



**Decreto del Direttore generale nr. 151 del 28/08/2023**

Proponente: *Gaetano Licitra*

*Dipartimento Pisa*

Pubblicità/Pubblicazione: Atto soggetto a pubblicazione *integrale* (sito internet)

Visto per la pubblicazione - Il Direttore generale: Dott. Pietro Rubellini

Responsabile del procedimento: *Dr. Gaetano Licitra*

Estensore: *Alessandra Grandi*

**Oggetto: Presa d'atto del Grant Agreement relativo al progetto LIFE22-ENV-IT-LIFE SILENT - “Sustainable Innovations for Long-life Environmental Noise Technologies” n. Project 101114310, con soggetto Capofila ANAS - attività progettuali dal 01.09.2023 al 31.03.2028.**

**ALLEGATI N.: 1**

<i>Denominazione</i>	<i>Pubblicazione</i>	<i>Tipo Supporto</i>
Allegato A - Grant Agreement Progetto Life Silent	sì	digitale

**Natura dell'atto:** *immediatamente eseguibile*

**Trattamento dati personali:** *Sì*      **Numerosità degli interessati:** *1 - 1.000*

## Il Direttore generale

Vista la L.R. 22 giugno 2009, n. 30 e s.m.i., avente per oggetto "Nuova disciplina dell'Agenzia regionale per la protezione ambientale della Toscana (ARPAT)";

Richiamato il decreto del Presidente della Giunta Regionale n. 74 del 23.03.2021, con il quale il sottoscritto è nominato Direttore generale dell'Agenzia Regionale per la Protezione Ambientale della Toscana;

Considerata la decorrenza dell'incarico di cui sopra dal 1° maggio 2021;

Dato atto che con decreto del Direttore generale n. 238 del 13.09.2011 è stato adottato il Regolamento di organizzazione dell'Agenzia (approvato dalla Giunta Regionale Toscana con delibera n. 796 del 19.09.2011), successivamente modificato con decreti n.1 del 04.01.2013 e n. 108 del 23.07.2013;

Visto l'“Atto di disciplina dell'organizzazione interna” approvato con decreto del Direttore generale n. 270/2011 (ai sensi dell'articolo 4, comma 3, del Regolamento organizzativo dell'Agenzia), modificato ed integrato con decreti n. 87 del 18.05.2012 e n. 2 del 04.01.2013;

Considerato che ARPAT ha tra i suoi compiti d'istituto definiti dall'art. 6 della L.R. 30 del 22 giugno 2009 “Nuova disciplina dell'Agenzia regionale per la protezione ambientale della Toscana (ARPAT)” quello della collaborazione con *“altri enti pubblici ed istituzioni, anche per la partecipazione all'attività di ricerca applicata, finalizzata in particolare al miglioramento della conoscenza sull'ambiente ed al miglioramento dell'efficienza dei processi di tutela.”*;

Considerato che la tematica dell'inquinamento acustico è strategica per il tema dell'inquinamento ambientale e della tutela della salute all'interno del contesto internazionale e delle strategie programmatiche della Regione Toscana, in accordo con le principali Direttive Comunitarie;

Considerato altresì che ARPAT tramite i Settori Agenti Fisici svolge attività di misura nel settore dell'inquinamento acustico e sviluppa metodi anche innovativi per la valutazione dei livelli sonori nell'ambiente;

Considerato altresì che nella Deliberazione GRT 27 gennaio 2020, n. 75 “Legge regionale n. 30/2009 e s.m.i.: art. 15 - Indirizzi ARPAT 2020/2022.” Allegato A - è prevista l'attività di “Messa a punto di procedure e/o metodiche anche attraverso attività di collaborazione con enti di ricerca e di normazione, finalizzata al raggiungimento di elevati standard di qualità per le attività di controllo, nonché al miglioramento della conoscenza sull'ambiente ed al miglioramento dell'efficienza dei processi di tutela” (riga 139 della Carta dei Servizi e delle attività di ARPAT);

Visto il Programma europeo LIFE per l'ambiente e l'azione per il clima (2021-2027), topic: LIFE-2022-SAP-ENV-ENVIRONMENT (d'ora in avanti Programma) istituito con il Regolamento (UE) 2021/783 del parlamento europeo e del consiglio del 29 aprile 2021, che ne detta le regole per la partecipazione;

Tenuto conto che ARPAT ha ritenuto di suo interesse aderire, in qualità di partner, alla proposta progettuale dal titolo “Sustainable Innovations for Long-life Environmental Noise Technologies” (acronimo LIFE SILENT) - rif. Grant Agreement version 11.05.2023 (Allegato “A”), che mira a sviluppare soluzioni eco-friendly e sostenibili per attenuare il rumore in ambienti urbani complessi, caratterizzati da differenti sorgenti emmissive, in particolar modo strade e ferrovie. Le soluzioni proposte consistono in pavimentazioni a ridotto impatto acustico e barriere antirumore da implementare e rivedere per abbattere i loro costi (LCC) ed accrescere la loro sostenibilità, utilizzando materiali riciclati (ad es. tessuti, carta, cartone);

Dato atto che con la sottoscrizione del Grant Agreement, i beneficiari hanno accettato la sovvenzione e accettano di attuare l'azione sotto la propria responsabilità e in conformità con l'Accordo, con tutti gli obblighi ed i termini e le condizioni in essa previsti;



Visto il Consortium Agreement (Allegato "B"), relativo al Grant Agreement di cui sopra, che sarà sottoscritto dalla Commissione europea e da ANAS SPA Capofila (Coordinatore) e dai Partner per la realizzazione del progetto SILENT, che regola la gestione tecnico-amministrativa del progetto e che ha lo scopo di precisare, rispetto al Progetto, i rapporti tra le Parti, in particolare per quanto riguarda l'organizzazione del lavoro, la gestione del Progetto e i diritti e gli obblighi delle Parti in materia, tra l'altro, di responsabilità, diritti di accesso e risoluzione delle controversie;

Dato atto che il Coordinatore, in qualità di responsabile amministrativo e di bilancio, è la persona giuridica che funge da intermediario tra le Parti e l'Autorità di finanziamento e, oltre alle sue responsabilità in qualità di Parte, svolge i compiti ad esso assegnati come descritti nel Grant Agreement e nel Consortium Agreement;

Dato atto che ciascuna Parte, conformemente ai propri consueti principi e prassi contabili e gestionali, sarà l'unica responsabile della giustificazione dei propri costi rispetto al Progetto nei confronti dell'Autorità di finanziamento e che né il Coordinatore né alcuna delle altre Parti, saranno in alcun modo responsabili per tale giustificazione dei costi nei confronti dell'Autorità di finanziamento;

Tenuto conto che il budget totale del progetto SILENT è di € 2.650.026,20, per il quale è previsto un cofinanziamento UE del 60% dei costi diretti ritenuti ammissibili per lo svolgimento delle attività progettuali nell'arco temporale dal 01.09.2023 al 31.03.2028 (salvo eventuali e formali proroghe del Progetto);

Considerato che il progetto individua ARPAT quale assegnataria di un budget totale di € 314.408,80, cofinanziato al 60%, pari a € 188.645,28, dallo strumento finanziario LIFE Plus e per il restante 40%, pari a € 125.763,52, da risorse interne, finalizzato all'attuazione delle attività di cui all'Art. 3 del Consortium Agreement, utili all'approfondimento delle conoscenze sulle tematiche della valutazione del rumore ambientale, della sua metrologia e del suo controllo;

Considerato inoltre che tali attività, verranno svolte prioritariamente da personale dell'Agenzia, individuato in base alle rispettive competenze, per l'effettuazione delle attività di management, tecniche e supporto al management, nel dettaglio:

- Gaetano Licitra, per le attività di coordinamento, di management e di disseminazione previste dal progetto
- Diego Palazzuoli, per le attività di coordinamento tecnico previsto dal progetto
- Matteo Bolognese, per l'effettuazione delle attività tecniche previste dal progetto
- Mauro Cerchiai, per l'effettuazione delle attività tecniche previste dal progetto;

Considerato altresì che l'assistenza nella gestione al Responsabile di Progetto verrà garantita da personale a tempo determinato che verrà a suo tempo identificato attraverso l'utilizzo delle graduatorie già in essere per i progetti europei;

Dato atto che le attività sopramenzionate sono supportate dall'esecuzione di misure acustiche per verificare l'efficacia degli interventi di mitigazione del rumore ambientale previsti lungo le strade regionali soggette al Piano di risanamento acustico predisposto dalla Regione Toscana redatto in base alla normativa vigente in materia già previste nella Carta dei Servizi di ARPAT alla riga 53, aggiornata con delibera Consiglio Regionale n. 9 del 30.01.2013;

Tenuto conto che le attività effettuate da ARPAT nell'ambito del Progetto Life SILENT saranno rendicontate con le regole e nei tempi e nelle modalità previste dal Progetto;

Dato atto che il calendario dei pagamenti, che prevede il trasferimento del prefinanziamento, dell'ulteriore prefinanziamento e del saldo finale alle Parti, sarà gestito secondo quanto descritto all'Art. 4.4 del Consortium Agreement;

Dato atto che il presente decreto è riconducibile alla seguente categoria della Data protection: “Affidamento di trattamenti dati a soggetti esterni”;

Visto il parere positivo di regolarità contabile in esito alla corretta quantificazione ed imputazione degli effetti contabili del provvedimento sul bilancio e sul patrimonio dell'Agenzia espresso dal Responsabile del Settore Bilancio e contabilità riportato in calce;

Visto il parere positivo di conformità formale alle norme vigenti, espresso dal Responsabile del Settore Affari generali, riportato in calce;

