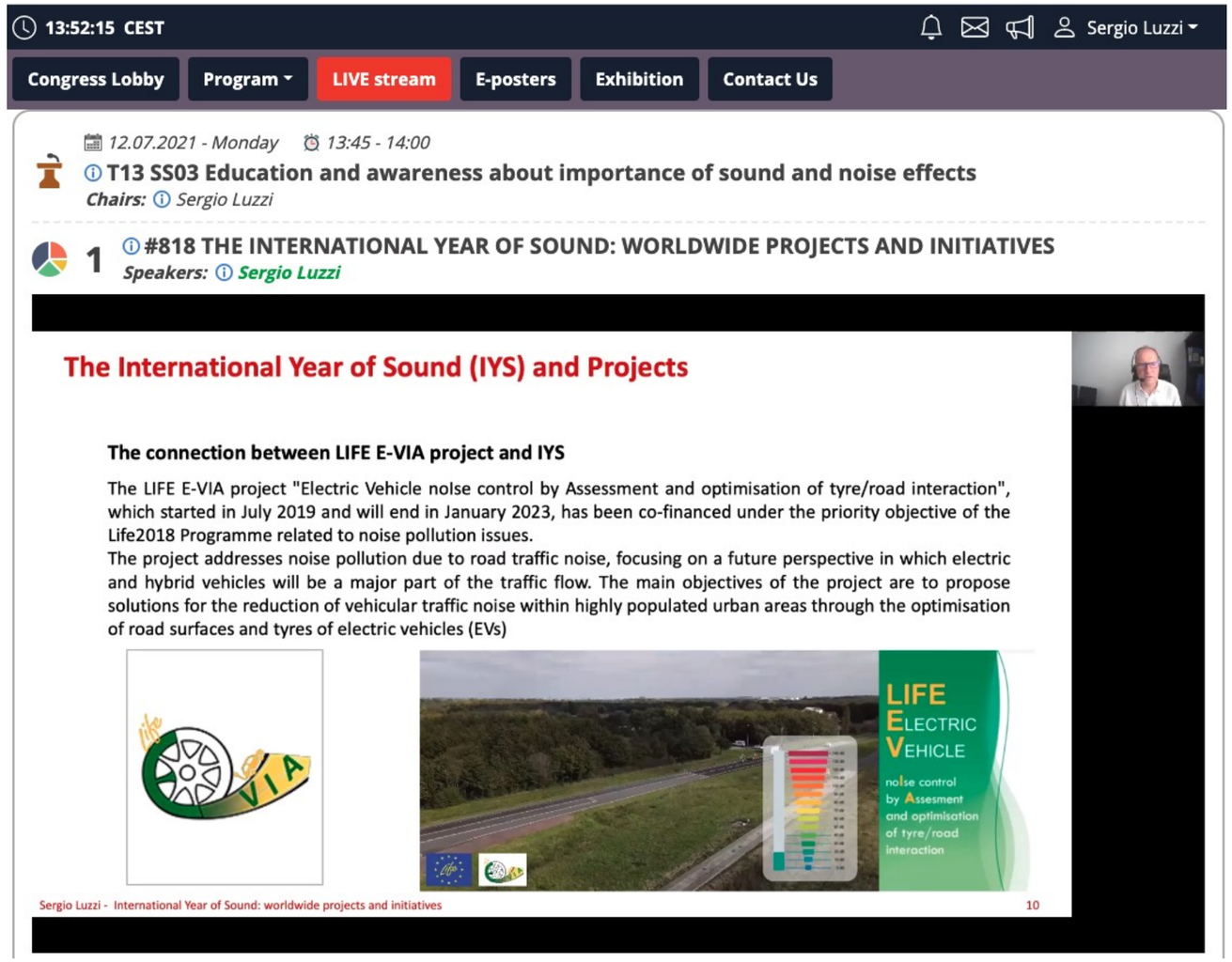
Sound plays an important role in the enjoyment of landscapes as well as in all human activities included education and it is also an essential part of communication between humans, in the form of speech and listening, creative sounds and music. The International Year of Sound (IYS) is a global initiative under the UNESCO Charter of Sound No. 39C/59. Its purpose is to highlight the importance of sound and the related sciences and technologies in the society and the world, considering landscape aspects and noise control in nature, in the built environment and in workplaces. IYS 2020-21 includes activities organized at the regional, national and international level by the International Commission for Acoustics (ICA). Among them there is a competition for students from around the world on the theme of "My World of Sounds". In particular, primary and middle school students are asked to produce drawings, images, patchwork, collages and similar related to their world of sounds, while high school students are asked to write a verse of the song entitled "We are the sounds of our world", inspired by the melody and refrain of the latter. Moreover, several events such as conferences, seminars, workshops but also performances, exhibitions had been included in the program of national IYS initiatives, as long as they are consistent with the message of the initiative. Due to the spread of the Covid-19 pandemic, only few initiatives took place, nevertheless some international projects have been carried on. In this paper a general updated overview on activities organised in the frame of the IYS is given and the state of implementation of some projects connected with IYS are shown.

Keywords: International Year of Sound, UNESCO, worldwide activities, LIFE projects



# Paper submitted to ICSV27
# "THE LIFE E-VIA PROJECT"

**Issued on: July 2021**

**By: Comune di Firenze, Vie en.ro.se. Ingegneria**

Deadline: 31/03/2023

**SCIENTIFIC PAPERS**
Code: 36_12

27th International Congress on Sound and Vibration
The annual congress of the International Institute of Acoustics and Vibration (IIAV)
11-16 July, 2021
ICSV27

Annual Congress of the International Institute of Acoustics and Vibration (IIAV)

## THE LIFE E-VIA PROJECT: NOISE CONTROL OF ELECTRIC VEHICLES THROUGH ASSESSMENT AND OPTIMISATION OF TYRE/ASPHALT INTERACTION

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European Environment Agency (EEA) data shows that some 100 million EU citizens are affected by high noise levels, negatively impacting their health. Traffic noise alone is harmful to the health of 40 million EU citizens of which 8 million are regularly exposed to high traffic noise level at night. European policies to reduce environmental noise, and in particular road traffic noise, in densely populated cities are focused on the introduction of low-noise asphalts and a progressive increase in the use of electric vehicles. The LIFE E-VIA "Electric Vehicle noIse control by Assessment and optimization of tyre/road interaction" project, co-funded under the priority objective of the Life2018 Programme related to noise pollution, addresses the issue of road traffic noise. Specifically, it looks ahead to a future where electric and hybrid vehicles will be a major part of road traffic and combining low-noise asphalts with tyres specifically for electric vehicles. The LIFE E-VIA project, started in July 2019 with a foreseen duration of 42 months, will foster the application of Directive 2002/49/EC on the assessment and management of environmental noise and of Directive 996/2015/EC on establishing common noise assessment methods (CNOSSOS model), in the context of the promotion and use of electric vehicles (EVs) and hybrid vehicles. The project will seek to develop a solution to reduce the rolling noise of electric and hybrid vehicle tyres in urban areas, taking account of the current best practices, also addressing the soundscape analysis and citizens involvement.
In the present article, after an introduction on the future policies for the reduction of road traffic noise in Europe, the objectives of the LIFE E-VIA project and its methodology are described, demonstrating how the expected results are in line with European strategies. Finally, recent preliminary results achieved by some key actions of the project are mentioned.
Keywords: Rolling noise, electric vehicles, EU policies.

# Presentation/ paper at the
# DAGA 2021 - 47. Jahrestagung für Akustik

**Issued on: August 2021**

**By: CONTINENTAL**

Deadline: 31/03/2023

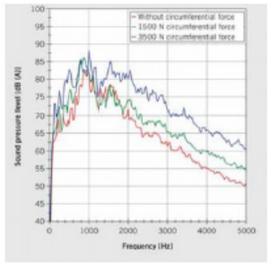
**SCIENTIFIC PAPERS**
Code: 36_13

## Why special requirements for tyres and roads for EV applications?

LIFE18 ENV/IT/000201

Compared to classical ICE vehicles...

- ...are EVs heavier.
  - Higher tyre load → higher tyre/road noise.
- ...exhibit EVs high torque values in a wide range of RPMs.
  - Additional tyre/road noise generation mechanisms.
- ...is there an even increased focus on low rolling resistance for EVs.
  - Reduced rolling resistance → increased milage → increased customer acceptance.




Source: F. Stalter et al.; Influence of driving torque on tyre noise, Auto Tech Review 10/2013, 34-38.



## Objectives

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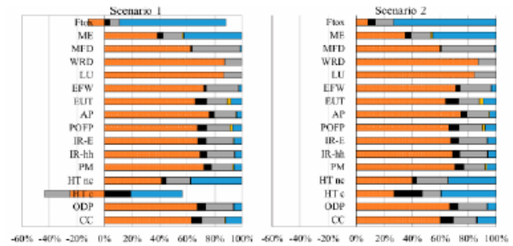
2. To **estimate the mitigation efficiency** and **potential** of **tyres**, **pavements** and **traffic** at a higher comprehensive level: Life Cycle Analysis (**LCA**) and Life Cycle Cost Analysis (**LCCA**) is performed to demonstrate the individual and synergistic efficiency of pavement surfaces, tyres and vehicles.




Source: F. Praticò *et al.*, Energy and Environmental Life Cycle Assessment of Suistainable Pavement Materials and Technologies for Urban Roads, Suistainability 2020, 12, 704

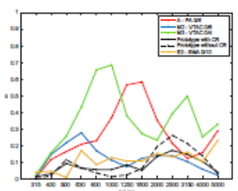


## Technical solutions – road surface

LIFE18 ENV/IT/000201

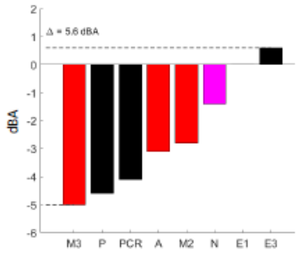
Road surface:

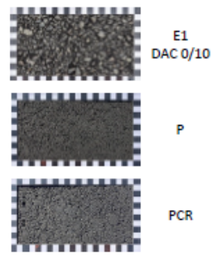
- Very thin asphalt concrete (VTAC) with max. aggregate size 6mm.
- With/without crumb rubber (PCR/P).
- MPD: ~0.3mm (PCR) / ~0.4 mm (P)
- Effective absorption 1.5 kHz to 5 kHz.



→ Based on prototype noise measurements:
3.5 dBA to 4.5 dBA with respect to reference DAC 0/10.





# LIFE E-VIA: the pilot case (IT)

**Issued on: September 2021**

**By: Vie en.ro.se. Ingegneria**

Deadline: 31/12/2022

**NOTICEBOARD IN ITALIAN LANGUAGE**

Code: 23_2

LIFE18 ENV/IT/000201

With the contribution of the LIFE programme of the European Union

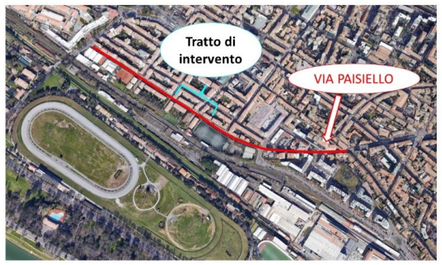
LIFE E-VIA

**E**lectric **V**ehicle no**I**se control by **A**ssessment and optimisation of tyre/road interaction

***Il caso pilota***

Dopo una fase progettuale seguita da una serie di accurati esperimenti di laboratorio, sono state selezionate due miscele di asfalto che sono state testate, durante il passaggio di veicoli elettrici, presso l'area di sperimentazione a Nantes. Al termine delle misure svolte in Francia, è stata scelta la miscela più efficace, contenente polverino di gomma da pneumatici riciclati. Quest'ultima è stata utilizzata presso il caso pilota individuato nella Città di Firenze, al fine di analizzare il beneficio apportato in termini di abbattimento del rumore da traffico veicolare. L'area pilota è stata identificata in Via Paisiello, caratterizzata da una significativa densità di abitazione. Il tratto di strada interessato dall'intervento è rettilineo e a senso unico di marcia. Inoltre, l'area pilota è caratterizzata da un elevato flusso di traffico dovuto alla vicinanza con il centro e alla presenza di uffici pubblici. Nelle vicinanze si trovano, inoltre, un importante parco pubblico (Cascine), interventi di riqualificazione urbana (Ex. Manifattura Tabacchi) e vari servizi pubblici, quali scuole, esercizi commerciali, impianti sportivi.

***Inquadramento Stato ante operam***




***Lavori di asfaltatura***

Rimozione asfalto

Stesura nuovo asfalto

Verifiche della tessitura

***Stato post operam***

Sito web: https://life-evia.eu/

# LIFE E-VIA: the pilot case (EN)

**Issued on: September 2021**

**By: Vie en.ro.se. Ingegneria**

Deadline: 31/12/2022

**NOTICEBOARD IN ENGLISH LANGUAGE**

Code: 18_3

LIFE18 ENV/IT/000201

With the contribution of the LIFE programme of the European Union

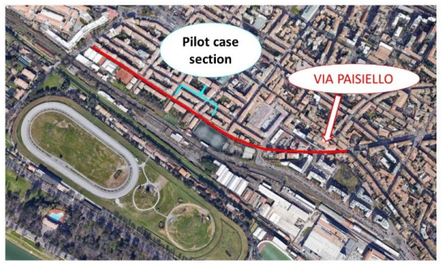
## LIFE E-VIA

**E**lectric **V**ehicle no**I**se control by **A**ssessment and optimisation of tyre/road interaction

***The Pilot case***

After an initial designing stage followed by careful laboratory experiments, two different asphalt mixtures have been selected and tested in the experimental area in Nantes, during the electric vehicles passages. The measurements carried out in France allowed to choose the most efficient mixture. This asphalt mixture contains crumb rubber from recycled tyres and it has been used in the pilot case in Firenze in order to analyse the benefits it provides to reduce traffic noise. Via Paisiello has been selected as a pilot area. It is characterized by a significant housing density. The section of the street where the asphalting works have been carried out, is straight and one-way. Moreover, the pilot area is characterized by a high level of traffic caused to its proximity to the city center and the presence of public offices. In the neighbourhood there are also an important public park (Cascine), urban regeneration interventions (Ex. Manifattura Tabacchi) and several public services, such as schools, commercial activities and sport installations.