Visti i pareri espressi in calce dal Direttore amministrativo e dal Direttore tecnico;

decreta

1. di prendere atto del Grant Agreement (Allegato "A") relativo al progetto LIFE22-ENV-IT-LIFE SILENT - n. Project 101114310 - sottoscritto dalla Commissione europea e da ANAS SPA, per la realizzazione del Progetto, di cui anche ARPAT è beneficiaria, che regola la realizzazione del Progetto LIFE SILENT “Sustainable Innovations for Long-life Environmental Noise Technologies” nell'ambito dello strumento finanziario LIFE PLUS e del Consortium Agreement (Allegato “B”), che sarà firmato da tutti i partner, che regola la gestione tecnico-amministrativa del progetto ed ha lo scopo di precisare, rispetto al Progetto, i rapporti tra le Parti, in particolare per quanto riguarda l'organizzazione del lavoro, la gestione del Progetto e i diritti e gli obblighi delle Parti in materia, tra l'altro, di responsabilità, diritti di accesso e risoluzione delle controversie;
2. di dare atto che il budget totale del progetto SILENT è di € 2.650.026,20, per il quale è previsto un cofinanziamento UE del 60% dei costi diretti ritenuti ammissibili per lo svolgimento delle attività progettuali nell'arco temporale dal 01.09.2023 al 31.03.2028 (salvo eventuali e formali proroghe del Progetto);
3. di dare atto che ARPAT è assegnataria di un budget totale di € 314.408,80, cofinanziato al 60%, pari a € 188.645,28, dallo strumento finanziario LIFE Plus e per il restante 40%, pari a € 125.763,52, da risorse interne, finalizzato allo svolgimento di attività utili all'approfondimento delle conoscenze sulle tematiche della valutazione del rumore ambientale, della sua metrologia e del suo controllo, e che tali attività verranno svolte prioritariamente da personale dell'Agenzia, individuato in base alle rispettive competenze, per l'effettuazione delle attività di management, tecniche e supporto al management, nel dettaglio:
  - Gaetano Licitra, per le attività di coordinamento, di management e di disseminazione previste dal progetto
  - Diego Palazzuoli, per le attività di coordinamento tecnico previsto dal progetto
  - Matteo Bolognese, per l'effettuazione delle attività tecniche previste dal progetto
  - Mauro Cerchiai, per l'effettuazione delle attività tecniche previste dal progetto;
4. di prevedere che l'assistenza nella gestione al Responsabile di Progetto verrà garantita da personale a tempo determinato che verrà a suo tempo identificato attraverso l'utilizzo delle graduatorie già in essere per i progetti europei;
5. di imputare l'ammontare dei costi rendicontati sul bilancio consuntivo dell'anno di riferimento in base alla quota di competenza economica delle rispettive attività;
6. di dare atto che le attività effettuate da ARPAT nell'ambito del Progetto Life SILENT saranno rendicontate con le regole e nei tempi e nelle modalità previste dal Progetto;
7. di dare atto che il calendario dei pagamenti, che prevede il trasferimento del prefinanziamento, dell'ulteriore prefinanziamento e del saldo finale alle Parti, sarà gestito secondo quanto descritto all'Art. 4.4 del Consortium Agreement;

8. di individuare quale responsabile del procedimento il Dott. Gaetano Licitra ai sensi dell'art. 4 della L. n. 241 del 07.08.1990 e s.m.i;
9. di notificare il presente decreto all'Ufficio DPO per la conservazione nel dossier data protection, ai sensi del decreto del Direttore generale n. 186 del 31 dicembre 2019;
10. di trasmettere il presente decreto al Collegio dei revisori ai sensi e per gli effetti dell'art. 28 della L.R.T. 22.06.2009 n. 30 e s.m.i.;
11. di dichiarare il presente decreto immediatamente eseguibile, al fine di consentire l'avvio delle attività nei tempi previsti dal Progetto.

Il Direttore generale  
Dott. Pietro Rubellini\*

\* “Documento informatico sottoscritto con firma digitale ai sensi del D.Lgs 82/2005. L'originale informatico è stato predisposto e conservato presso ARPAT in conformità alle regole tecniche di cui all'art. 71 del D.Lgs 82/2005. Nella copia analogica la sottoscrizione con firma autografa è sostituita dall'indicazione a stampa del nominativo del soggetto responsabile secondo le disposizioni di cui all'art. 3 del D.Lgs 39/1993.”

Il Decreto è stato firmato elettronicamente da:

- Marta Bachechi , responsabile del settore Affari generali in data 11/08/2023
- Paola Querci , sostituto responsabile del settore Bilancio e Contabilità in data 11/08/2023
- Gaetano Licitra , il proponente in data 13/08/2023
- Paola Querci , Direttore amministrativo in data 17/08/2023
- Marcello Mossa Verre , Direttore tecnico in data 25/08/2023
- Pietro Rubellini , Direttore generale in data 28/08/2023



## EUROPEAN CLIMATE, INFRASTRUCTURE AND ENVIRONMENT EXECUTIVE AGENCY (CINEA)

CINEA.D – Natural resources, climate, sustainable blue economy and clean energy  
D.2 – LIFE Environment (Nature & Circular Economy)

### GRANT AGREEMENT

#### **Project 101114310 — LIFE22-ENV-IT-LIFE SILENT**

#### **PREAMBLE**

This **Agreement** ('the Agreement') is **between** the following parties:

**on the one part,**

the **European Climate, Infrastructure and Environment Executive Agency (CINEA)** ('EU executive agency' or 'granting authority'), under the powers delegated by the European Commission ('European Commission'),

**and**

**on the other part,**

1. 'the coordinator':

**ANAS SPA (ANAS)**, PIC 950966467, established in VIA MONZAMBANO 10, ROMA 00185, Italy,  
and the following other beneficiaries, if they sign their 'accession form' (see Annex 3 and Article 40):

2. **RETE FERROVIARIA ITALIANA (RFI)**, PIC 999434360, established in PIAZZA DELLA CROCE ROSSA 1, ROMA 00161, Italy,

3. **ITALFERR SPA (ITALFERR)**, PIC 924683056, established in VIA VITO GIUSEPPE GALATI 71, ROMA 00155, Italy,

4. **AGENZIA REGIONALE PER LA PROTEZIONE AMBIENTALE DELLA TOSCANA (ARPAT)**, PIC 997237601, established in VIA PONTE ALLE MOSSE 211, FIRENZE 50144, Italy,

5. **CONSIGLIO NAZIONALE DELLE RICERCHE (CNR)**, PIC 999979500, established in PIAZZALE ALDO MORO 7, ROMA 00185, Italy,

6. **ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA (UNIBO)**, PIC 999993953, established in VIA ZAMBONI 33, BOLOGNA 40126, Italy,

7. **UNIVERSITA DEGLI STUDI MEDITERRANEA DI REGGIO CALABRIA (UNIRC)**, PIC 997224894, established in VIA SALITA MELISSARI FEO DI VITO, REGGIO CALABRIA 89124, Italy,

8. **MOPI (MOPI)**, PIC 911227604, established in VIA ANTONIO COCCHI 7, PISA 56121, Italy,

Unless otherwise specified, references to ‘beneficiary’ or ‘beneficiaries’ include the coordinator and affiliated entities (if any).

If only one beneficiary signs the grant agreement (‘mono-beneficiary grant’), all provisions referring to the ‘coordinator’ or the ‘beneficiaries’ will be considered — mutatis mutandis — as referring to the beneficiary.

The parties referred to above have agreed to enter into the Agreement.

By signing the Agreement and the accession forms, the beneficiaries accept the grant and agree to implement the action under their own responsibility and in accordance with the Agreement, with all the obligations and terms and conditions it sets out.

The Agreement is composed of:

Preamble

Terms and Conditions (including Data Sheet)

Annex 1 Description of the action<sup>1</sup>

Annex 2 Estimated budget for the action

Annex 2a Additional information on unit costs and contributions (if applicable)

Annex 3 Accession forms (if applicable)<sup>2</sup>

Annex 3a Declaration on joint and several liability of affiliated entities (if applicable)<sup>3</sup>

Annex 4 Model for the financial statements

Annex 5 Specific rules (if applicable)

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<sup>1</sup> Template published on [Portal Reference Documents](#).

<sup>2</sup> Template published on [Portal Reference Documents](#).

<sup>3</sup> Template published on [Portal Reference Documents](#).

## TERMS AND CONDITIONS

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Project summary:

Project summary
<p>The main scope of this proposal is the development of sustainable and eco-friendly solutions to mitigate noise in complex urban environments, where multiple and diverse noise sources, mainly roads and railways, coexist across densely populated areas. Low noise pavements and low-height noise barriers are the main targeted solutions, to be upgraded and revisited in order to abate their costs (LCC) and improve their sustainability. To that end, recycled materials (e.g., textiles, papers, cardboard) will be used. The need to reduce noise levels in outdoor urban areas is imperative since according to the World Health Organization, 20% of the European population is exposed to noise levels exceeding 65 dB(A) during the day, whereas the maximum recommended level is 55 dB(A). Mitigating noise in such environments generally excludes the use of solutions that might interfere with the urban context, such as noise barriers, for many reasons. First of all the proximity of receivers to the noise source, typically roads. Secondly, the visual impact: noise barriers reduce the visibility of the surroundings and air circulation, causing local temperature rise (especially in summer) and social denial. This is why noise mitigation measures acting directly on the source are recommended, such as low noise pavements and traffic calming for roads, dampers, rail grinding and silent brakes for railways. However, these solutions have been proven to be poorly effective over time and consequently quite expensive. In this proposal, innovative and sustainable low noise pavements and low height noise barriers will be developed and demonstrated in real test sites, to provide transport owners and managers solid information to support their widespread use. To that end, the proposal includes also the preparation of special procedures to manage their implementation in complex urban scenarios, as well as tools to standardize their characterization and plans to prepare their launch to the market.</p>

Keywords:

- Noise
- Low Noise Pavements, Low Height Noise Barriers, Action Plan in Complex Environment, Concurrent Noise sources

Project number: 101114310

Project name: Sustainable Innovations for Long-life Environmental Noise Technologies

Project acronym: LIFE22-ENV-IT-LIFE SILENT

Call: LIFE-2022-SAP-ENV

Topic: LIFE-2022-SAP-ENV-ENVIRONMENT

Type of action: LIFE Project Grants

Granting authority: European Climate, Infrastructure and Environment Executive Agency

Grant managed through EU Funding & Tenders Portal: Yes (eGrants)

Project starting date: fixed date: 1 September 2023

Project end date: 31 August 2028

Project duration: 60 months

Consortium agreement: Yes

### 2. Participants

List of participants:

N°	Role	Short name	Legal name	Ctry	PIC	Total eligible costs (BEN and AE)	Max grant amount
1	COO	ANAS	ANAS SPA	IT	950966467	523 675.12	314 205.07
2	BEN	RFI	RETE FERROVIARIA ITALIANA	IT	999434360	280 237.28	168 142.37

N°	Role	Short name	Legal name	Ctry	PIC	Total eligible costs (BEN and AE)	Max grant amount
3	BEN	ITALFERR	ITALFERR SPA	IT	924683056	306 779.70	184 067.82
4	BEN	ARPAT	AGENZIA REGIONALE PER LA PROTEZIONE AMBIENTALE DELLA TOSCANA	IT	997237601	314 408.80	188 645.28
5	BEN	CNR	CONSIGLIO NAZIONALE DELLE RICERCHE	IT	999979500	223 826.88	134 296.13
6	BEN	UNIBO	ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA	IT	999993953	414 817.60	248 890.56
7	BEN	UNIRC	UNIVERSITA DEGLI STUDI MEDITERRANEA DI REGGIO CALABRIA	IT	997224894	358 169.66	214 901.80
8	BEN	MOPI	MOPI	IT	911227604	228 111.16	136 866.70
9	AP	TEBAID	Consorzio TEBAID	IT	888669575	0.00	0.00
<b>Total</b>						2 650 026.20	1 590 015.73

**Coordinator:**

- ANAS SPA (ANAS)

**3. Grant****Maximum grant amount, total estimated eligible costs and contributions and funding rate:**

Total eligible costs (BEN and AE)	Funding rate (%)	Maximum grant amount (Annex 2)	Maximum grant amount (award decision)
2 650 026.20	60	1 590 015.73	1 590 015.73

**Grant form:** Budget-based**Grant mode:** Action grant**Budget categories/activity types:**

- A. Personnel costs
  - A.1 Employees, A.2 Natural persons under direct contract, A.3 Seconded persons
  - A.4 SME owners and natural person beneficiaries
  - A.5 Volunteers
- B. Subcontracting costs
- C. Purchase costs
  - C.1 Travel and subsistence
  - C.2 Equipment
  - C.3 Other goods, works and services
- D. Other cost categories
  - D.1 Financial support to third parties
  - D.2 Land purchase
- E. Indirect costs

**Cost eligibility options:**

- Standard supplementary payments
- Limitation for subcontracting

- Travel and subsistence:
  - Travel: Actual costs
  - Accommodation: Actual costs
  - Subsistence: Actual costs
- Equipment: full costs and depreciation for listed equipment
- Costs for providing financial support to third parties (actual cost; max amount for each recipient: EUR 20 000.00)
- Indirect cost flat-rate: 7% of the eligible direct costs (categories A-D, except volunteers costs and exempted specific cost categories, if any)
- VAT: Yes
- Other ineligible costs

**Budget flexibility:** Yes (no flexibility cap)

**4. Reporting, payments and recoveries**

**4.1 Continuous reporting** (art 21)

**Deliverables:** see Funding & Tenders Portal Continuous Reporting tool

**4.2 Periodic reporting and payments**

**Reporting and payment schedule** (art 21, 22):

Reporting					Payments	
Reporting periods			Type	Deadline	Type	Deadline (time to pay)
RP No	Month from	Month to				
					Initial prefinancing	30 days from entry into force/ financial guarantee (if required) – whichever is the latest
1	1	33	Additional prefinancing report	60 days after end of reporting period	Additional prefinancing	60 days from receiving additional prefinancing report/ financial guarantee (if required) – whichever is the latest
2	34	60	Periodic report	60 days after end of reporting period	Final payment	90 days from receiving periodic report

**Prefinancing payments and guarantees:**

Prefinancing payment		Prefinancing guarantee		
Type	Amount	Guarantee amount	Division per participant	
Prefinancing 1 (initial)	477 004.72	n/a	1 - ANAS	n/a
			2 - RFI	n/a
			3 - ITALFERR	n/a
			4 - ARPAT	n/a

Prefinancing payment		Prefinancing guarantee		
Type	Amount	Guarantee amount	Division per participant	
			5 - CNR	n/a
			6 - UNIBO	n/a
			7 - UNIRC	n/a
			8 - MOPI	n/a
Prefinancing 2 (additional)	795 007.87	n/a	1 - ANAS	n/a
			2 - RFI	n/a
			3 - ITALFERR	n/a
			4 - ARPAT	n/a
			5 - CNR	n/a
			6 - UNIBO	n/a
			7 - UNIRC	n/a
			8 - MOPI	n/a

**Reporting and payment modalities** (art 21, 22):

Mutual Insurance Mechanism (MIM): No

Restrictions on distribution of initial prefinancing: The prefinancing may be distributed only if the minimum number of beneficiaries set out in the call conditions (if any) have acceded to the Agreement and only to beneficiaries that have acceded.

Interim payment ceiling (if any): 90% of the maximum grant amount

No-profit rule: Yes

Late payment interest: ECB + 3.5%

Bank account for payments:

IT39K0100003245350200020060

Conversion into euros: Double conversion

Reporting language: Language of the Agreement

**4.3 Certificates** (art 24):

Certificates on the financial statements (CFS):

Conditions:

Schedule: interim/final payment, if threshold is reached

Standard threshold (beneficiary-level):

- financial statement: requested EU contribution to costs  $\geq$  EUR 500 000.00

**4.4 Recoveries** (art 22)

**First-line liability for recoveries:**

Beneficiary termination: Beneficiary concerned

Final payment: Coordinator

After final payment: Beneficiary concerned

**Joint and several liability for enforced recoveries (in case of non-payment):**

Limited joint and several liability of other beneficiaries — up to the maximum grant amount of the beneficiary

Joint and several liability of affiliated entities — n/a

**5. Consequences of non-compliance, applicable law & dispute settlement forum**

**Applicable law (art 43):**

Standard applicable law regime: EU law + law of Belgium

**Dispute settlement forum (art 43):**

Standard dispute settlement forum:

EU beneficiaries: EU General Court + EU Court of Justice (on appeal)

Non-EU beneficiaries: Courts of Brussels, Belgium (unless an international agreement provides for the enforceability of EU court judgements)

**6. Other**

**Specific rules (Annex 5):** Yes

**Standard time-limits after project end:**

Confidentiality (for X years after final payment): 5

Record-keeping (for X years after final payment): 5 (or 3 for grants of not more than EUR 60 000)

Reviews (up to X years after final payment): 5 (or 3 for grants of not more than EUR 60 000)

Audits (up to X years after final payment): 5 (or 3 for grants of not more than EUR 60 000)

Extension of findings from other grants to this grant (no later than X years after final payment): 5 (or 3 for grants of not more than EUR 60 000)

Impact evaluation (up to X years after final payment): 5 (or 3 for grants of not more than EUR 60 000)



## **CHAPTER 1 GENERAL**

### **ARTICLE 1 — SUBJECT OF THE AGREEMENT**

This Agreement sets out the rights and obligations and terms and conditions applicable to the grant awarded for the implementation of the action set out in Chapter 2.

### **ARTICLE 2 — DEFINITIONS**

For the purpose of this Agreement, the following definitions apply:

Actions — The project which is being funded in the context of this Agreement.

Grant — The grant awarded in the context of this Agreement.

EU grants — Grants awarded by EU institutions, bodies, offices or agencies (including EU executive agencies, EU regulatory agencies, EDA, joint undertakings, etc.).

Participants — Entities participating in the action as beneficiaries, affiliated entities, associated partners, third parties giving in-kind contributions, subcontractors or recipients of financial support to third parties.

Beneficiaries (BEN) — The signatories of this Agreement (either directly or through an accession form).

Affiliated entities (AE) — Entities affiliated to a beneficiary within the meaning of Article 187 of EU Financial Regulation 2018/1046<sup>4</sup> which participate in the action with similar rights and obligations as the beneficiaries (obligation to implement action tasks and right to charge costs and claim contributions).

Associated partners (AP) — Entities which participate in the action, but without the right to charge costs or claim contributions.

Purchases — Contracts for goods, works or services needed to carry out the action (e.g. equipment, consumables and supplies) but which are not part of the action tasks (see Annex 1).

Subcontracting — Contracts for goods, works or services that are part of the action tasks (see Annex 1).