***Ante operam status***




***Asphalting works***

Asphalt removal

Laying a new asphalt

Texture check

***Post operam status***

Sito web: https://life-evia.eu/

# LIFE E-VIA: the pilot case (FR)

**Issued on: September 2021**

**By: Université Gustave Eiffel**

Deadline: 31/12/2022

**NOTICEBOARD IN FRENCH LANGUAGE**

Code: 21_2

LIFE E-VIA

Contrôle du bruit des Véhicules Électriques par l'évaluation et l'optimisation de l'interaction pneumatique/chaussée

LIFE18 ENV/IT/000201

***Le projet pilote***

Après une première phase de conception suivie d'expériences en laboratoire détaillées, deux enrobés ont été sélectionnés et testés sur la zone expérimentale de Nantes, au passage de véhicules électriques. Les mesures effectuées en France ont permis d'identifier le mélange le plus performant. Cette formule de béton bitumineux contient de la gomme provenant de pneus recyclés et a été utilisée dans le projet pilote à Florence afin d'analyser les avantages en matière de réduction du bruit de trafic. La rue Paisiello a été sélectionnée comme zone pilote. Elle se caractérise par une forte densité de logements. La section où les travaux de pose du béton bitumineux ont été réalisés est rectiligne et à sens unique. De plus, elle présente un niveau élevé de trafic dû à la proximité du centre ville et à la présence d'établissements publics. Dans le quartier, on trouve également un important parc public (Cascine), des opérations de réhabilitation urbaine (Ex. Manifattura Tabacchi) et divers établissements publics, tels que des écoles, des activités commerciales et des installations sportives.

***État initial***


***Mise en œuvre du nouvel enrobé bitumineux***

Élimination de l'ancien revêtement routier

Pose du nouveau béton bitumineux

Contrôle de la texture

***État final***

Site web: https://life-evia.eu/

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LIFE E-VIA

Electric Vehicle noise control by Assessment and optimisation of tyre/road interaction

# LIFE E-VIA: the pilot case (DE)

**Issued on: September 2021**

**By: CONTINENTAL**

Deadline: 31/12/2022

**NOTICEBOARD IN GERMAN LANGUAGE**

Code: 22_2

LIFE E-VIA

Electric Vehicle noIse control by Assessment and optimisation of tyre/road interaction

LIFE18 ENV/IT/000201

**Die Pilot-anwendung**

Als Ergebnis einer initialen Designphase gefolgt von umfassenden Laborexperimenten wurden zwei Asphaltmischungen ausgewählt und auf einer Teststrecke in Nantes mittels Geräuschmessungen für Vorbeifahrten von Elektrofahrzeugen getestet. Auf Basis dieser Ergebnisse konnte die bessere der beiden Mischungen identifiziert werden. Diese enthält als Besonderheit Gummigranulat von Altreifen. Im Rahmen einer Pilotanwendung wurde in Florenz ein Abschnitt einer Straße mit der ausgewählten Mischung asphaltiert, um das Potential zur Verringerung des Straßenverkehrslärms zu untersuchen. Bei der ausgewählten Via Paisiello handelt es sich um eine Einbahnstraße, die im Bereich der Neuasphaltierung gerade verläuft. Die Umgebung ist aufgrund ihrer Nähe zum Stadtzentrum durch eine hohe Wohndichte und ein hohes Verkehrsaufkommen gekennzeichnet. In der Nachbarschaft gibt es weiterhin einen bedeutenden öffentlichen Park (*Cascine*), Stadterneuerungsprojekte (z.B. *Manifatura Tabacchi*), Geschäfte und öffentliche Einrichtungen wie Schulen und Sportanlagen.

**Ausgangs-situation**


**Asphaltier-arbeiten**

Entfernung des Altbelages

Neuasphaltierung

Überprüfung der Oberflächenrauigkeit

**Ergebnis**

Webseite: https://life-evia.eu/

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LIFE E-VIA

Electric Vehicle noise control by Assessment and optimisation of tyre/road interaction

# LIFE E-VIA: Laboratory experiments(EN)

**Issued on: September 2021**

**By: UNIRC**

Deadline: 31/12/2022

**NOTICEBOARD IN ENGLISH LANGUAGE**

Code: 18_4

LIFE E-VIA

Electric Vehicle noIse control by Assessment and optimisation of tyre/road interaction

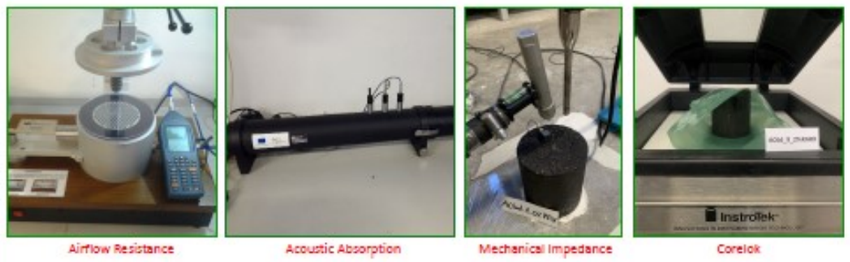
LIFE18 ENV/IT/000201

*Mix design*

The University 'MEDITERRANEA' of Reggio Calabria (UNIRC) analysed more than 150 solutions in the literature (friction courses), based on acoustic and non-acoustic performance, in order to select appropriate solutions. Their characteristics and impacts were considered and preliminary tests were carried out. From 150 asphalt concretes, nine mixtures were selected, based on many characteristics, including: 1) Acoustic response. 2) Expected life by referring to mechanistic properties. 3) Permeability. 4) Friction. 5) ENDT value.
Based on these latter, open asphalt concretes with Nominal Maximum Aggregate of 6 mm (AC6) were selected.
An accurate plan of experiments was set up and followed in order to design and validate the final mixtures. Two types of mixtures were finally designed and tested (AC6 with and without crumb rubber).

*Superpave compaction*

*Laboratory experiments*




Airflow Resistance | Acoustic Absorption | Mechanical Impedance | Corelok


Permeability | Skid Test | Sand Patch Test | Marshall Stability

Sito web: https://life-evia.eu/



LIFE E-VIA

Electric Vehicle noise control by Assessment and optimisation of tyre/road interaction

# LIFE18 ENV/IT/000201
# LIFE E-VIA PROJECT
# 11 October 2021 - Vie en.ro.se Ingegneria

# Website http://life-evia.eu/



**LIFE18 ENV/IT/000201**
**LIFE E-VIA PROJECT**
**11 October 2021 - Vie en.ro.se Ingegneria**

# Electric vehicles festival

EXPOMOVE 21 22
MOBILITÀ ELETTRICA & SOSTENIBILE
LEGGERA • PUBBLICA • CONDIVISA

## INVITO

13-14 ottobre 2021
Fortezza da Basso, Firenze

CONFERENZA INTERNAZIONALE
MOBILITÀ SOSTENIBILE: UNO SGUARDO EUROPEO

**Progetto LIFE18 ENV/IT/000201 LIFE E-VIA**
"Electric Vehicle noise control by Assessment and optimisation of tyre/road interaction"
• **Filippo Praticò**, Università Mediterranea - Reggio Calabria

**13th October**

**Progetto LIFE18 ENV/IT/000201 LIFE E-VIA**
"Electric Vehicle noise control by Assessment and optimisation of tyre/road interaction"
• **Arnaldo Melloni**, Comune di Firenze - Direzione Ambiente

**14th October**


DEDICATED POSTER SPACE

# LIFE E-VIA

**E**lectric **V**ehicle no**I**se control by **A**ssessment and optimisation of tyre/ road interaction

*www.life-evia.eu*

## LIFE E-VIA PROJECT

## Internal meeting – Reggio Calabria 11th October 2021

## Vienrose Ingegneria

## Responsible for actions B5, D1 and D2

Raffaella Bellomini, Sergio Luzzi, Chiara Bartalucci, Sara Delle Macchie, Lucia Busa, Francesco Borchi, Gianfrancesco Colucci

Vie en.ro.se. Ingegneria

With the contribution of the LIFE programme of the European Union

**LIFE18 ENV/IT/000201**

LIFE E-VIA Technical Meeting
Reggio Calabria / Videoconference
11th Ocotober 2021

LIFE18 ENV/IT/000201

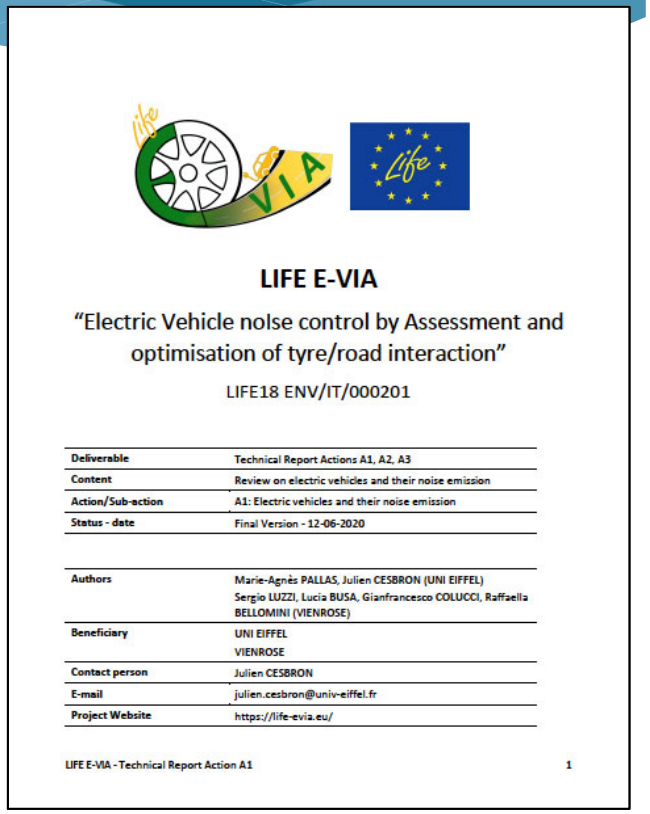
# Technical progress of actions:
# A1 - Electric vehicles and their noise emission
# B2 - Tyre-pavement coupling study


Julien CESBRON, Marie-Agnès PALLAS, Simon BIANCHETTI

Université Gustave Eiffel (UNI EIFFEL)
Joint Research Unit in Environmental Acoustics (UMRAE)

# Action A1 - EVs and their noise emission

- Preparatory action (Months 3 to 9)
- Literature review considering different aspects:
  - EV fleet and distribution across Europe
    (linked with action B2 and B3)
  - Changes in driving style of EV and impact on noise
    (linked with actions B1 and B2)
  - Noise source emission of EVs
    (linked with action B2)
  - Noise perception of EVs
    (linked with action B5)
  - EV consideration in noise prediction models
    (linked with action B6)
- Contributing partners: UNI EIFFEL, VIENROSE, UNIRC
- Deliverable validated on 12/06/2020



**LIFE E-VIA**

"Electric Vehicle noise control by Assessment and optimisation of tyre/road interaction"

LIFE18 ENV/IT/000201

| | |
|---|---|
| **Deliverable** | Technical Report Actions A1, A2, A3 |
| **Content** | Review on electric vehicles and their noise emission |
| **Action/Sub-action** | A1: Electric vehicles and their noise emission |
| **Status - date** | Final Version - 12-06-2020 |

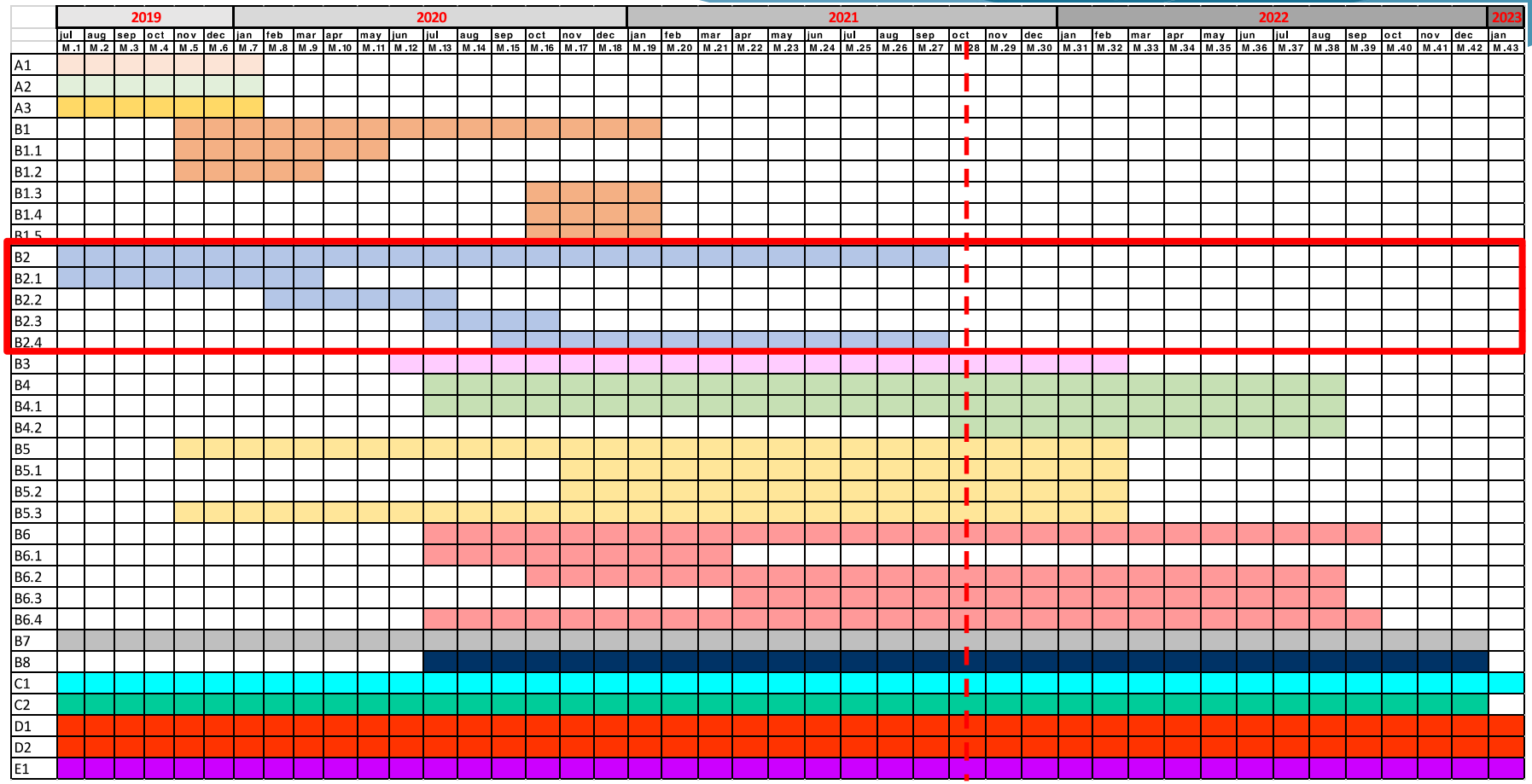
| | |
|---|---|
| **Authors** | Marie-Agnès PALLAS, Julien CESBRON (UNI EIFFEL)<br>Sergio LUZZI, Lucia BUSA, Gianfrancesco COLUCCI, Raffaella BELLOMINI (VIENROSE) |
| **Beneficiary** | UNI EIFFEL<br>VIENROSE |
| **Contact person** | Julien CESBRON |
| **E-mail** | julien.cesbron@univ-eiffel.fr |
| **Project Website** | https://life-evia.eu/ |