In-kind contributions — In-kind contributions within the meaning of Article 2(36) of EU Financial

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<sup>4</sup> For the definition, see Article 187 Regulation (EU, Euratom) 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union, amending Regulations (EU) No 1296/2013, (EU) No 1301/2013, (EU) No 1303/2013, (EU) No 1304/2013, (EU) No 1309/2013, (EU) No 1316/2013, (EU) No 223/2014, (EU) No 283/2014, and Decision No 541/2014/EU and repealing Regulation (EU, Euratom) No 966/2012 ('EU Financial Regulation') (OJ L 193, 30.7.2018, p. 1): "**affiliated entities** [are]:

- (a) entities that form a sole beneficiary [(i.e. where an entity is formed of several entities that satisfy the criteria for being awarded a grant, including where the entity is specifically established for the purpose of implementing an action to be financed by a grant)];
- (b) entities that satisfy the eligibility criteria and that do not fall within one of the situations referred to in Article 136(1) and 141(1) and that have a link with the beneficiary, in particular a legal or capital link, which is neither limited to the action nor established for the sole purpose of its implementation".

Regulation 2018/1046, i.e. non-financial resources made available free of charge by third parties.

**Fraud** — Fraud within the meaning of Article 3 of EU Directive 2017/1371<sup>5</sup> and Article 1 of the Convention on the protection of the European Communities' financial interests, drawn up by the Council Act of 26 July 1995<sup>6</sup>, as well as any other wrongful or criminal deception intended to result in financial or personal gain.

**Irregularities** — Any type of breach (regulatory or contractual) which could impact the EU financial interests, including irregularities within the meaning of Article 1(2) of EU Regulation 2988/95<sup>7</sup>.

**Grave professional misconduct** — Any type of unacceptable or improper behaviour in exercising one's profession, especially by employees, including grave professional misconduct within the meaning of Article 136(1)(c) of EU Financial Regulation 2018/1046.

**Applicable EU, international and national law** — Any legal acts or other (binding or non-binding) rules and guidance in the area concerned.

**Portal** — EU Funding & Tenders Portal; electronic portal and exchange system managed by the European Commission and used by itself and other EU institutions, bodies, offices or agencies for the management of their funding programmes (grants, procurements, prizes, etc.).

## **CHAPTER 2 ACTION**

### **ARTICLE 3 — ACTION**

The grant is awarded for the action **101114310 — LIFE22-ENV-IT-LIFE SILENT** ('action'), as described in Annex 1.

### **ARTICLE 4 — DURATION AND STARTING DATE**

The duration and the starting date of the action are set out in the Data Sheet (see Point 1).

## **CHAPTER 3 GRANT**

### **ARTICLE 5 — GRANT**

#### **5.1 Form of grant**

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<sup>5</sup> Directive (EU) 2017/1371 of the European Parliament and of the Council of 5 July 2017 on the fight against fraud to the Union's financial interests by means of criminal law (OJ L 198, 28.7.2017, p. 29).

<sup>6</sup> OJ C 316, 27.11.1995, p. 48.

<sup>7</sup> Council Regulation (EC, Euratom) No 2988/95 of 18 December 1995 on the protection of the European Communities financial interests (OJ L 312, 23.12.1995, p. 1).

The grant is an action grant<sup>8</sup> which takes the form of a budget-based mixed actual cost grant (i.e. a grant based on actual costs incurred, but which may also include other forms of funding, such as unit costs or contributions, flat-rate costs or contributions, lump sum costs or contributions or financing not linked to costs).

## 5.2 Maximum grant amount

The maximum grant amount is set out in the Data Sheet (see Point 3) and in the estimated budget (Annex 2).

## 5.3 Funding rate

The funding rate for costs is 60% of the action's eligible costs.

Contributions are not subject to any funding rate.

## 5.4 Estimated budget, budget categories and forms of funding

The estimated budget for the action is set out in Annex 2.

It contains the estimated eligible costs and contributions for the action, broken down by participant and budget category.

Annex 2 also shows the types of costs and contributions (forms of funding)<sup>9</sup> to be used for each budget category.

If unit costs or contributions are used, the details on the calculation will be explained in Annex 2a.

## 5.5 Budget flexibility

The budget breakdown may be adjusted — without an amendment (see Article 39) — by transfers (between participants and budget categories), as long as this does not imply any substantive or important change to the description of the action in Annex 1.

However:

- changes to the budget category for volunteers (if used) always require an amendment
- changes to budget categories with lump sums costs or contributions (if used; including financing not linked to costs) always require an amendment
- changes to budget categories with higher funding rates or budget ceilings (if used) always require an amendment
- addition of amounts for subcontracts not provided for in Annex 1 either require an amendment or simplified approval in accordance with Article 6.2

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<sup>8</sup> For the definition, see Article 180(2)(a) EU Financial Regulation 2018/1046: ‘**action grant**’ means an EU grant to finance “an action intended to help achieve a Union policy objective”.

<sup>9</sup> See Article 125 EU Financial Regulation 2018/1046.

- other changes require an amendment or simplified approval, if specifically provided for in Article 6.2
- flexibility caps: not applicable.

## **ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS AND CONTRIBUTIONS**

In order to be eligible, costs and contributions must meet the **eligibility** conditions set out in this Article.

### **6.1 General eligibility conditions**

The **general eligibility conditions** are the following:

- (a) for actual costs:
  - (i) they must be actually incurred by the beneficiary
  - (ii) they must be incurred in the period set out in Article 4 (with the exception of costs relating to the submission of the final periodic report, which may be incurred afterwards; see Article 21)
  - (iii) they must be declared under one of the budget categories set out in Article 6.2 and Annex 2
  - (iv) they must be incurred in connection with the action as described in Annex 1 and necessary for its implementation
  - (v) they must be identifiable and verifiable, in particular recorded in the beneficiary's accounts in accordance with the accounting standards applicable in the country where the beneficiary is established and with the beneficiary's usual cost accounting practices
  - (vi) they must comply with the applicable national law on taxes, labour and social security and
  - (vii) they must be reasonable, justified and must comply with the principle of sound financial management, in particular regarding economy and efficiency
- (b) for unit costs or contributions (if any):
  - (i) they must be declared under one of the budget categories set out in Article 6.2 and Annex 2
  - (ii) the units must:
    - be actually used or produced by the beneficiary in the period set out in Article 4 (with the exception of units relating to the submission of the final periodic report, which may be used or produced afterwards; see Article 21)
    - be necessary for the implementation of the action and
  - (iii) the number of units must be identifiable and verifiable, in particular supported by records and documentation (see Article 20)

- (c) for flat-rate costs or contributions (if any):
- (i) they must be declared under one of the budget categories set out in Article 6.2 and Annex 2
  - (ii) the costs or contributions to which the flat-rate is applied must:
    - be eligible
    - relate to the period set out in Article 4 (with the exception of costs or contributions relating to the submission of the final periodic report, which may be incurred afterwards; see Article 21)
- (d) for lump sum costs or contributions (if any):
- (i) they must be declared under one of the budget categories set out in Article 6.2 and Annex 2
  - (ii) the work must be properly implemented by the beneficiary in accordance with Annex 1
  - (iii) the deliverables/outputs must be achieved in the period set out in Article 4 (with the exception of deliverables/outputs relating to the submission of the final periodic report, which may be achieved afterwards; see Article 21)
- (e) for unit, flat-rate or lump sum costs or contributions according to usual cost accounting practices (if any):
- (i) they must fulfil the general eligibility conditions for the type of cost concerned
  - (ii) the cost accounting practices must be applied in a consistent manner, based on objective criteria, regardless of the source of funding
- (f) for financing not linked to costs (if any): the results must be achieved or the conditions must be fulfilled as described in Annex 1.

In addition, for direct cost categories (e.g. personnel, travel & subsistence, subcontracting and other direct costs) only costs that are directly linked to the action implementation and can therefore be attributed to it directly are eligible. They must not include any indirect costs (i.e. costs that are only indirectly linked to the action, e.g. via cost drivers).

## 6.2 Specific eligibility conditions for each budget category

For each budget category, the **specific eligibility conditions** are as follows:

### **Direct costs**

#### **A. Personnel costs**

**A.1 Costs for employees (or equivalent)** are eligible as personnel costs if they fulfil the general eligibility conditions and are related to personnel working for the beneficiary under an employment contract (or equivalent appointing act) and assigned to the action.

They must be limited to salaries, social security contributions, taxes and other costs linked to the

remuneration, if they arise from national law or the employment contract (or equivalent appointing act) and be calculated on the basis of the costs actually incurred, in accordance with the following method:

{daily rate for the person  
multiplied by  
number of day-equivalents worked on the action (rounded up or down to the nearest half-day)}.

The daily rate must be calculated as:

{annual personnel costs for the person  
divided by  
215}.

The number of day-equivalents declared for a person must be identifiable and verifiable (see Article 20).

The total number of day-equivalents declared in EU grants, for a person for a year, cannot be higher than 215.

The personnel costs may also include supplementary payments for personnel assigned to the action (including payments on the basis of supplementary contracts regardless of their nature), if:

- it is part of the beneficiary's usual remuneration practices and is paid in a consistent manner whenever the same kind of work or expertise is required
- the criteria used to calculate the supplementary payments are objective and generally applied by the beneficiary, regardless of the source of funding used.

**A.2 and A.3 Costs for natural persons working under a direct contract** other than an employment contract and costs for **seconded persons by a third party against payment** are also eligible as personnel costs, if they are assigned to the action, fulfil the general eligibility conditions and:

- (a) work under conditions similar to those of an employee (in particular regarding the way the work is organised, the tasks that are performed and the premises where they are performed) and
- (b) the result of the work belongs to the beneficiary (unless agreed otherwise).

They must be calculated on the basis of a rate which corresponds to the costs actually incurred for the direct contract or secondment and must not be significantly different from those for personnel performing similar tasks under an employment contract with the beneficiary.

**A.4 The work of SME owners** for the action (i.e. owners of beneficiaries that are small and medium-sized enterprises<sup>10</sup> not receiving a salary) or **natural person beneficiaries** (i.e. beneficiaries that are

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<sup>10</sup> For the definition, see Commission Recommendation 2003/361/EC: micro, small or medium-sized enterprise (SME) are enterprises

- engaged in an economic activity, irrespective of their legal form (including, in particular, self-employed persons and family businesses engaged in craft or other activities, and partnerships or associations regularly engaged in an economic activity) and

natural persons not receiving a salary) may be declared as personnel costs, if they fulfil the general eligibility conditions and are calculated as unit costs in accordance with the method set out in Annex 2a.

**A.5** The work of **volunteers** for the action (i.e. persons who freely work for an organisation, on a non-compulsory basis and without being paid) may be declared as personnel costs, if and as declared eligible in the call conditions, if they fulfil the general eligibility conditions and are calculated as unit costs in accordance with the method set out in Annex 2a.

They:

- may not exceed the maximum amount for volunteers for the action (which corresponds to 50% of the total (ineligible and eligible) project costs and contributions estimated in the proposal)
- may not exceed the maximum amount for volunteers for each beneficiary set out in Annex 2
- may not make the maximum EU contribution to costs higher than the total eligible costs without volunteers.

If also indirect costs for volunteers are declared eligible in the call conditions, the amount of indirect costs may be added to the volunteers costs category in Annex 2, at the flat-rate set out in Point E.

## **B. Subcontracting costs**

**Subcontracting costs** for the action (including related duties, taxes and charges, such as non-deductible or non-refundable value added tax (VAT)) are eligible, if they are calculated on the basis of the costs actually incurred, fulfil the general eligibility conditions and are awarded using the beneficiary's usual purchasing practices — provided these ensure subcontracts with best value for money (or if appropriate the lowest price) and that there is no conflict of interests (see Article 12).

Beneficiaries that are 'contracting authorities/entities' within the meaning of the EU Directives on public procurement must also comply with the applicable national law on public procurement.

Subcontracting may cover only a limited part of the action.

The tasks to be subcontracted and the estimated cost for each subcontract must be set out in Annex 1 and the total estimated costs of subcontracting per beneficiary must be set out in Annex 2 (or may be approved ex post in the periodic report, if the use of subcontracting does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants; 'simplified approval procedure').

## **C. Purchase costs**

**Purchase costs** for the action (including related duties, taxes and charges, such as non-deductible or non-refundable value added tax (VAT)) are eligible if they fulfil the general eligibility conditions and are bought using the beneficiary's usual purchasing practices — provided these ensure purchases with

- 
- employing fewer than 250 persons (expressed in 'annual working units' as defined in Article 5 of the Recommendation) and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million.



best value for money (or if appropriate the lowest price) and that there is no conflict of interests (see Article 12).

Beneficiaries that are ‘contracting authorities/entities’ within the meaning of the EU Directives on public procurement must also comply with the applicable national law on public procurement.

### **C.1 Travel and subsistence**

Purchases for **travel, accommodation and subsistence** must be calculated as follows:

- travel: on the basis of the costs actually incurred and in line with the beneficiary’s usual practices on travel
- accommodation: on the basis of the costs actually incurred and in line with the beneficiary’s usual practices on travel
- subsistence: on the basis of the costs actually incurred and in line with the beneficiary’s usual practices on travel .

### **C.2 Equipment**

Purchases of **equipment, infrastructure or other assets** specifically for the action (or developed as part of the action tasks) may be declared as full capitalised costs if they fulfil the eligibility conditions applicable to their respective cost categories.

‘Capitalised costs’ means:

- costs incurred in the purchase or for the development of the equipment, infrastructure or other assets and,
- which are recorded under a fixed asset account of the beneficiary in compliance with international accounting standards and the beneficiary’s usual cost accounting practices.

If such equipment, infrastructure or other assets are rented or leased, full costs for **renting or leasing** are eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets and do not include any financing fees.

### **C.3 Other goods, works and services**

Purchases of **other goods, works and services** must be calculated on the basis of the costs actually incurred.

Such goods, works and services include, for instance, consumables and supplies, promotion, dissemination, protection of results, translations, publications, certificates and financial guarantees, if required under the Agreement.

## **D. Other cost categories**

### **D.1 Financial support to third parties**

**Costs for providing financial support to third parties** (in the form of **grants, prizes** or similar forms of support; if any) are eligible, if and as declared eligible in the call conditions, if they fulfil the



general eligibility conditions, are calculated on the basis of the costs actually incurred and the support is implemented in accordance with the conditions set out in Annex 1.

These conditions must ensure objective and transparent selection procedures and include at least the following:

- (a) for grants (or similar):
  - (i) the maximum amount of financial support for each third party ('recipient'); this amount may not exceed the amount set out in the Data Sheet (see Point 3) or otherwise agreed with the granting authority
  - (ii) the criteria for calculating the exact amount of the financial support
  - (iii) the different types of activity that qualify for financial support, on the basis of a closed list
  - (iv) the persons or categories of persons that will be supported and
  - (v) the criteria and procedures for giving financial support
- (b) for prizes (or similar):
  - (i) the eligibility and award criteria
  - (ii) the amount of the prize and
  - (iii) the payment arrangements.

## **D.2 Land purchase**

Costs for land purchase from private entities (or long-term lease of land or one-off compensations for land use rights) are eligible, if and as declared eligible in the call conditions, if they fulfil the general eligibility conditions, are calculated on the basis of the costs actually incurred and:

- (a) the purchase will contribute to improving, maintaining and restoring the integrity of the Natura 2000 network set up pursuant to Article 3 of Directive 92/43/EEC, including through improving connectivity by the creation of corridors, stepping stones, or other elements of green infrastructure
- (b) land purchase is the only or most cost-effective way of achieving the desired conservation outcome
- (c) the land purchased is reserved in the long term for uses consistent with the specific objectives of the LIFE Programme
- (d) the Member State concerned ensures, by way of transfer or otherwise, the long-term assignment of such land to nature conservation purposes and the beneficiary documents this by ensuring that:
  - (i) the entry into the land register includes a condition that the land will be assigned definitively to nature conservation
  - (ii) or, if there is no land register or such a condition is not possible under national law, that

such a condition is either included in the land sale contract or guaranteed by equivalent means

- (e) for land purchases by private entity beneficiaries: the beneficiaries ensure the long-term conservation by ensuring that:
  - (i) the entry into the land register includes a condition that, in case of their dissolution or incapacity to manage the land according to nature conservation requirements, the property will be transferred to an entity primarily active in the field of nature protection
  - (ii) or, if there is no land register or such a condition is not possible under national law, that such a condition is either included in the land sale contract or guaranteed by equivalent means
- (f) for purchases of partial rights: the entry into the land register duly reflects the long-term nature conservation objectives and the requirements set out in this Article
- (g) for land purchased to be exchanged at a later date for another parcel on which the action will be undertaken: the exchange is carried out before the end of the action and the land exchanged complies with the requirements set out in this Article
- (h) for long-term leases: the lease is of at least 20 years and includes provisions and commitments that ensure the achievement of its objectives in terms of habitat and species protection.

This cost will not be taken into account for the indirect cost flat-rate.

### **Indirect costs**

#### **E. Indirect costs**

**Indirect costs** will be reimbursed at the flat-rate of 7% of the eligible direct costs (categories A-D, except volunteers costs and exempted specific cost categories, if any).

### **Contributions**

Not applicable

### **6.3 Ineligible costs and contributions**

The following costs or contributions are **ineligible**:

- (a) costs or contributions that do not comply with the conditions set out above (Article 6.1 and 6.2), in particular:
  - (i) costs related to return on capital and dividends paid by a beneficiary
  - (ii) debt and debt service charges
  - (iii) provisions for future losses or debts
  - (iv) interest owed
  - (v) currency exchange losses

- (vi) bank costs charged by the beneficiary’s bank for transfers from the granting authority
  - (vii) excessive or reckless expenditure
  - (viii) deductible or refundable VAT (including VAT paid by public bodies acting as public authority)
  - (ix) costs incurred or contributions for activities implemented during grant agreement suspension (see Article 31)
  - (x) in-kind contributions by third parties
- (b) costs or contributions declared under other EU grants (or grants awarded by an EU Member State, non-EU country or other body implementing the EU budget), except for the following cases:
- (i) Synergy actions: not applicable
  - (ii) if the action grant is combined with an operating grant<sup>11</sup> running during the same period and the beneficiary can demonstrate that the operating grant does not cover any (direct or indirect) costs of the action grant
- (c) costs or contributions for staff of a national (or regional/local) administration, for activities that are part of the administration’s normal activities (i.e. not undertaken only because of the grant)
- (d) costs or contributions (especially travel and subsistence) for staff or representatives of EU institutions, bodies or agencies
- (e) other :
- (i) country restrictions for eligible costs: not applicable
  - (ii) costs or contributions declared specifically ineligible in the call conditions.

## **6.4 Consequences of non-compliance**

If a beneficiary declares costs or contributions that are ineligible, they will be rejected (see Article 27).

This may also lead to other measures described in Chapter 5.

## **CHAPTER 4 GRANT IMPLEMENTATION**

### **SECTION 1 CONSORTIUM: BENEFICIARIES, AFFILIATED ENTITIES AND OTHER PARTICIPANTS**

#### **ARTICLE 7 — BENEFICIARIES**

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<sup>11</sup> For the definition, see Article 180(2)(b) of EU Financial Regulation 2018/1046: ‘**operating grant**’ means an EU grant to finance “the functioning of a body which has an objective forming part of and supporting an EU policy”.

The beneficiaries, as signatories of the Agreement, are fully responsible towards the granting authority for implementing it and for complying with all its obligations.

They must implement the Agreement to their best abilities, in good faith and in accordance with all the obligations and terms and conditions it sets out.