LIFE E-VIA - Technical Report Action A1 1

# Action B2 – Tyre-pavement coupling study

- Implementation action divided in 4 sub-actions:
  - B21: Acoustical characterization of EVs on existing tracks (UNI EIFFEL)
    - Months 1 to 9 – done
  - B22: Construction of a B1-based test track prototype (UNI EIFFEL, UNIRC)
    - Months 8 to 13 – done
  - B23: Characterization of the B1-based prototypal test section (UNI EIFFEL, IPOOL)
    - Months 13 to 16 – on-going
  - B24: Selection of optimized EV tyres (CRD, UNI EIFFEL)
    - Months 15 to 27 – on-going
- Contributing partners: UNI EIFFEL, UNIRC, IPOOL, CRD

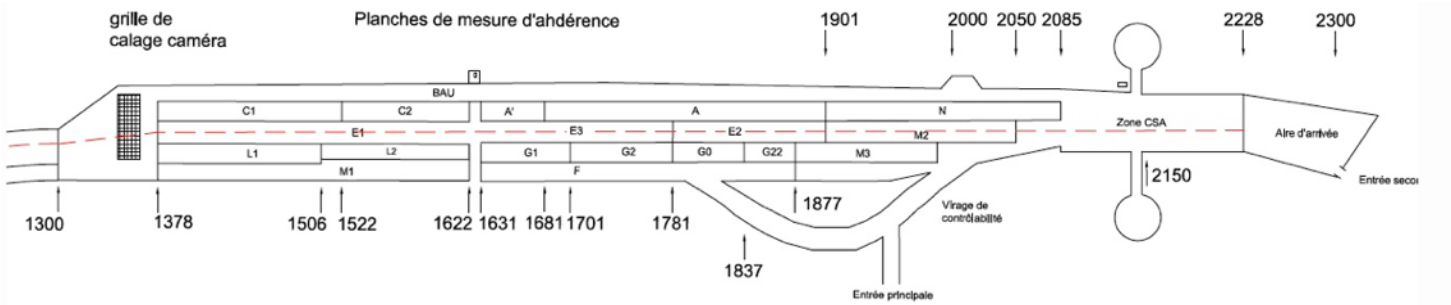
# Action B2 – Tyre-pavement coupling study




- Milestone: B2 Tyre-pavement coupling study – Prototype realization – 30/09/2021
- Deliverable: B2 Report on prototype implementation and tyre/road noise performances – 30/11/2021

# Action B21 - Acoustical characterization of EVs

- Measurement campaign performed on UNI EIFFEL reference test track

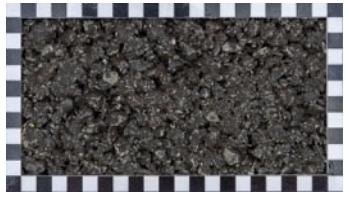



3 impervious road surfaces

**N –** ISO 10844

**E1 –** DAC 0/10

**E3 –** SMA 0/10



3 absorbing road surfaces

**A –** PA 0/6

**M2 -** VTAC 0/6

**M3 -** VTAC 0/4

# Action B21 - Acoustical characterization of EVs

- Types of pass-by measurements
  - Standard Controlled Pass-By (CPB) on all road surfaces (E1, E3, N, A, M2, M3)
  - Microphone array pass-by measurements (only on N road surface - ISO 10844 )
- Pass-by conditions :
  - Constant speed : from 20 to 110 km/h in 5 km/h steps
  - Full acceleration for start speeds from 0 to 50/90 km/h initial speed
  - Deceleration with friction brake from 50 to 70 km/h initial speed (August 2019)
  - Regenerative deceleration from 40 to 90 km/h initial speed (July 2020)

# Action B21 - Acoustical characterization of EVs

- 3 vehicles tested in August 2019

Renault Kangoo ZE and Diesel

Renault Zoe #1

- 5 vehicles tested in July 2020

Nissan Leaf #1

BMW i3

Peugeot e-208

Tesla Model 3

+ Renault Zoe #2

# Action B21 - Acoustical characterization of EVs

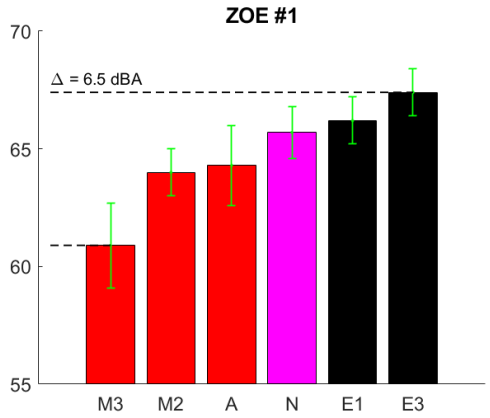
| August 2019 | | July 2020 | |
|---|---|---|---|
| **Vehicle** | **Tyres** | **Vehicle** | **Tyres** |
| Renault ZOE #1 | Michelin Energy EV 185/65 R15 88Q | Renault ZOE #2 | Michelin Energy EV 185/65 R15 88Q |
| Renault Kangoo ZE | Michelin Energy Saver 195/65 R15 95T* | Nissan Leaf #1 | Michelin Energy Saver **205/55 R16 91V**** |
| Renault Kangoo D | Michelin Energy Saver 195/65 R15 95T* | BMW i3 | Bridgestone Ecopia EP500 175/55 R20 89T (front) 195/50 R20 93T (rear) |
| | | Tesla Model 3 | Michelin Pilot Sport S 235/35 ZR20 92Y |
| | | Peugeot e-208 | Michelin Primacy4 195/55 R16 87H |

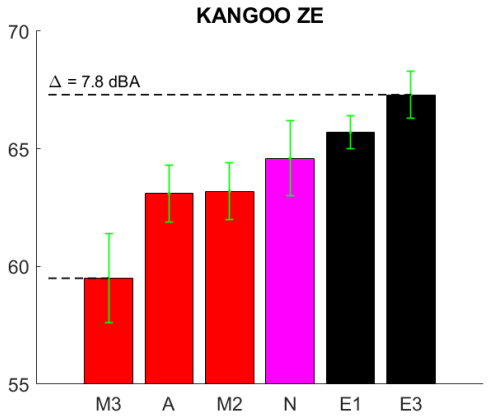
* Tyres also tested in laboratory by CRD within action B2/B7

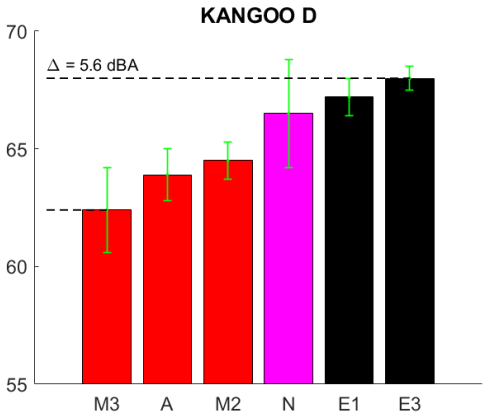
** Tyre size to be optimized on the prototypal test section (cf. conclusions of action A3)

# Action B21 - Acoustical characterization of EVs

Histogram CPB noise levels at 50 km/h – August 2019
(regressed, corrected at 20°C, including all vehicle noise sources)

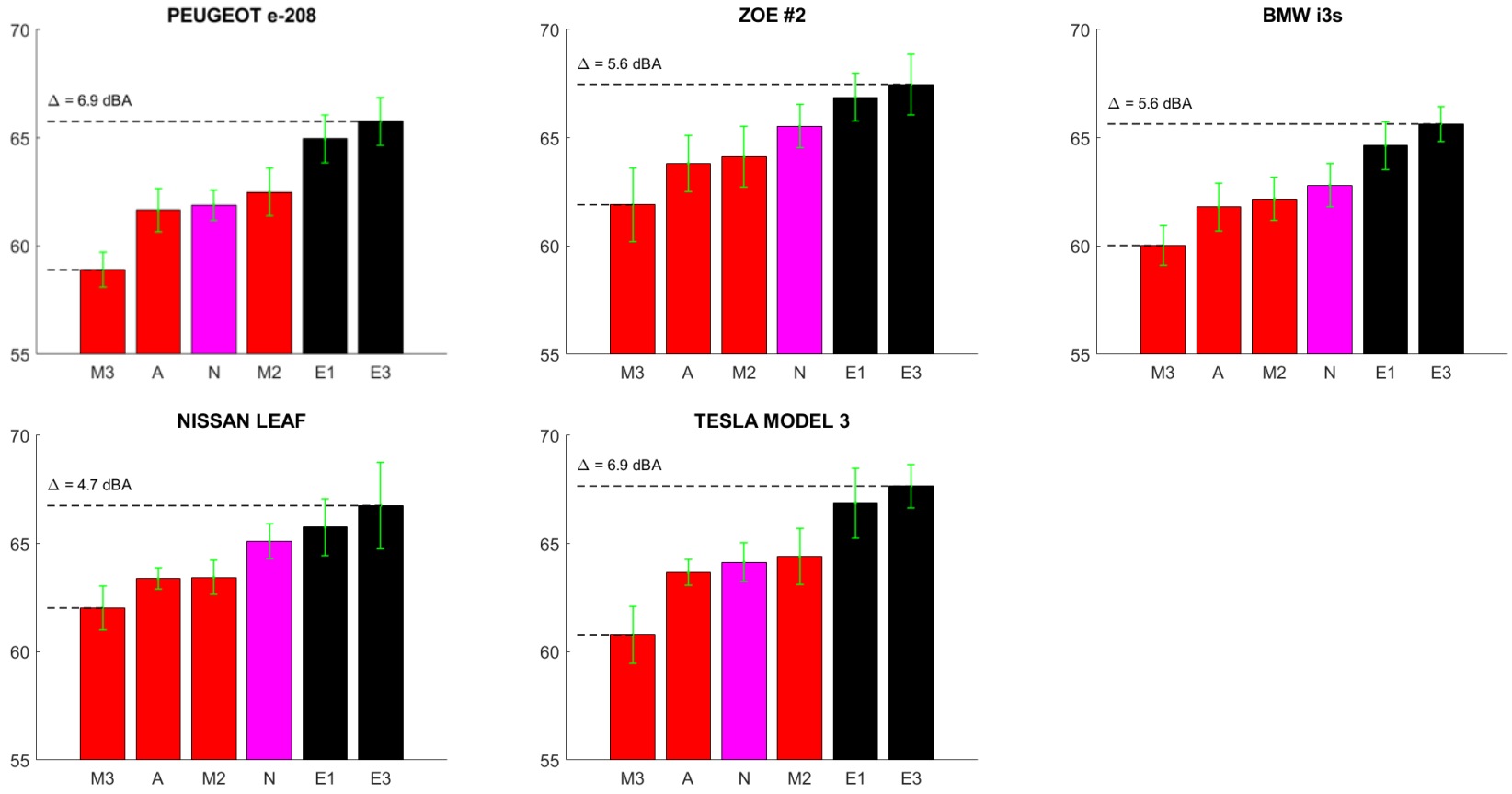


# Action B21 - Acoustical characterization of EVs

## Histogram CPB noise levels at 50 km/h – July 2020
## (regressed, corrected at 20°C, including all vehicle noise sources)

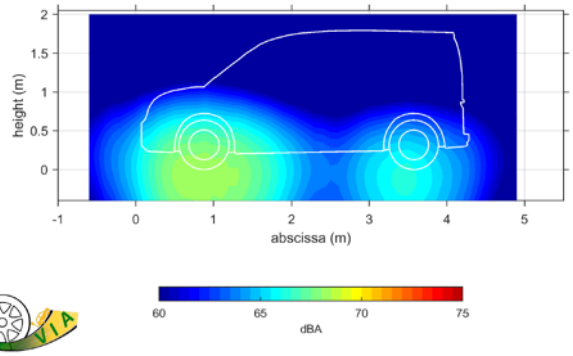


# Action B21 - Acoustical characterization of EVs

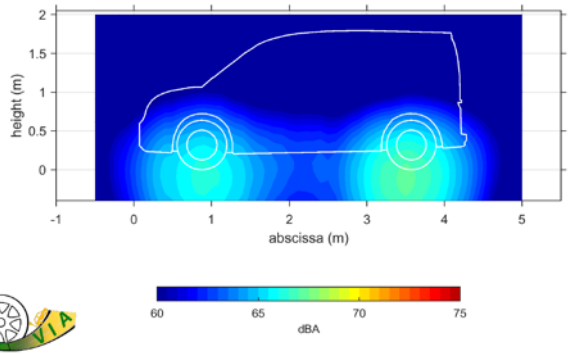
**Road surface N (ISO 10844)** **Constant speed 50 km/h**