They must have the appropriate resources to implement the action and implement the action under their own responsibility and in accordance with Article 11. If they rely on affiliated entities or other participants (see Articles 8 and 9), they retain sole responsibility towards the granting authority and the other beneficiaries.

They are jointly responsible for the *technical* implementation of the action. If one of the beneficiaries fails to implement their part of the action, the other beneficiaries must ensure that this part is implemented by someone else (without being entitled to an increase of the maximum grant amount and subject to an amendment; see Article 39). The *financial* responsibility of each beneficiary in case of recoveries is governed by Article 22.

The beneficiaries (and their action) must remain eligible under the EU programme funding the grant for the entire duration of the action. Costs and contributions will be eligible only as long as the beneficiary and the action are eligible.

The **internal roles and responsibilities** of the beneficiaries are divided as follows:

(a) Each beneficiary must:

- (i) keep information stored in the Portal Participant Register up to date (see Article 19)
- (ii) inform the granting authority (and the other beneficiaries) immediately of any events or circumstances likely to affect significantly or delay the implementation of the action (see Article 19)
- (iii) submit to the coordinator in good time:
  - the prefinancing guarantees (if required; see Article 23)
  - the financial statements and certificates on the financial statements (CFS) (if required; see Articles 21 and 24.2 and Data Sheet, Point 4.3)
  - the contribution to the deliverables and technical reports (see Article 21)
  - any other documents or information required by the granting authority under the Agreement
- (iv) submit via the Portal data and information related to the participation of their affiliated entities.

(b) The coordinator must:

- (i) monitor that the action is implemented properly (see Article 11)
- (ii) act as the intermediary for all communications between the consortium and the granting authority, unless the Agreement or granting authority specifies otherwise, and in particular:

- submit the prefinancing guarantees to the granting authority (if any)
  - request and review any documents or information required and verify their quality and completeness before passing them on to the granting authority
  - submit the deliverables and reports to the granting authority
  - inform the granting authority about the payments made to the other beneficiaries (report on the distribution of payments; if required, see Articles 22 and 32)
- (iii) distribute the payments received from the granting authority to the other beneficiaries without unjustified delay (see Article 22).

The coordinator may not delegate or subcontract the above-mentioned tasks to any other beneficiary or third party (including affiliated entities).

However, coordinators which are public bodies may delegate the tasks set out in Point (b)(ii) last indent and (iii) above to entities with ‘authorisation to administer’ which they have created or which are controlled by or affiliated to them. In this case, the coordinator retains sole responsibility for the payments and for compliance with the obligations under the Agreement.

Moreover, coordinators which are ‘sole beneficiaries’<sup>12</sup> (or similar, such as European research infrastructure consortia (ERICs)) may delegate the tasks set out in Point (b)(i) to (iii) above to one of their members. The coordinator retains sole responsibility for compliance with the obligations under the Agreement.

The beneficiaries must have **internal arrangements** regarding their operation and co-ordination, to ensure that the action is implemented properly.

If required by the granting authority (see Data Sheet, Point 1), these arrangements must be set out in a written **consortium agreement** between the beneficiaries, covering for instance:

- the internal organisation of the consortium
- the management of access to the Portal
- different distribution keys for the payments and financial responsibilities in case of recoveries (if any)
- additional rules on rights and obligations related to background and results (see Article 16)
- settlement of internal disputes
- liability, indemnification and confidentiality arrangements between the beneficiaries.

The internal arrangements must not contain any provision contrary to this Agreement.

## ARTICLE 8 — AFFILIATED ENTITIES

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<sup>12</sup> For the definition, see Article 187(2) EU Financial Regulation 2018/1046: “Where several entities satisfy the criteria for being awarded a grant and together form one entity, that entity may be treated as the **sole beneficiary**, including where it is specifically established for the purpose of implementing the action financed by the grant.”

Not applicable

## **ARTICLE 9 — OTHER PARTICIPANTS INVOLVED IN THE ACTION**

### **9.1 Associated partners**

The following entities which cooperate with a beneficiary will participate in the action as ‘associated partners’:

- **Consorzio TEBAID (TEBAID)**, PIC 888669575

Associated partners must implement the action tasks attributed to them in Annex 1 in accordance with Article 11. They may not charge costs or contributions to the action and the costs for their tasks are not eligible.

The tasks must be set out in Annex 1.

The beneficiaries must ensure that their contractual obligations under Articles 11 (proper implementation), 12 (conflict of interests), 13 (confidentiality and security), 14 (ethics), 17.2 (visibility), 18 (specific rules for carrying out action), 19 (information) and 20 (record-keeping) also apply to the associated partners.

The beneficiaries must ensure that the bodies mentioned in Article 25 (e.g. granting authority, OLAF, Court of Auditors (ECA), etc.) can exercise their rights also towards the associated partners.

### **9.2 Third parties giving in-kind contributions to the action**

Other third parties may give in-kind contributions to the action (i.e. personnel, equipment, other goods, works and services, etc. which are free-of-charge), if necessary for the implementation.

Third parties giving in-kind contributions do not implement any action tasks. They may not charge costs or contributions to the action and the costs for the in-kind contributions are not eligible.

The third parties and their in-kind contributions should be set out in Annex 1.

### **9.3 Subcontractors**

Subcontractors may participate in the action, if necessary for the implementation.

Subcontractors must implement their action tasks in accordance with Article 11. The costs for the subcontracted tasks (invoiced price from the subcontractor) are eligible and may be charged by the beneficiaries, under the conditions set out in Article 6. The costs will be included in Annex 2 as part of the beneficiaries’ costs.

The beneficiaries must ensure that their contractual obligations under Articles 11 (proper implementation), 12 (conflict of interest), 13 (confidentiality and security), 14 (ethics), 17.2 (visibility), 18 (specific rules for carrying out action), 19 (information) and 20 (record-keeping) also apply to the subcontractors.

The beneficiaries must ensure that the bodies mentioned in Article 25 (e.g. granting authority, OLAF, Court of Auditors (ECA), etc.) can exercise their rights also towards the subcontractors.

## 9.4 Recipients of financial support to third parties

If the action includes providing financial support to third parties (e.g. grants, prizes or similar forms of support), the beneficiaries must ensure that their contractual obligations under Articles 12 (conflict of interest), 13 (confidentiality and security), 14 (ethics), 17.2 (visibility), 18 (specific rules for carrying out action), 19 (information) and 20 (record-keeping) also apply to the third parties receiving the support (recipients).

The beneficiaries must also ensure that the bodies mentioned in Article 25 (e.g. granting authority, OLAF, Court of Auditors (ECA), etc.) can exercise their rights also towards the recipients.

## ARTICLE 10 — PARTICIPANTS WITH SPECIAL STATUS

### 10.1 Non-EU participants

Participants which are established in a non-EU country (if any) undertake to comply with their obligations under the Agreement and:

- to respect general principles (including fundamental rights, values and ethical principles, environmental and labour standards, rules on classified information, intellectual property rights, visibility of funding and protection of personal data)
- for the submission of certificates under Article 24: to use qualified external auditors which are independent and comply with comparable standards as those set out in EU Directive 2006/43/EC<sup>13</sup>
- for the controls under Article 25: to allow for checks, reviews, audits and investigations (including on-the-spot checks, visits and inspections) by the bodies mentioned in that Article (e.g. granting authority, OLAF, Court of Auditors (ECA), etc.).

Special rules on dispute settlement apply (see Data Sheet, Point 5).

### 10.2 Participants which are international organisations

Participants which are international organisations (IOs; if any) undertake to comply with their obligations under the Agreement and:

- to respect general principles (including fundamental rights, values and ethical principles, environmental and labour standards, rules on classified information, intellectual property rights, visibility of funding and protection of personal data)
- for the submission of certificates under Article 24: to use either independent public officers or external auditors which comply with comparable standards as those set out in EU Directive 2006/43/EC
- for the controls under Article 25: to allow for the checks, reviews, audits and investigations by the bodies mentioned in that Article, taking into account the specific agreements concluded by them and the EU (if any).

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<sup>13</sup> Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts or similar national regulations (OJ L 157, 9.6.2006, p. 87).



For such participants, nothing in the Agreement will be interpreted as a waiver of their privileges or immunities, as accorded by their constituent documents or international law.

Special rules on applicable law and dispute settlement apply (see Article 43 and Data Sheet, Point 5).

### 10.3 Pillar-assessed participants

Pillar-assessed participants (if any) may rely on their own systems, rules and procedures, in so far as they have been positively assessed and do not call into question the decision awarding the grant or breach the principle of equal treatment of applicants or beneficiaries.

‘Pillar-assessment’ means a review by the European Commission on the systems, rules and procedures which participants use for managing EU grants (in particular internal control system, accounting system, external audits, financing of third parties, rules on recovery and exclusion, information on recipients and protection of personal data; see Article 154 EU Financial Regulation 2018/1046).

Participants with a positive pillar assessment may rely on their own systems, rules and procedures, in particular for:

- record-keeping (Article 20): may be done in accordance with internal standards, rules and procedures
- currency conversion for financial statements (Article 21): may be done in accordance with usual accounting practices
- guarantees (Article 23): for public law bodies, prefinancing guarantees are not needed
- certificates (Article 24):
  - certificates on the financial statements (CFS): may be provided by their regular internal or external auditors and in accordance with their internal financial regulations and procedures
  - certificates on usual accounting practices (CoMUC): are not needed if those practices are covered by an ex-ante assessment

and use the following specific rules, for:

- recoveries (Article 22): in case of financial support to third parties, there will be no recovery if the participant has done everything possible to retrieve the undue amounts from the third party receiving the support (including legal proceedings) and non-recovery is not due to an error or negligence on its part
- checks, reviews, audits and investigations by the EU (Article 25): will be conducted taking into account the rules and procedures specifically agreed between them and the framework agreement (if any)
- impact evaluation (Article 26): will be conducted in accordance with the participant’s internal rules and procedures and the framework agreement (if any)
- grant agreement suspension (Article 31): certain costs incurred during grant suspension are eligible (notably, minimum costs necessary for a possible resumption of the action and costs



relating to contracts which were entered into before the pre-information letter was received and which could not reasonably be suspended, reallocated or terminated on legal grounds)

- grant agreement termination (Article 32): the final grant amount and final payment will be calculated taking into account also costs relating to contracts due for execution only after termination takes effect, if the contract was entered into before the pre-information letter was received and could not reasonably be terminated on legal grounds
- liability for damages (Article 33.2): the granting authority must be compensated for damage it sustains as a result of the implementation of the action or because the action was not implemented in full compliance with the Agreement only if the damage is due to an infringement of the participant's internal rules and procedures or due to a violation of third parties' rights by the participant or one of its employees or individual for whom the employees are responsible.

Participants whose pillar assessment covers procurement and granting procedures may also do purchases, subcontracting and financial support to third parties (Article 6.2) in accordance with their internal rules and procedures for purchases, subcontracting and financial support.

Participants whose pillar assessment covers data protection rules may rely on their internal standards, rules and procedures for data protection (Article 15).

The participants may however not rely on provisions which would breach the principle of equal treatment of applicants or beneficiaries or call into question the decision awarding the grant, such as in particular:

- eligibility (Article 6)
- consortium roles and set-up (Articles 7-9)
- security and ethics (Articles 13, 14)
- IPR (including background and results, access rights and rights of use), communication, dissemination and visibility (Articles 16 and 17)
- information obligation (Article 19)
- payment, reporting and amendments (Articles 21, 22 and 39)
- rejections, reductions, suspensions and terminations (Articles 27, 28, 29-32)

If the pillar assessment was subject to remedial measures, reliance on the internal systems, rules and procedures is subject to compliance with those remedial measures.

Participants whose assessment has not yet been updated to cover (the new rules on) data protection may rely on their internal systems, rules and procedures, provided that they ensure that personal data is:

- processed lawfully, fairly and in a transparent manner in relation to the data subject
- collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes

- adequate, relevant and limited to what is necessary in relation to the purposes for which they are processed
- accurate and, where necessary, kept up to date
- kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the data is processed and
- processed in a manner that ensures appropriate security of the personal data.

Participants must inform the coordinator without delay of any changes to the systems, rules and procedures that were part of the pillar assessment. The coordinator must immediately inform the granting authority.

Pillar-assessed participants that have also concluded a framework agreement with the EU, may moreover — under the same conditions as those above (i.e. not call into question the decision awarding the grant or breach the principle of equal treatment of applicants or beneficiaries) — rely on the provisions set out in that framework agreement.

## **SECTION 2 RULES FOR CARRYING OUT THE ACTION**

### **ARTICLE 11 — PROPER IMPLEMENTATION OF THE ACTION**

#### **11.1 Obligation to properly implement the action**

The beneficiaries must implement the action as described in Annex 1 and in compliance with the provisions of the Agreement, the call conditions and all legal obligations under applicable EU, international and national law.

#### **11.2 Consequences of non-compliance**

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 28).

Such breaches may also lead to other measures described in Chapter 5.

### **ARTICLE 12 — CONFLICT OF INTERESTS**

#### **12.1 Conflict of interests**

The beneficiaries must take all measures to prevent any situation where the impartial and objective implementation of the Agreement could be compromised for reasons involving family, emotional life, political or national affinity, economic interest or any other direct or indirect interest ('conflict of interests').

They must formally notify the granting authority without delay of any situation constituting or likely to lead to a conflict of interests and immediately take all the necessary steps to rectify this situation.

The granting authority may verify that the measures taken are appropriate and may require additional measures to be taken by a specified deadline.

## **12.2 Consequences of non-compliance**

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 28) and the grant or the beneficiary may be terminated (see Article 32).

Such breaches may also lead to other measures described in Chapter 5.

## **ARTICLE 13 — CONFIDENTIALITY AND SECURITY**

### **13.1 Sensitive information**

The parties must keep confidential any data, documents or other material (in any form) that is identified as sensitive in writing ('sensitive information') — during the implementation of the action and for at least until the time-limit set out in the Data Sheet (see Point 6).

If a beneficiary requests, the granting authority may agree to keep such information confidential for a longer period.

Unless otherwise agreed between the parties, they may use sensitive information only to implement the Agreement.

The beneficiaries may disclose sensitive information to their personnel or other participants involved in the action only if they:

- (a) need to know it in order to implement the Agreement and
- (b) are bound by an obligation of confidentiality.

The granting authority may disclose sensitive information to its staff and to other EU institutions and bodies.

It may moreover disclose sensitive information to third parties, if:

- (a) this is necessary to implement the Agreement or safeguard the EU financial interests and
- (b) the recipients of the information are bound by an obligation of confidentiality.

The confidentiality obligations no longer apply if:

- (a) the disclosing party agrees to release the other party
- (b) the information becomes publicly available, without breaching any confidentiality obligation
- (c) the disclosure of the sensitive information is required by EU, international or national law.

Specific confidentiality rules (if any) are set out in Annex 5.

### **13.2 Classified information**

The parties must handle classified information in accordance with the applicable EU, international or national law on classified information (in particular, Decision 2015/444<sup>14</sup> and its implementing rules).

Deliverables which contain classified information must be submitted according to special procedures agreed with the granting authority.

Action tasks involving classified information may be subcontracted only after explicit approval (in writing) from the granting authority.

Classified information may not be disclosed to any third party (including participants involved in the action implementation) without prior explicit written approval from the granting authority.

Specific security rules (if any) are set out in Annex 5.

### **13.3 Consequences of non-compliance**

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 28).

Such breaches may also lead to other measures described in Chapter 5.

## **ARTICLE 14 — ETHICS AND VALUES**

### **14.1 Ethics**

The action must be carried out in line with the highest ethical standards and the applicable EU, international and national law on ethical principles.

Specific ethics rules (if any) are set out in Annex 5.

### **14.2 Values**

The beneficiaries must commit to and ensure the respect of basic EU values (such as respect for human dignity, freedom, democracy, equality, the rule of law and human rights, including the rights of minorities).

Specific rules on values (if any) are set out in Annex 5.

### **14.3 Consequences of non-compliance**

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 28).

Such breaches may also lead to other measures described in Chapter 5.

## **ARTICLE 15 — DATA PROTECTION**

### **15.1 Data processing by the granting authority**

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<sup>14</sup> Commission Decision 2015/444/EC, Euratom of 13 March 2015 on the security rules for protecting EU classified information (OJ L 72, 17.3.2015, p. 53).

Any personal data under the Agreement will be processed under the responsibility of the data controller of the granting authority in accordance with and for the purposes set out in the Portal Privacy Statement.

For grants where the granting authority is the European Commission, an EU regulatory or executive agency, joint undertaking or other EU body, the processing will be subject to Regulation 2018/1725<sup>15</sup>.

## **15.2 Data processing by the beneficiaries**

The beneficiaries must process personal data under the Agreement in compliance with the applicable EU, international and national law on data protection (in particular, Regulation 2016/679<sup>16</sup>).

They must ensure that personal data is:

- processed lawfully, fairly and in a transparent manner in relation to the data subjects
- collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes
- adequate, relevant and limited to what is necessary in relation to the purposes for which they are processed
- accurate and, where necessary, kept up to date
- kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the data is processed and
- processed in a manner that ensures appropriate security of the data.

The beneficiaries may grant their personnel access to personal data only if it is strictly necessary for implementing, managing and monitoring the Agreement. The beneficiaries must ensure that the personnel is under a confidentiality obligation.

The beneficiaries must inform the persons whose data are transferred to the granting authority and provide them with the Portal Privacy Statement.

## **15.3 Consequences of non-compliance**

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 28).

Such breaches may also lead to other measures described in Chapter 5.

## **ARTICLE 16 — INTELLECTUAL PROPERTY RIGHTS (IPR) — BACKGROUND AND RESULTS — ACCESS RIGHTS AND RIGHTS OF USE**

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<sup>15</sup> Regulation (EU) 2018/1725 of the European Parliament and of the Council of 23 October 2018 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data, and repealing Regulation (EC) No 45/2001 and Decision No 1247/2002/EC (OJ L 295, 21.11.2018, p. 39).

<sup>16</sup> Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC ('GDPR') (OJ L 119, 4.5.2016, p. 1).

## 16.1 Background and access rights to background

The beneficiaries must give each other and the other participants access to the background identified as needed for implementing the action, subject to any specific rules in Annex 5.

‘Background’ means any data, know-how or information — whatever its form or nature (tangible or intangible), including any rights such as intellectual property rights — that is:

- (a) held by the beneficiaries before they acceded to the Agreement and
- (b) needed to implement the action or exploit the results.

If background is subject to rights of a third party, the beneficiary concerned must ensure that it is able to comply with its obligations under the Agreement.

## 16.2 Ownership of results

The granting authority does not obtain ownership of the results produced under the action.

‘Results’ means any tangible or intangible effect of the action, such as data, know-how or information, whatever its form or nature, whether or not it can be protected, as well as any rights attached to it, including intellectual property rights.

## 16.3 Rights of use of the granting authority on materials, documents and information received for policy, information, communication, dissemination and publicity purposes

The granting authority has the right to use non-sensitive information relating to the action and materials and documents received from the beneficiaries (notably summaries for publication, deliverables, as well as any other material, such as pictures or audio-visual material, in paper or electronic form) for policy, information, communication, dissemination and publicity purposes — during the action or afterwards.