***Global noise levels at a distance of 2.7 m – August 2019***

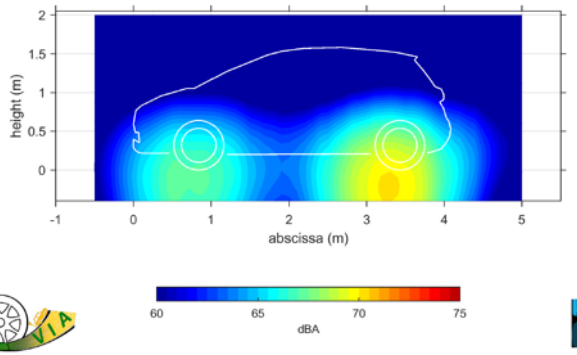
KANGOO D




KANGOO ZE




ZOE #1

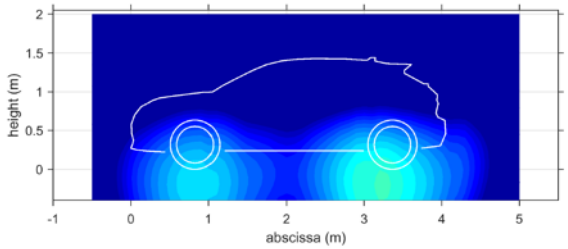


# Action B21 - Acoustical characterization of EVs

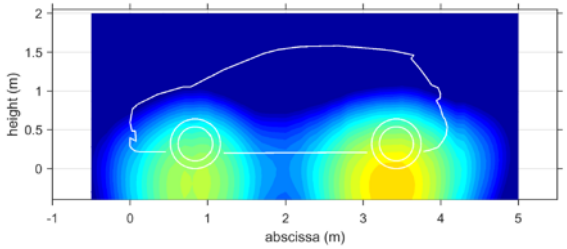
**Road surface N (ISO 10844)** **Constant speed 50 km/h**

***Global noise levels at a distance of 2.7 m – July 2020***

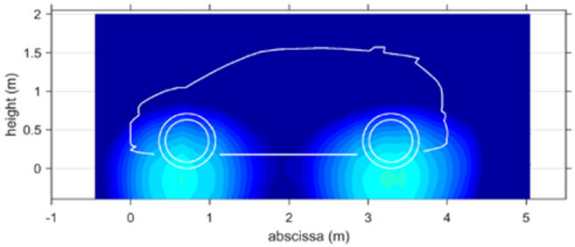
e-208



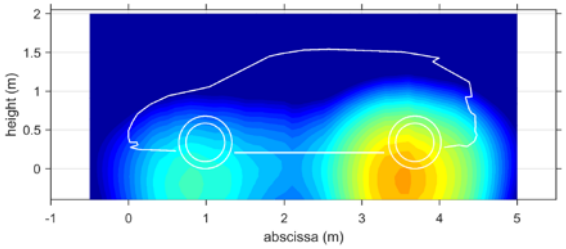

ZOE #2



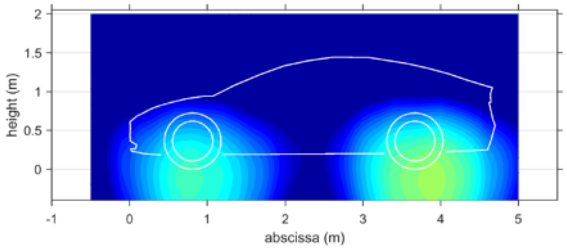

BMW i3

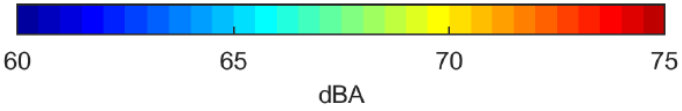



LEAF #1




TESLA Model 3



# Action B22 – Prototype construction

- Call for tender published in June 2020, 4 companies consulted
- Only one company applied for building the prototype
- Based on UNIRC recommendation from results of action B1, two different mixes of VTAC 0/6 have been laid (with or without crumb rubber)
- Thickness of the compacted mixture: 0.025m
- Underlayer: Dense-Graded Asphalt Concrete 0/10 + as dug gravel

# Action B22 – Prototype construction

- Call for tender published in June 2020, 4 companies consulted
- Only one company (Colas) applied for building the prototype
- Based on UNIRC recommendation from results of action B1, two different mixes of VTAC 0/6 have been laid by Colas (with or without crumb rubber)

| Fraction (mm) | Mix without crumb rubber | Mix with crumb rubber |
|---|---|---|
| 4/6.3 | 7.0% | 7.0% |
| 2/4 | 33.0% | 33.0% |
| 0/2 | 52.0% | 51.0% |
| 0/1 (RARX-CR) | - | 1.9% |
| Fines | 1.6% | 1.0% |
| Filler bitumen | - | 6.1% |
| Total bitumen | 6.4% | 6.4% |

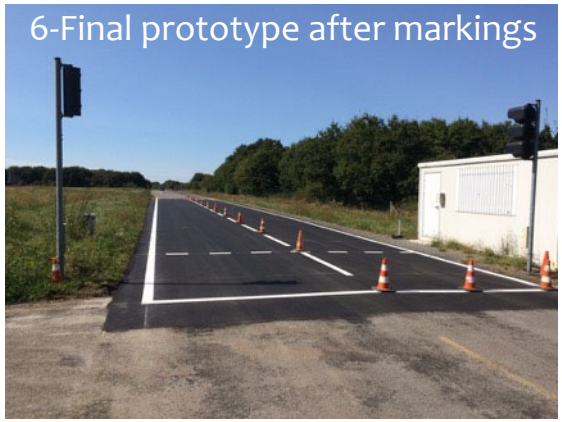
- Thickness of the compacted mixture: 0.025m
- Underlayer: Dense-Graded Asphalt Concrete 0/10 + as dug gravel

# Action B22 – Prototype construction

- Prototype construction from 7th to 10th September 2020

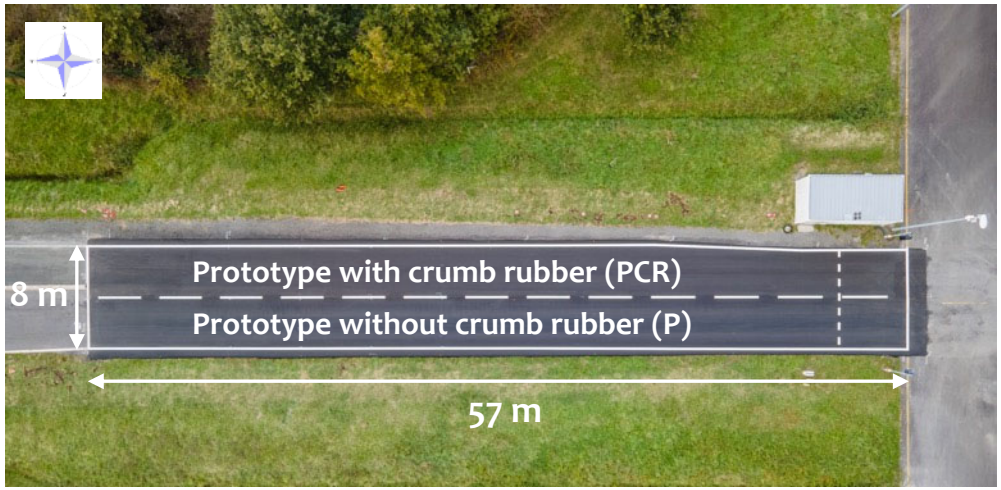




# Action B22 – Prototype construction

- Final prototype




PCR

P

# Action B23 – Prototype characterization

- Measurement campaign planned in Sep/Nov 2020 and spring 2021
- **CPB and microphone array measurements for a selection of EVs (10/2020)**
- **CPX measurements** (**UGE – 10/2020, 04/2021** and IPOOL – planned 06/2021)
- Simultaneous CPB/CPX measurements
- Measurement of road surface properties influencing tyre/road noise
  - **3D surface texture (03/2021)**
  - **Sound absorption** (impedance tube and **extended surface method – 09/2020**)
  - **Mechanical impedance (03/2021)**
- Other road surface properties
  - **SRT pendula friction tests (09/2020)**
  - **MPD measurements (09/2020)**
  - **Dynamical wet friction test (03/2021 – under analysis)**
  - **Wehner and Schulze tests (03/2021 – under analysis)**

# Action B23 – Prototype characterization

- Skid Resistance Tester (SRT) results

| | P - Mix without crumb rubber | PCR - Mix with crumb rubber |
|---|---|---|
| $\mu_{SRT}$ | 0.70±0.03 | 0.83±0.02 |

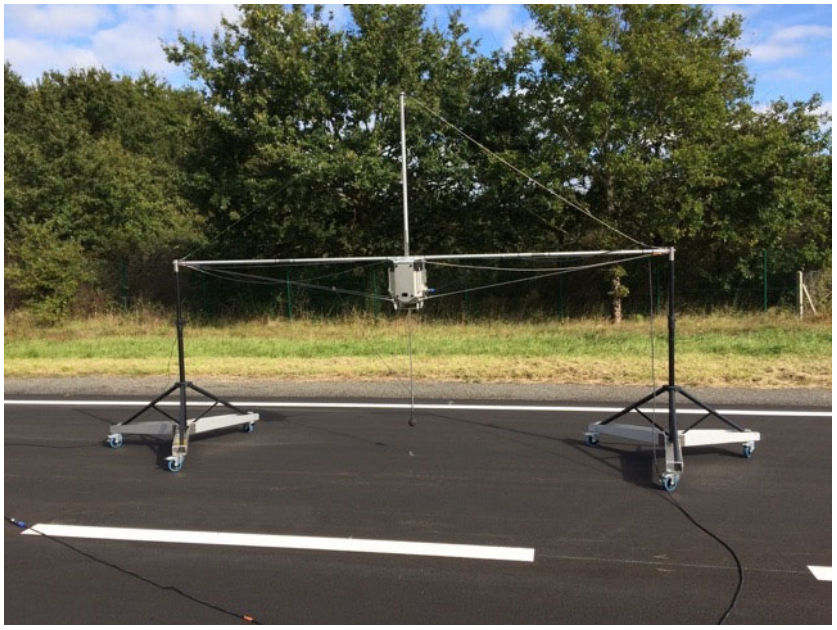
# Action B23 – Prototype characterization

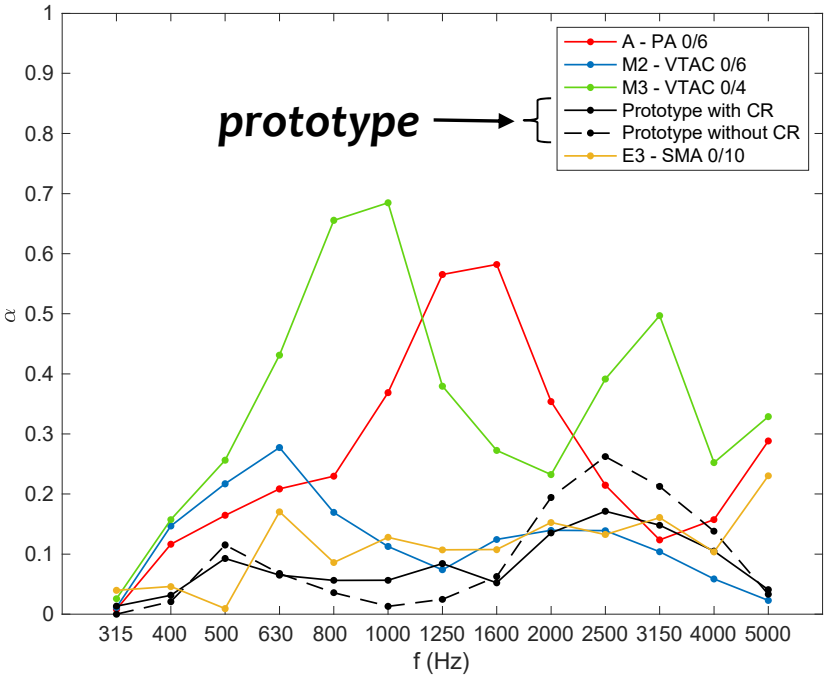
- MTD tests

| | P - Mix without crumb rubber | | PCR - Mix with crumb rubber | |
|---|---|---|---|---|
| **Location** | Left track | Right track | Left track | Right track |
| **MTD Colas (mm)** | 0.53 | 0.53 | 0.43 | 0.43 |
| **MTD Uni Eiffel (mm)** | 0.39 | 0.42 | 0.30 | 0.32 |
| **ETD Uni Eiffel (mm) from 3D texture MPD** | 0.51 | 0.50 | 0.45 | 0.45 |

# Action B23 – Prototype characterization

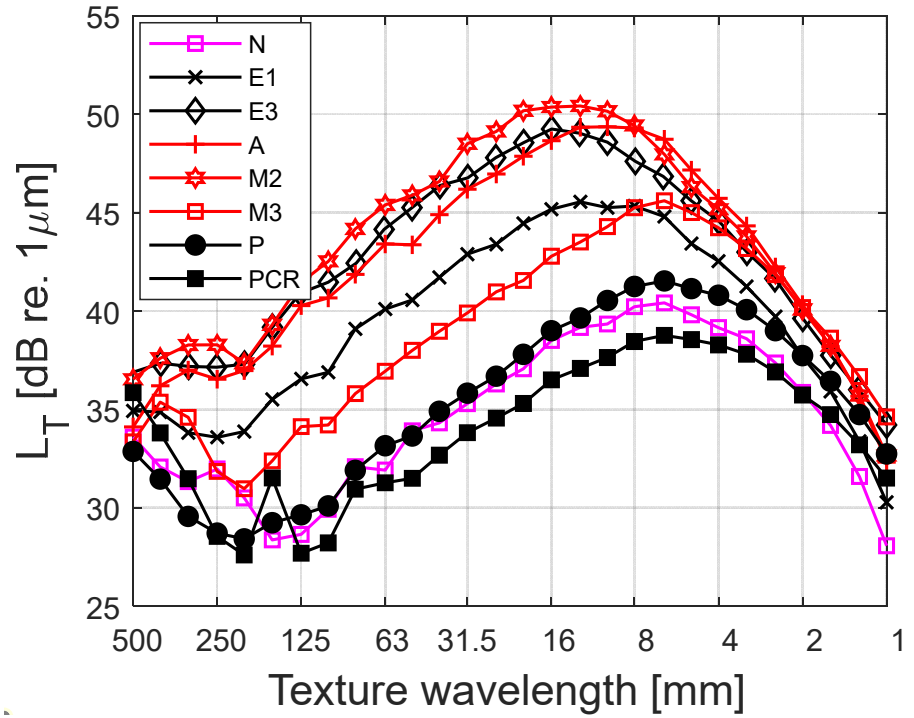
- Sound absorption measurement by ISO 13472-1 method on 28/09/2020





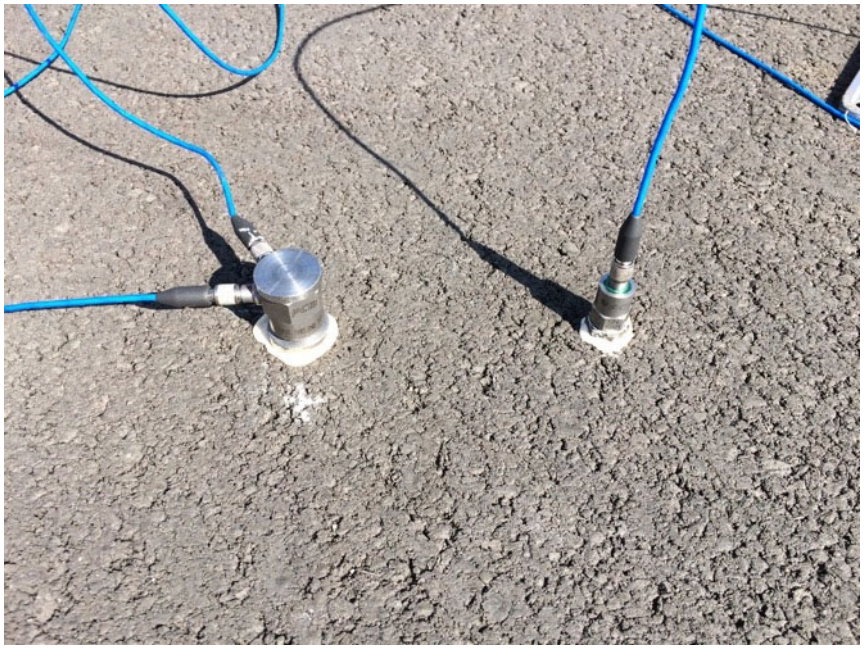
# Action B23 – Prototype characterization

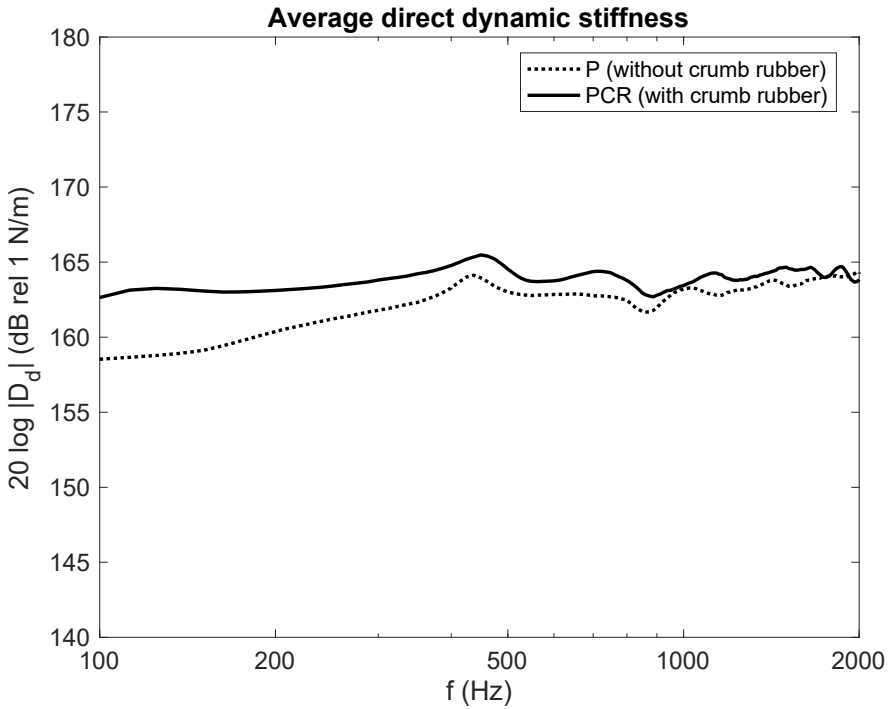
- 3D texture measurements performed in March 2021



# Action B23 – Prototype characterization

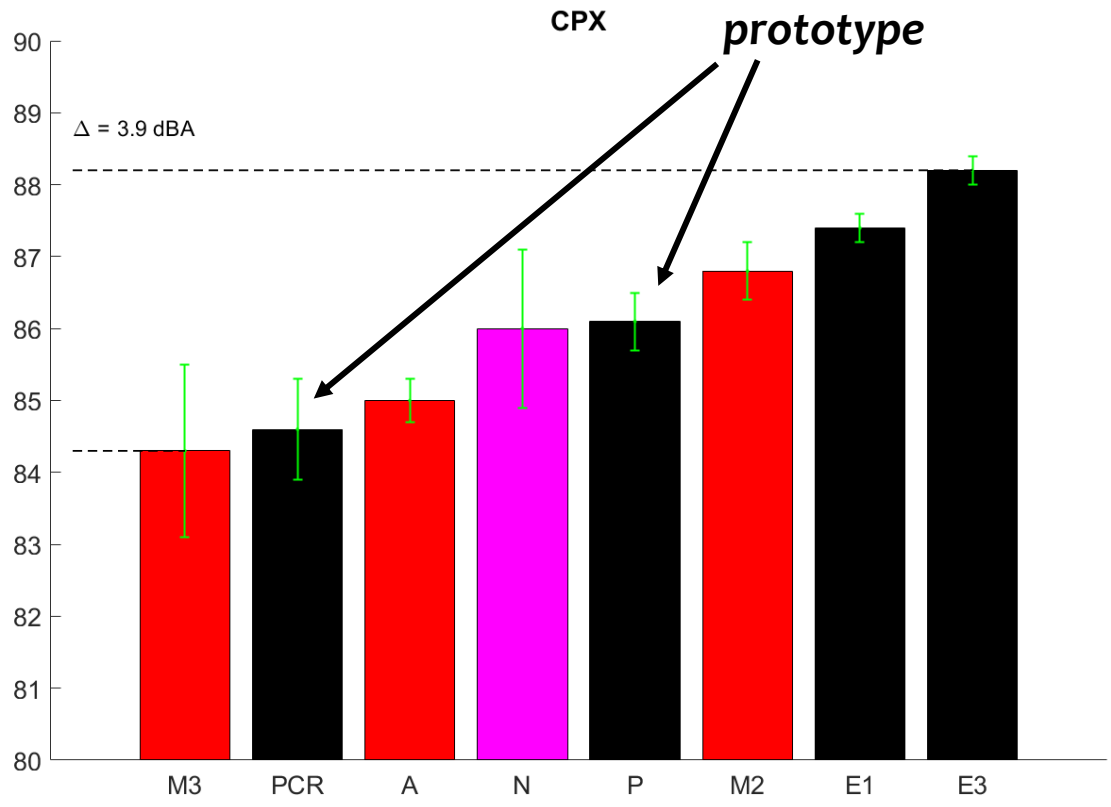
- Mechanical impedance tests performed in March 2021





# Action B23 – Prototype characterization

## CPX noise levels at 50 km/h, October 2020 (regressed, corrected at 20°C)




Renault Megane Scenic 2L

Michelin Energy Saver E3A
195/60 R15

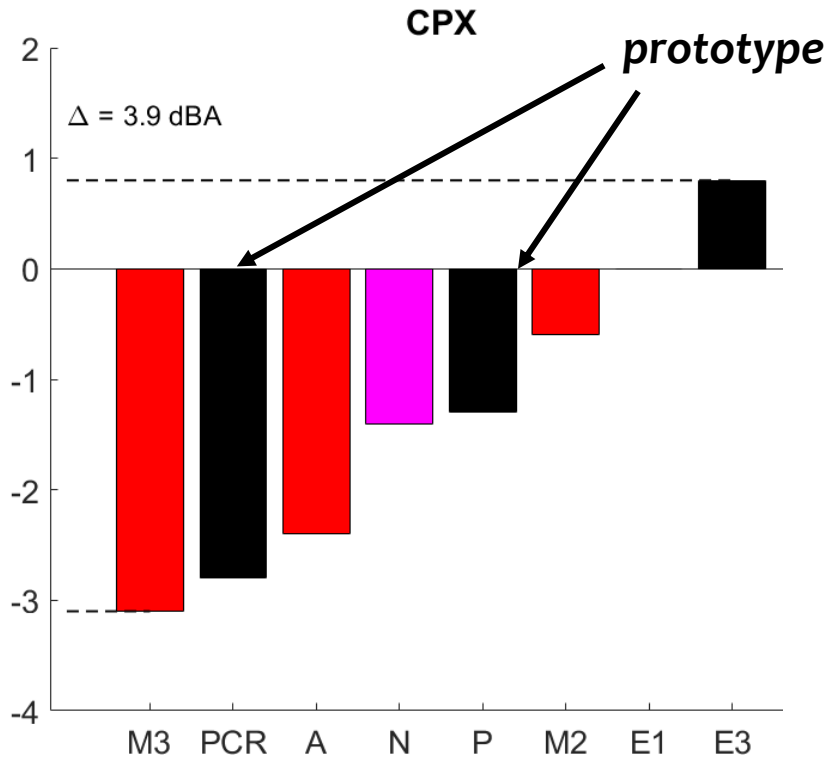
# Action B23 – Prototype characterization

## CPX noise levels reduction at 50 km/h at 20°C

## Reference: DAC 0/10 (E1)

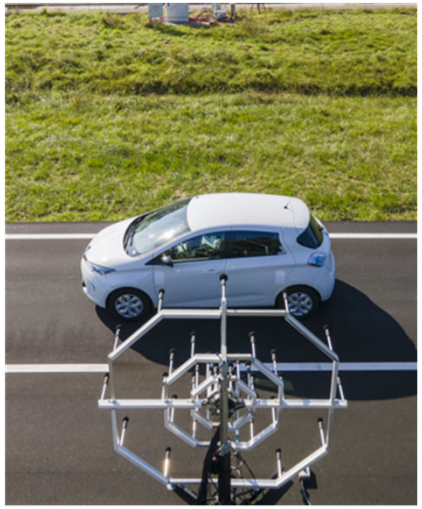
**Michelin Energy Saver E3A 195/60 R15**

| Test section | LAeq(50) | ΔLAeq(50) |
|---|---|---|
| **PCR** | **84.6 dBA** | **-2.8 dBA** |
| **P** | **86.1 dBA** | **-1.3 dBA** |
| A | 85.0 dBA | -2.4 dBA |
| **E1 (ref)** | **87.4 dBA** | **-** |
| E3 | 88.2 dBA | +0.8 dBA |
| M2 | 86.8 dBA | -0.6 dBA |
| M3 | 84.3 dBA | -3.1 dBA |
| N | 86.0 dBA | -1.4 dBA |



# Action B23 – Prototype characterization

- Pass-by measurement campaign in October 2020
  - Standard Controlled Pass-By (CPB) on PCR and P test sections
  - Microphone array pass-by measurements on PCR and P
- Pass-by conditions :
  - Constant speed : from 20 to 110 km/h in 5 km/h steps
  - Full acceleration for start speeds from 0 to 50/90 km/h initial speed
  - Regenerative deceleration from 40 to 90 km/h initial speed



# Action B23 – Prototype characterization

- 3 vehicles tested on the prototype in October 2020

Renault Zoe #2

Michelin Energy

**EV 185/65 R15 88Q**

Renault Kangoo ZE

Michelin Energy Saver

**195/65 R15 95T**

Nissan Leaf #2

Michelin Energy Saver

**205/55 R16 91V**

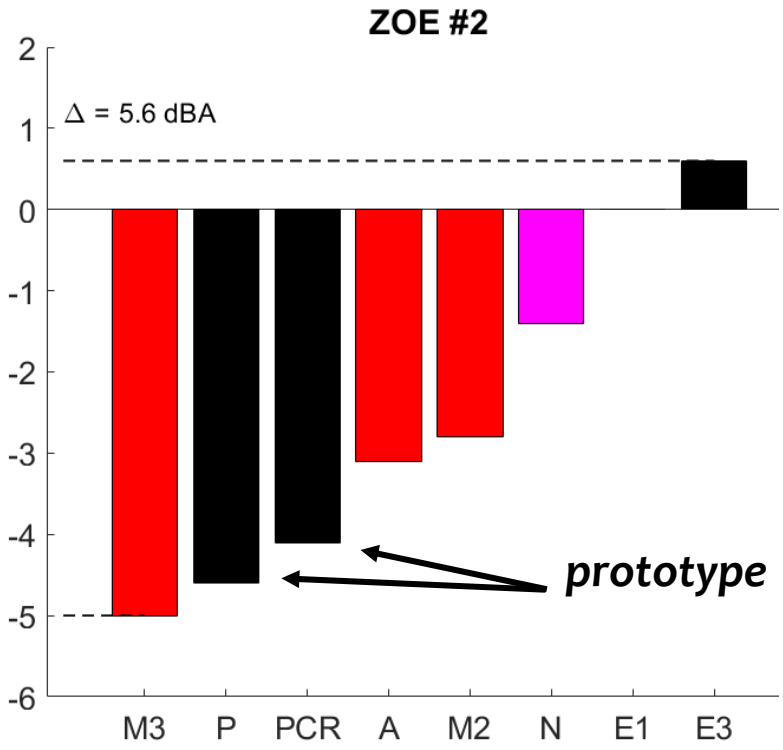
# Action B23 – Prototype characterization

## CPB noise levels reduction at 50 km/h at 20°C

## Reference: DAC 0/10 (E1)

**Renault ZOE#2**

| Test section | LAmax(50) | ΔLAmax(50) |
|---|---|---|
| **PCR** | **62.8 dBA** | **-4.0 dBA** |
| **P** | **62.3 dBA** | **-4.6 dBA** |
| A | 63.8 dBA | -3.0 dBA |
| **E1 (ref)** | **66.9 dBA** | **-** |
| E3 | 67.5 dBA | 0.6 dBA |
| M2 | 64.1 dBA | -2.8 dBA |
| M3 | 61.9 dBA | -5.0 dBA |
| N | 65.5 dBA | -1.3 dBA |



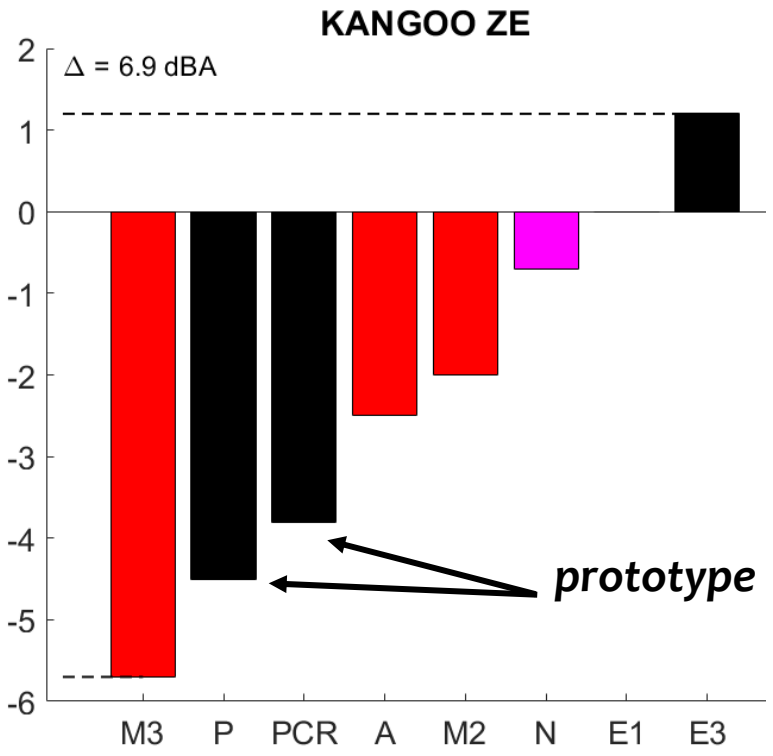
# Action B23 – Prototype characterization

## CPB noise levels reduction at 50 km/h at 20°C

## Reference: DAC 0/10 (E1)

**Renault KANGOO ZE**

| Test section | LAmax(50) | ΔLAmax(50) |
|---|---|---|
| **PCR** | **61.9 dBA** | **-3.8 dBA** |
| **P** | **61.2 dBA** | **-4.5 dBA** |
| A | 63.2 dBA | -2.5 dBA |
| **E1 (ref)** | **65.7 dBA** | **-** |
| E3 | 66.9 dBA | 1.2 dBA |
| M2 | 63.7 dBA | -2.0 dBA |
| M3 | 60.0 dBA | -5.7 dBA |
| N | 65.0 dBA | -0.7 dBA |



# Action B23 – Prototype characterization

## CPB noise levels reduction at 50 km/h at 20°C

## Reference: DAC 0/10 (E1)

**Nissan LEAF #1**

| Test section | LAmax(50) | ΔLAmax(50) |
|---|---|---|
| A | 62.9 dBA | -2.1 dBA |
| **E1 (ref)** | **65.0 dBA** | **-** |
| E3 | 66.0 dBA | 1.0 dBA |
| M2 | 62.7 dBA | -2.3 dBA |
| M3 | 61.3 dBA | -3.7 dBA |
| N | 64.3 dBA | -0.7 dBA |

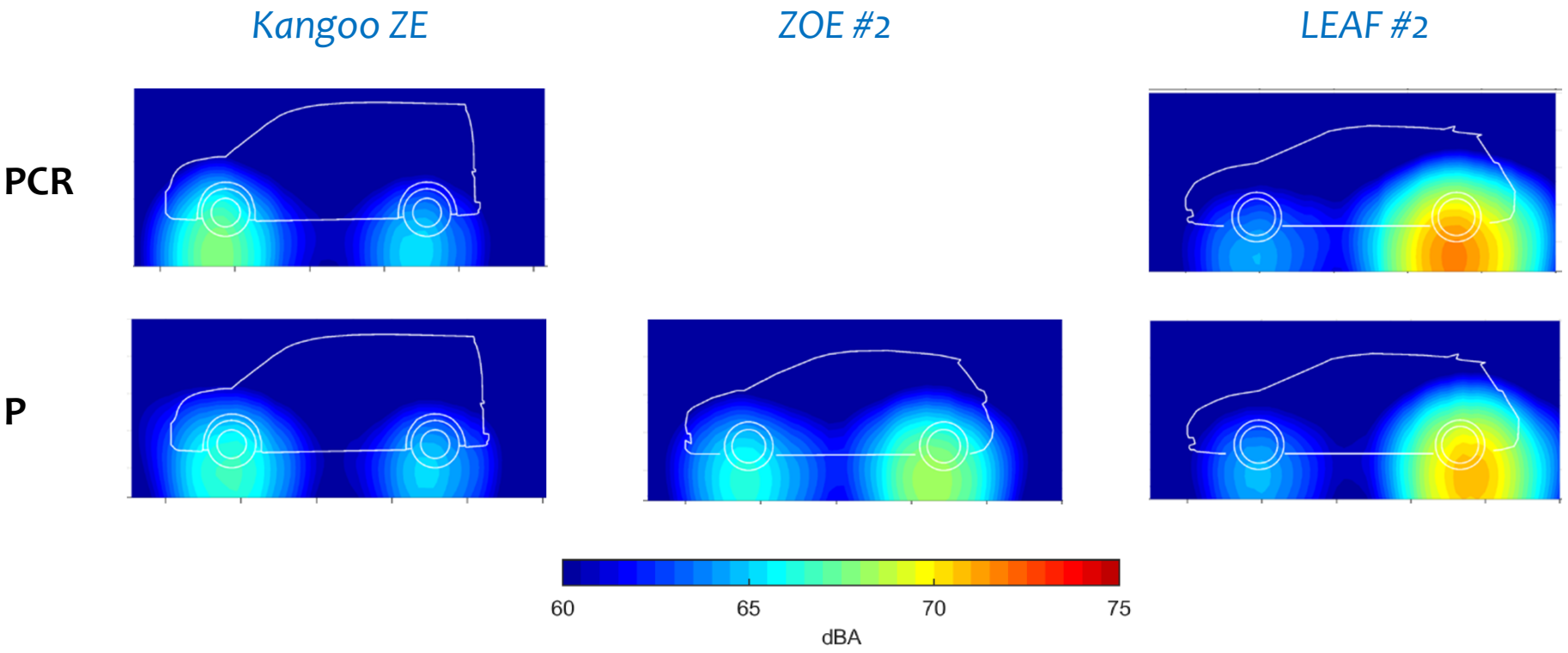
**Nissan LEAF #2**

| Test section | LAmax(50) | ΔLAmax(50) |
|---|---|---|
| **PCR** | **63.7 dBA** | Ref. not available |
| **P** | **63.5 dBA** | Ref. not available |

# Action B23 – Prototype characterization

***Global noise levels at a distance of 2.7 m – October 2020***

**Constant speed 50 km/h**



# Action B24 – Selection of optimized EV tyres

- Carved prototype tyres delivered by CRD to UNI EIFFEL for testing on the prototypal test surface:
  - Reference tyres: standard European summer replacement market at the time of testing
  - Other tyres: variations of tread pattern, construction and/or compound of the reference
  - Aim: optimizing the balance of exterior noise performance and other tyre performances (e.g. rolling resistance, grip) for EV vehicles

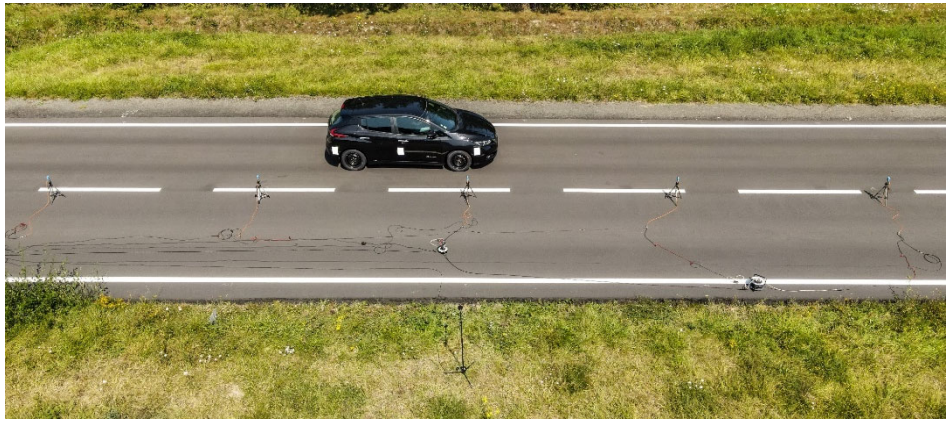
- Tests to be performed by UNI EIFFEL:
  - Constant speed and accelerated pass-by noise measurements, according to UNECE R51.03
  - Pass-by measurements with EV and ICE test vehicles representative of the respective markets
    - ⇨ completed in August 2021
  - CPX measurements on the prototypal test section and further standard road surfaces
    - ⇨ in progress

# Action B24 – Selection of optimized EV tyres

- Pass-by noise measurements, according to UNECE R51.03 regulation
  - 6 versions of prototype tyres provided by CRD, dimension 205/55 R16



  - 1 electric vehicle (Nissan LEAF) and 1 ICE vehicle (Renault KADJAR), 2 sides
  - 2 prototype road surfaces: P and PCR
  - 2 pass-by conditions: 50 km/h, at constant speed and under acceleration



# Dissemination Actions D1 and D2

- Sub-action D1-3:
  - Deliverable name: Video of the prototype construction (action D1)
  - Title: **Low-noise road surface prototype for electric vehicles**

- Sub-action D2-2:
  - J. Cesbron, M-A. Pallas, P. Klein, S. Bianchetti, A. Le Bellec and V. Gary, *LIFE E-VIA : contrôle du bruit des véhicules électriques par optimisation de l'interaction pneumatique-chaussée*, Journées Techniques Acoustique et Vibrations, Lille, France, mars 2020.
  - J. Cesbron, S. Bianchetti, M-A. Pallas , A. Le Bellec, V. Gary and P. Klein, *Road surface influence on electric vehicle noise emission at urban speed, Road surface influence on electric vehicle noise emission at urban speed*. Noise Mapping 8: 217-227, 2021. https://doi.org/10.1515/noise-2021-0017
  - J. Cesbron, S. Bianchetti, M-A. Pallas, A. Le Bellec, V. Gary and P. Klein, *Influence du revêtement de chaussée sur l'émission sonore des véhicules électriques (projet LIFE E-VIA)*, Journées Techniques Acoustique et Vibrations (JTAV 2021, on-line seminar), 8 June 2021.
  - J. Cesbron, S. Bianchetti, M-A. Pallas, F. Pratico, R. Fedele, G. Pellicano, A. Moro, F. Bianco, *Acoustical characterization of low-noise prototype asphalt concretes for electric vehicles*, Euronoise 2021, Madeira, Portugal, 25-27 Octobre 2021 .
  - M.A. Pallas, J. Cesbron, S. Bianchetti, P. Klein, V. Cerezo, P. Augris, C. Ropert, F. G. Praticò, F. Bianco, *LIFE E-VIA: Prototypal low-noise road surface for the reduction of electric vehicle rolling noise in urban area*. PIARC International Sustainability of Road Transport, Cluj-Napoca, Romania, 20-22 October 2021.

# Milestones and Deliverables

## Milestones

| Action | Name | Expected Date | Achieved |
|---|---|---|---|
| B2 | B2 Tyre-pavement coupling study - Prototype realization | 09/2021 | Yes (09/2021) |

## Deliverables

| Action | Name | Expected Date | Achieved |
|---|---|---|---|
| A1 | Technical Report Actions A1,A2,A3 | 03/2020 | Yes (12/06/2020) |
| B2 | B2 Report on prototype implementation and tyre/road noise performances | 11/2021 | No |
| D1 | 5 noticeboards in French language | 12/2022 | 2/5 (09/2021) |
| D1 | Video of the prototype construction | 12/2021 | Yes (06/2021) |
| D2 | Presentations in national / international congresses | 03/2023 | 1 JTAV2020, 1 JTAV 2021, 1 Euronoise 2021, 1 PIARC 2021 |
| D2 | 1 Article Published in an open access top ranked journal | 12/2022 | 1 Noise Mapping 2021 |

# Thank you for your attention

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  - marie-agnes.pallas@univ-eiffel.fr
  - simon.bianchetti@univ-eiffel.fr

- Link:
  - http://www.umrae.fr/

LIFE18 ENV/IT/000201

Scan me

The **Joint Research Unit in Environmental Acoustics** (UMRAE) is a research laboratory common to Ifsttar and Cerema

# LIFE E-VIA

**E**lectric **V**ehicle no**I**se control by **A**ssessment and optimisation of tyre/ road interaction

*www.life-evia.eu*

Start : July 1st, 2019

End: March 31st, 2023

## LIFE E-VIA PROJECT – WEB MEETING
## October 11 2021

Università degli Studi 'MEDITERRANEA' di Reggio Calabria

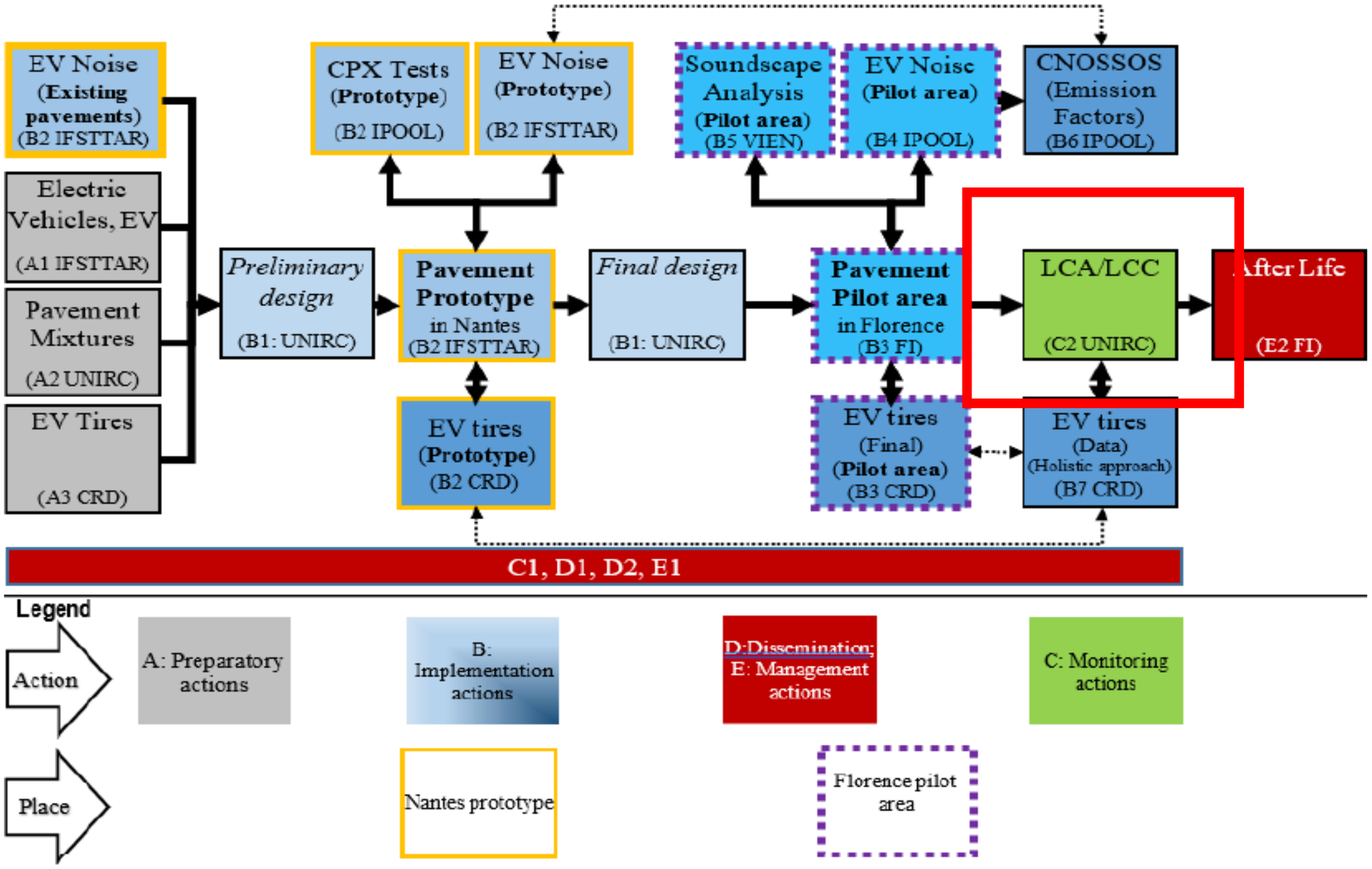
With the contribution of the LIFE programme of the European Union

**LIFE18 ENV/IT/000201**

# 1. Overall: Gantt chart

| Action | | 2019 | | | | 2020 | | | | 2021 | | | | 2022 | | | | 2023 | | | | 2024 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Action numbe | Name of the action | I | II | III | IV | I | II | III | IV | I | II | II | IV | | II | III | IV | I | II | III | IV | I | II | III | IV |
| **A. Preparatory actions (if needed)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| A.1 | Electric vehicles and their noise emission | | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | |
| A.2 | Quiet pavement technologies and their performance over time | | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | |
| A.3 | Tyre role in the new context of EV and ICEV | | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | |
| **B. Implementation actions (obligatory)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| B.1 | Tracks design | | | | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| B.2 | Tyre-pavement coupling study and prototype implementation | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | |
| B.3 | Pilot area: Implementation. | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| B.4 | Track efficiency tests in the pilot area | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| B.5 | Soundscape analysis | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | |
| B.6 | Evaluation of EV noise emissions | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | |
| B.7 | Holistic performances of tyres | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | |
| B.8 | Replicability and Transferability | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | |
| **C. Monitoring of the impact of the project actions (obligatory)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| C.1 | Monitoring of the impact of the project actions | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| C.2 | Life cycle analysis (LCA) and life cycle costing (LCC) | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | |
| **D. Public awareness and dissemination of results (obligatory)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| D.1 | Information and awareness raising activities | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| D.2 | Technical dissemination activities to stakeholders | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| **E. Project management (obligatory)** | | | | | | | | | | | | | | | | | | | | | | | | | |
| E.1 | Coordination, Monitoring and Project management | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | |
| E.2 | After LIFE Plan | | | | | | | | | | | | | | | | ■ | | | | | | | | |

# 2. Overall: Flowchart

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# 3. Overall: Actions of the project in which UNIRC is involved

- ❑ **A.1 Electric vehicles and their noise emission (scheduled: 07/2019-03/2020, [IFSTTAR]) - COMPLETED**
- ❑ **A.2 Quiet pavement technologies and their performance over time (scheduled: 07/2019-03/2020, [UNIRC]) - COMPLETED**
- ❑ **B.1 Tracks design (scheduled: 10/2019-03/2021, [UNIRC]) - COMPLETED**
- ❑ **B.2 Tyre-pavement coupling study and prototype implementation (scheduled: 07/2019-09/2021, [IFSTTAR])- COMPLETED**
- ❑ B.3 Pilot area: Implementation (scheduled: 04/2020-03/2023, [FI])
- ❑ B.8 Replicability and Transferability (scheduled: 07/2020-12/2022, [FI])
- ❑ C.1 Monitoring of the impact of the project actions (scheduled: 07/2019-03/2023, [FI])
- ❑ C.2 LCA and LCC (scheduled 07/2019-03/2023, [UNIRC])
- ❑ D.1 Information and awareness raising activities (scheduled: 07/2019-03/2023, [VIEN])
- ❑ D.2 Technical dissemination activities to stakeholders (scheduled: 07/2019-03/2023, [VIEN])
- ❑ E.1 Coordination, Monitoring and Project management (scheduled: 07/2019-03/2023, [FI])

B3
B8
C1
C2
D1
D2
E1
THANKS

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# *Action B3*

- *Action B3 - Pilot area: Implementation. (scheduled: 04/2020-03/2023, [FI]):* action B3, leaded by FIRENZE, is of paramount importance because it refers to the interventions' implementation in the pilot area of the LIFE E-VIA project (Sub-Action B3.1) and it allows the subsequent fulfilment of Actions B4, B5, B6 and following. **UNIRC is contributing to this action through information exchange.**

# *Action B3*

- *Action B8 - Replicability and Transferability (scheduled: 07/2020-12/2022, [FI].* This action, leaded by FI, includes replication of solutions, action plans for the replication, *implementations in different contexts*, replication of the festival, improvement of CNOSSOS data base, *CR-based initiatives*, method and guideline adoption (by other European Regions), EV-oriented tyres, *pavement solution patenting*, *start-up or/and spin-off creation*. Even if pandemic is still creating cons, UNIRC is focusing on specific duties.

# *Action C1*

- *Action C1 - Monitoring of the impact of the project actions (scheduled: 07/2019-03/2023, [FI]):* the aim of this action is to progressively verify that Implementation actions (actions B) are carried out according to the originally defined project objectives and that the quantitative expected results are actually obtained. Preliminary monitoring activities of the impact of LIFE E-VIA project where carried out by UNIRC according to the LIFE project performance indicators especially for those suggested for the environmental issues.

# *Action C2*

- *Action C2 - Life cycle analysis (LCA) and life cycle costing (LCC) (scheduled 07/2019-12/2022, [**UNIRC**]):* these analyses will continue and will focus on evaluating tracks efficiency from a comprehensive point of view, including soundscape components (B5), thus achieving obj.6 of demonstrating the durability and effectiveness through LCA. The data gathering process is still in progress (UNIRC).

# Focus on C2

These analyses will continue and will focus on evaluating tracks efficiency from a comprehensive point of view, including soundscape components (B5), thus achieving obj.6 of demonstrating the durability and effectiveness through LCA.

Data gathering is in progress.

The paper, *"Energy and Environmental Life Cycle Assessment of Sustainable Pavement Materials and Technologies for Urban Roads"*, has been published. This is available on the website of the LIFE E-VIA project: https://life-evia.eu/papers/papers-1-lorem-ipsum/


Energy and Environmental Life Cycle Assessment of Sustainable Pavement Materials and Technologies for Urban Roads

January 2020 · Sustainability 12(2):704 · Follow journal

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# *Action D1*

- *Action D1 - Information and awareness raising activities (scheduled: 07/2019-03/2023, [VIENROSE]):* the dissemination regards all activities concerning the Project promotion to stakeholders, the involvement of the general public, scientific communication and organization of events dedicated to the communication of results. Paper submitted to Euronoise 2021.

# *Action D2*

- *Action D2 - Technical dissemination activities to stakeholders (scheduled: 07/2019-03/2023, [VIENROSE]):* technical dissemination activities to stakeholders will be guaranteed towards the participation and reporting on LIFE E-VIA state of art in periodic meetings of the major City Network in Europe dealing with environmental/mobility issues. Scheduled: 20th IEEE Conference MELECON 2020. Conference Environmental Engineering 2020. Euronoise Congress 2021.

# *Action E1*

- *Action E1- Coordination, Monitoring and Project management (scheduled: 07/2019-03/2023, [FI]):* Preliminary activities. Meetings in Florence (held), in Reggio (in progress), Hannover (to be held), and Nantes (to be held).

# Contest=competition between a couple of schools of Reggio province

- A. Volta is already on board!!!
- Other are going to be involved. By October
- Editing the call. Issuing the call. By November
- Commission to examine the applications presented by the schools/students. One representative per partner
- Deadline: February 2022
- Presentation of the winners at the expomove to be held in Florence in May 2022
- The winners/professors will be told to have this trip to Continental or/Florence expomove.

# LIFE E-VIA

**E**lectric **V**ehicle no**I**se control by **A**ssessment and optimisation of tyre/ road interaction

*www.life-evia.eu*

Start : July 1st, 2019

End: March 31st, 2023

# THANKS FOR YOUR ATTENTION

Università degli Studi 'MEDITERRANEA' di Reggio Calabria

## LIFE E-VIA PROJECT – WEB MEETING
## October 11 2021

With the contribution of the LIFE programme of the European Union

**LIFE18 ENV/IT/000201**

Continental
The Future in Motion

With the contribution of
the LIFE programme of
the European Union

LIFE18 ENV/IT/000201

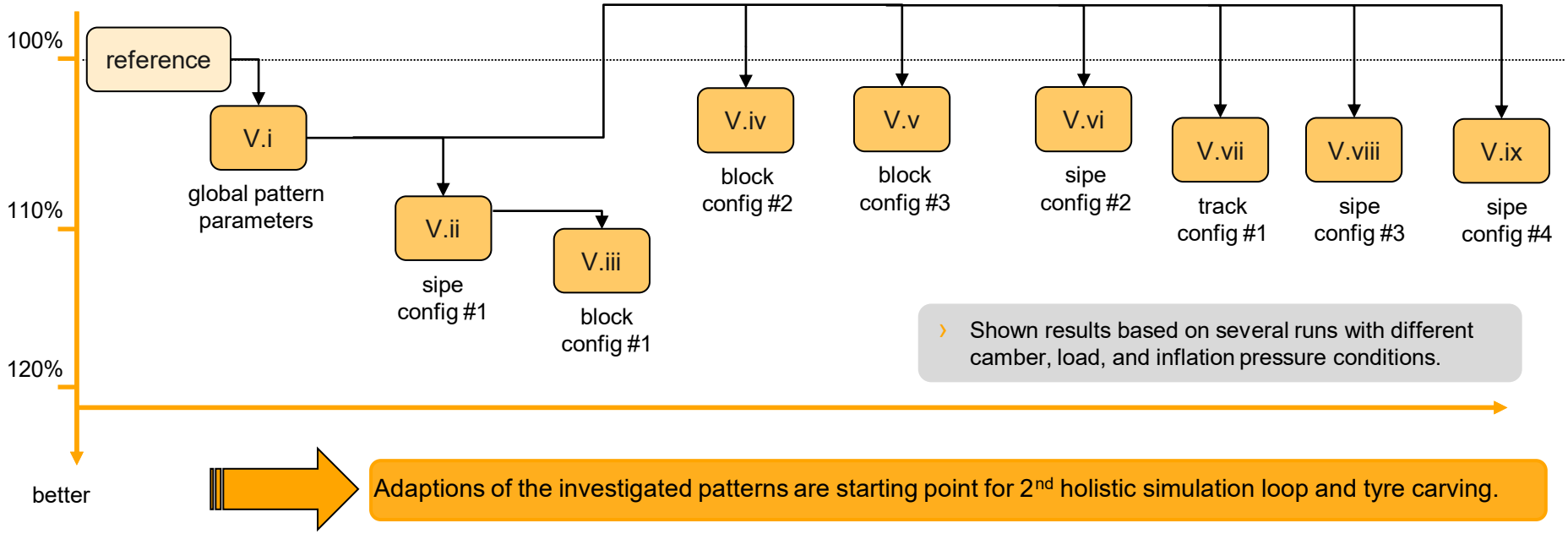
# LIFE E-VIA

## Status update October 2021

https://www.continental-tires.com/

Continental Reifen Deutschland GmbH

# Initial virtual noise optimization loop

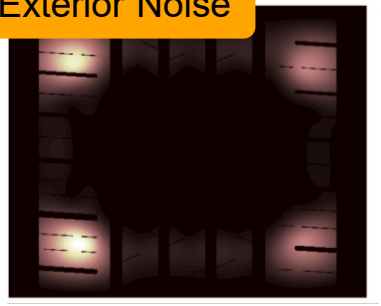



› Shown results based on several runs with different camber, load, and inflation pressure conditions.

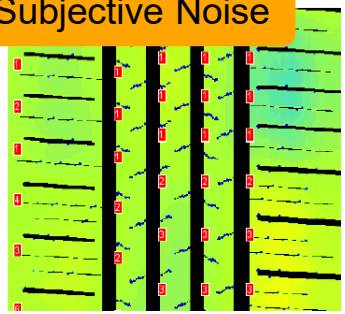
Adaptions of the investigated patterns are starting point for 2nd holistic simulation loop and tyre carving.

# Holistic simulation loop

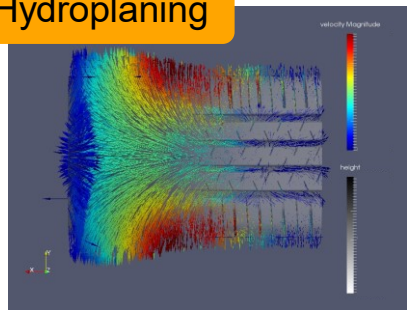
Exterior Noise



Subjective Noise

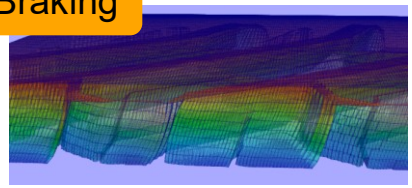


Hydroplaning

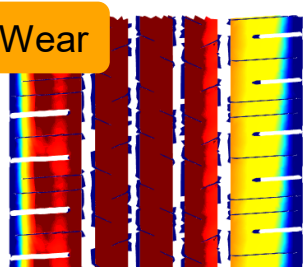


Handling

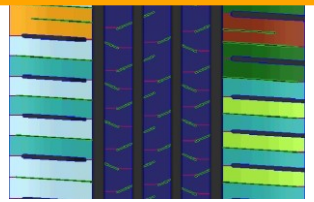
Braking



Wear



Mechanical traction

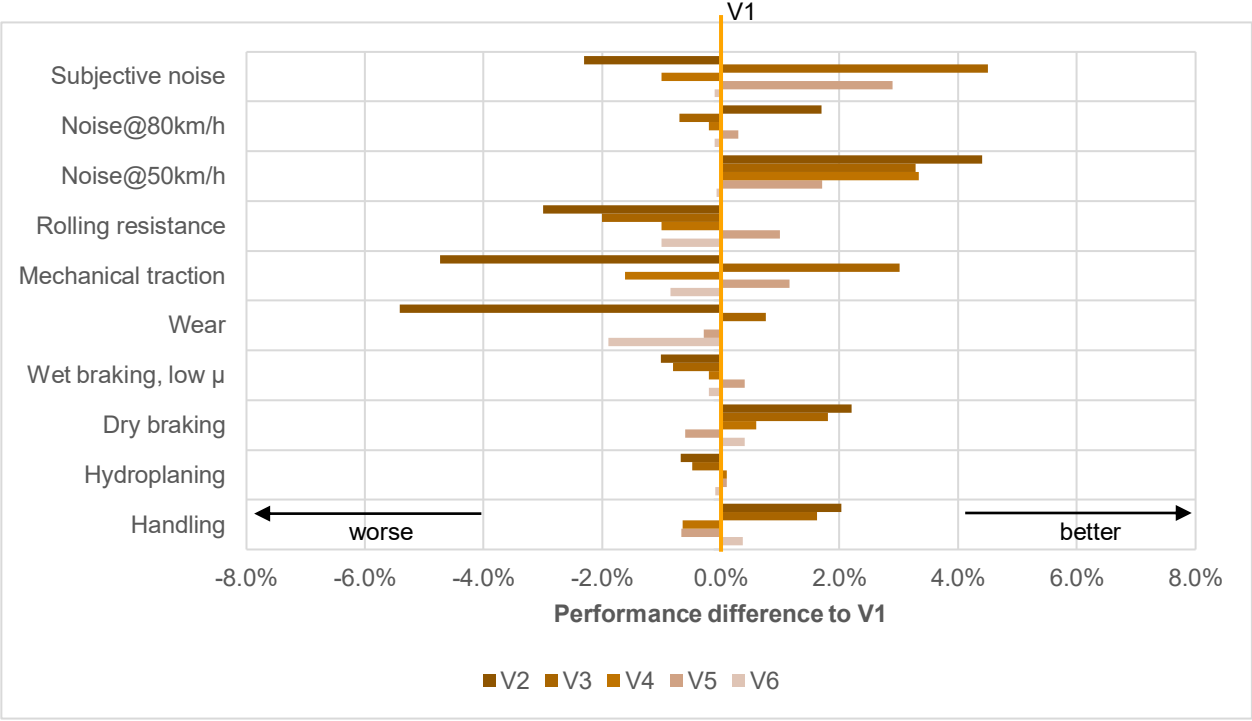


Rolling resistance

Footprint

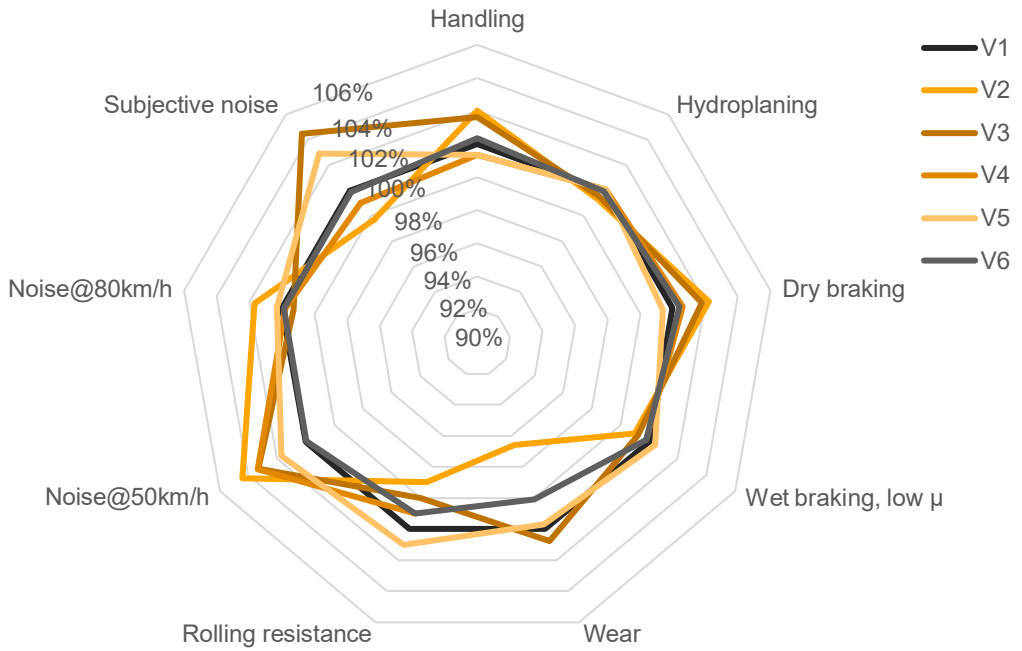
>200 simulations so far

# Simulation results




- Pure pattern effects.
- Benefit from combination of measures used for different variants cannot be linearly superposed.
- Since performances depend to different degrees on construction, compound, etc. the shown values cannot be transferred 1:1 to real life performance.

# Simulation target conflict analysis




- Mostly correlation between noise performances
- No or positive correlation noise and handling/hydroplaning/dry braking
- Target conflicts noise and wear/wet braking/rolling resistance for some variants

# Testing: noise measurements on drum

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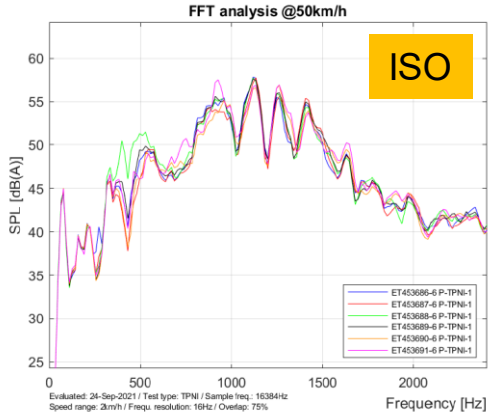
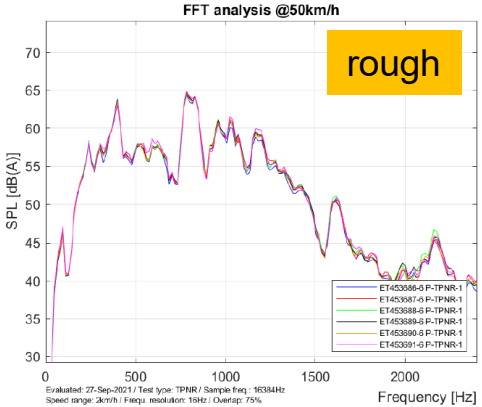
- Test have been carried out for free rolling on ISO and rough surface replicas, and acceleration on ISO surface replica.
- Detailed analysis still ongoing.




**acceleration**

| (Hz) / dB(A)[SPL] | 500Nm 3rd Octave F1 | F2 | F3 | OA | Peak |
|---|---|---|---|---|---|
| | 20 – 500 | 300 – 1500 | 700 – 3000 | 20 – 5000 | 20 – 5000 |
| ET453686 | 57.7 | 70.1 | 70.9 | 71.4 | 65.7 |
| ET453687 | 58.9 | 69.8 | 70.5 | 71.2 | 65.0 |
| ET453688 | 61.2 | 69.7 | 69.6 | 70.5 | 64.4 |
| ET453689 | 59.0 | 70.0 | 70.5 | 71.0 | 65.2 |
| ET453690 | 58.4 | 69.6 | 70.2 | 70.7 | 64.4 |
| ET453691 | 57.8 | 70.1 | 70.5 | 70.9 | 66.0 |

**Compared to Reference or Target**

| | | | | | |
|---|---|---|---|---|---|
| ET453686 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ET453687 | 1.2 | -0.3 | -0.4 | -0.2 | -0.7 |
| ET453688 | 3.4 | -0.4 | -1.2 | -0.9 | -1.3 |
| ET453689 | 1.3 | -0.1 | -0.4 | -0.4 | -0.5 |
| ET453690 | 0.6 | -0.5 | -0.7 | -0.6 | -1.3 |
| ET453691 | 0.0 | 0.0 | -0.4 | -0.4 | 0.3 |

# Dissemination actions: Project presentation at *DAGA 2021*

LIFE18 ENV/IT/000201

- (Virtual) participation in the *Annual Meeting of the German Acoustical Society (DAGA 2021)*, 15-18 August 2021
- Presentation and short paper


**LIFE E-VIA: Electric Vehicle Noise Control by Assessment and Optimisation of Tyre/Road Interaction**

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**Introduction**

Data collected by the European Environment Agency (EEA) shows that more than 100 million EU citizens are affected by noise levels negatively impacting human well-being. Although noise associated with rail and air traffic cannot be ignored, a significant contributor to these high noise levels is the road transportation sector. According to a World Health Organization (WHO) report [1] ca. 50 % of the EU population are habitually subjected to road traffic noise levels above 53 dBA (the WHO guideline value for outdoor sound levels [2]), and roughly 10 % to levels exceeding 65 dBA, which for example have shown to lead to a 20 % to 40 % increased risk for cardiovascular diseases [3]. Consequently, the WHO states that "at least one million healthy life years are lost every year from traffic-related noise in the western part of Europe" [1].

Road traffic noise comprises of the vehicle's power train noise, rolling noise and aerodynamic noise. Traditionally, rolling noise is the primary noise source for typical internal combustion engine vehicles (ICEV) at common urban driving speeds of roughly 40 km/h to 100 km/h [4]. Below these speeds powertrain noise dominates, and above aerodynamic noise. For electric vehicles (EV) tyre/road noise starts to dominate the overall exterior noise of the vehicle at even lower speeds because of the lower engine noise. Still, at slower speeds EVs exterior noise levels are lower than for ICEVs which is why electric mobility has been identified as an important way to reduce urban noise levels. As an additional benefit also (local) emissions of $CO_2$ and other air pollutants are reduced.

One of the key focus areas of the LIFE E-VIA project is road traffic noise reduction in densely populated urban areas. Noise mitigation measures are usually most efficient when addressing the problem directly at the source. In terms of the remaining EV traffic noise this means that measures aimed at providing noise optimized road surfaces and tyres have a high noise mitigation potential. Thus, it is one of E-VIA's objectives to develop noise optimized roads and tyres for future electric mobility traffic scenarios.

For the optimization of a low noise EV tyre different boundary conditions than for an ICEV application need to be considered. For EVs the relative contribution of the tyre noise to the overall vehicle noise is considerably increased because of the drastically lower drivetrain noise. Because of the higher drivetrain efficiency of electrical engines also the tyre rolling resistance has a relatively higher contribution to the energy consumption of an EV than for an ICE vehicle. Depending on how the electric energy used for charging the EV is created, this also can have a significant contribution to the emission of $CO_2$ and other air pollutants. More importantly, the tyre rolling resistance has a large impact on the achievable mileage of an EV. A large mileage, in turn, is crucial for the public acceptance of EVs as means of transportation. Therefore, a low noise, low rolling resistance tyre is considerably more beneficial for EVs than for comparable ICE vehicles.

From a purely acoustical point of view, tyre requirements for EV applications also change because typically EVs are heavier than comparable ICEVs and have higher available torque values in a wide range of RPMs. Both increased tyre load, and increased tyre torque are known to lead to higher tyre/road noise [4].

To sum up, the LIFE E-VIA project focuses on noise pollution due to road traffic in a future urban environment in which electric and hybrid vehicles will be a consistent portion of the traffic flow. A major objective will be the development of a holistic low noise tyre and a low noise road surface, both optimized for the special requirements of EVs. Within the project a final version of the pavement will later be used for repaving a section of a road in Florence, Italy. This pilot area will be the centre of further accompanying activities like guideline development, local dissemination and information campaigns, a soundscape analysis, and life cycle (cost) analysis. Finally, the measurement data collected during the runtime of the project is intended to be used to update the CNOSSOS model (Directive 996/2015/EC [5]) for new traffic spectra and new electric- or hybrid-powered vehicles.

**Project objectives**

The project objectives are:

1. To reduce noise for roads inside very populated urban areas by implementing mitigation measures based on noise optimized road surfaces and tyres for EV applications. The tyres will be developed with a holistic view which assures that relevant, non-noise related performance requirements like safety, rolling resistance, or grip are met.
2. To estimate the mitigation efficiency and potential of tyres, pavements, and traffic conditions (e.g. noise spectra, speeds, traffic flow) at a higher, comprehensive level. For this, Life Cycle Analysis

# Further dissemination actions since last meeting

LIFE18 ENV/IT/000201

- Presentation at a meeting of the *European Tire and Rim Technical Organization (ETRTO)*, 19th May 2021
- Presentation at the *University of Applied Sciences and Arts* Hanover, 7th June 2021
- Translation of pilot area noticeboard into German.

ETRTO The European Tyre and Rim Technical Organisation

HOCHSCHULE HANNOVER UNIVERSITY OF APPLIED SCIENCES AND ARTS

# Thank you!