The right to use the beneficiaries’ materials, documents and information is granted in the form of a royalty-free, non-exclusive and irrevocable licence, which includes the following rights:

- (a) **use for its own purposes** (in particular, making them available to persons working for the granting authority or any other EU service (including institutions, bodies, offices, agencies, etc.) or EU Member State institution or body; copying or reproducing them in whole or in part, in unlimited numbers; and communication through press information services)
- (b) **distribution to the public** (in particular, publication as hard copies and in electronic or digital format, publication on the internet, as a downloadable or non-downloadable file, broadcasting by any channel, public display or presentation, communicating through press information services, or inclusion in widely accessible databases or indexes)
- (c) **editing or redrafting** (including shortening, summarising, inserting other elements (e.g. meta-data, legends, other graphic, visual, audio or text elements), extracting parts (e.g. audio or video files), dividing into parts, use in a compilation)
- (d) **translation**
- (e) **storage** in paper, electronic or other form



- (f) **archiving**, in line with applicable document-management rules
- (g) the right to authorise **third parties** to act on its behalf or sub-license to third parties the modes of use set out in Points (b), (c), (d) and (f), if needed for the information, communication and publicity activity of the granting authority
- (h) **processing**, analysing, aggregating the materials, documents and information received and **producing derivative works**.

The rights of use are granted for the whole duration of the industrial or intellectual property rights concerned.

If materials or documents are subject to moral rights or third party rights (including intellectual property rights or rights of natural persons on their image and voice), the beneficiaries must ensure that they comply with their obligations under this Agreement (in particular, by obtaining the necessary licences and authorisations from the rights holders concerned).

Where applicable, the granting authority will insert the following information:

“© – [year] – [name of the copyright owner]. All rights reserved. Licensed to the [name of granting authority] under conditions.”

#### **16.4 Specific rules on IPR, results and background**

Specific rules regarding intellectual property rights, results and background (if any) are set out in Annex 5.

#### **16.5 Consequences of non-compliance**

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 28).

Such a breach may also lead to other measures described in Chapter 5.

### **ARTICLE 17 — COMMUNICATION, DISSEMINATION AND VISIBILITY**

#### **17.1 Communication — Dissemination — Promoting the action**

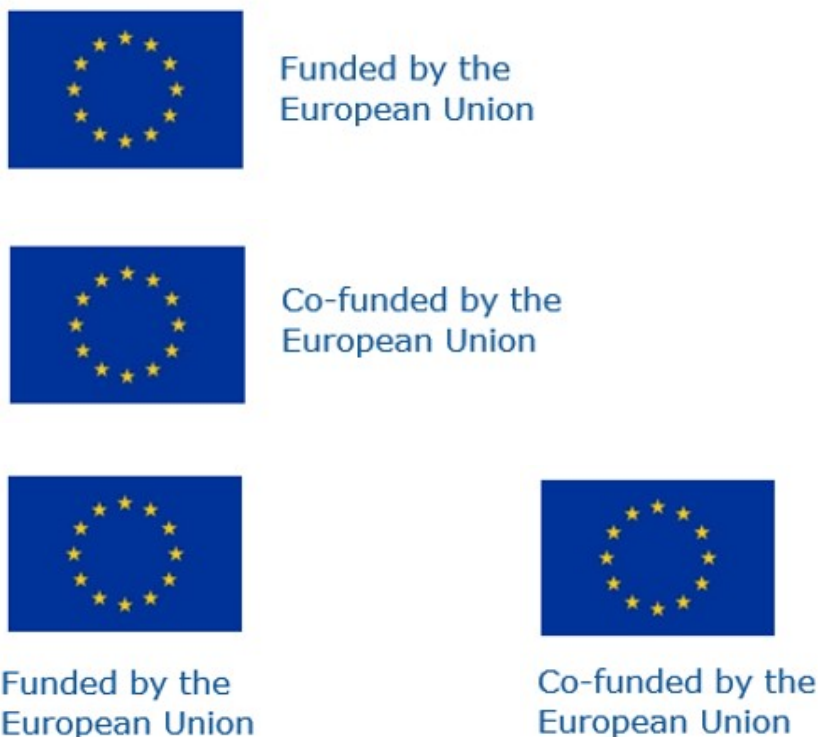
Unless otherwise agreed with the granting authority, the beneficiaries must promote the action and its results by providing targeted information to multiple audiences (including the media and the public), in accordance with Annex 1 and in a strategic, coherent and effective manner.

Before engaging in a communication or dissemination activity expected to have a major media impact, the beneficiaries must inform the granting authority.

#### **17.2 Visibility — European flag and funding statement**

Unless otherwise agreed with the granting authority, communication activities of the beneficiaries related to the action (including media relations, conferences, seminars, information material, such as brochures, leaflets, posters, presentations, etc., in electronic form, via traditional or social media, etc.), dissemination activities and any infrastructure, equipment, vehicles, supplies or major result funded

by the grant must acknowledge EU support and display the European flag (emblem) and funding statement (translated into local languages, where appropriate):



The emblem must remain distinct and separate and cannot be modified by adding other visual marks, brands or text.

Apart from the emblem, no other visual identity or logo may be used to highlight the EU support.

When displayed in association with other logos (e.g. of beneficiaries or sponsors), the emblem must be displayed at least as prominently and visibly as the other logos.

For the purposes of their obligations under this Article, the beneficiaries may use the emblem without first obtaining approval from the granting authority. This does not, however, give them the right to exclusive use. Moreover, they may not appropriate the emblem or any similar trademark or logo, either by registration or by any other means.

### 17.3 Quality of information — Disclaimer

Any communication or dissemination activity related to the action must use factually accurate information.

Moreover, it must indicate the following disclaimer (translated into local languages where appropriate):

“Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or [name of the granting authority]. Neither the European Union nor the granting authority can be held responsible for them.”

### 17.4 Specific communication, dissemination and visibility rules

Specific communication, dissemination and visibility rules (if any) are set out in Annex 5.



## **17.5 Consequences of non-compliance**

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 28).

Such breaches may also lead to other measures described in Chapter 5.

## **ARTICLE 18 — SPECIFIC RULES FOR CARRYING OUT THE ACTION**

### **18.1 Specific rules for carrying out the action**

Specific rules for implementing the action (if any) are set out in Annex 5.

### **18.2 Consequences of non-compliance**

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 28).

Such a breach may also lead to other measures described in Chapter 5.

## **SECTION 3 GRANT ADMINISTRATION**

## **ARTICLE 19 — GENERAL INFORMATION OBLIGATIONS**

### **19.1 Information requests**

The beneficiaries must provide — during the action or afterwards and in accordance with Article 7 — any information requested in order to verify eligibility of the costs or contributions declared, proper implementation of the action and compliance with the other obligations under the Agreement.

The information provided must be accurate, precise and complete and in the format requested, including electronic format.

### **19.2 Participant Register data updates**

The beneficiaries must keep — at all times, during the action or afterwards — their information stored in the Portal Participant Register up to date, in particular, their name, address, legal representatives, legal form and organisation type.

### **19.3 Information about events and circumstances which impact the action**

The beneficiaries must immediately inform the granting authority (and the other beneficiaries) of any of the following:

- (a) **events** which are likely to affect or delay the implementation of the action or affect the EU's financial interests, in particular:
  - (i) changes in their legal, financial, technical, organisational or ownership situation (including changes linked to one of the exclusion grounds listed in the declaration of honour signed before grant signature)

(ii) linked action information: not applicable

(b) **circumstances** affecting:

(i) the decision to award the grant or

(ii) compliance with requirements under the Agreement.

#### **19.4 Consequences of non-compliance**

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 28).

Such breaches may also lead to other measures described in Chapter 5.

### **ARTICLE 20 — RECORD-KEEPING**

#### **20.1 Keeping records and supporting documents**

The beneficiaries must — at least until the time-limit set out in the Data Sheet (see Point 6) — keep records and other supporting documents to prove the proper implementation of the action in line with the accepted standards in the respective field (if any).

In addition, the beneficiaries must — for the same period — keep the following to justify the amounts declared:

- (a) for actual costs: adequate records and supporting documents to prove the costs declared (such as contracts, subcontracts, invoices and accounting records); in addition, the beneficiaries' usual accounting and internal control procedures must enable direct reconciliation between the amounts declared, the amounts recorded in their accounts and the amounts stated in the supporting documents
- (b) for flat-rate costs and contributions (if any): adequate records and supporting documents to prove the eligibility of the costs or contributions to which the flat-rate is applied
- (c) for the following simplified costs and contributions: the beneficiaries do not need to keep specific records on the actual costs incurred, but must keep:
  - (i) for unit costs and contributions (if any): adequate records and supporting documents to prove the number of units declared
  - (ii) for lump sum costs and contributions (if any): adequate records and supporting documents to prove proper implementation of the work as described in Annex 1
  - (iii) for financing not linked to costs (if any): adequate records and supporting documents to prove the achievement of the results or the fulfilment of the conditions as described in Annex 1
- (d) for unit, flat-rate and lump sum costs and contributions according to usual cost accounting practices (if any): the beneficiaries must keep any adequate records and supporting documents to prove that their cost accounting practices have been applied in a consistent manner, based on

objective criteria, regardless of the source of funding, and that they comply with the eligibility conditions set out in Articles 6.1 and 6.2.

Moreover, the following is needed for specific budget categories:

- (e) for personnel costs: time worked for the beneficiary under the action must be supported by declarations signed monthly by the person and their supervisor, unless another reliable time-record system is in place; the granting authority may accept alternative evidence supporting the time worked for the action declared, if it considers that it offers an adequate level of assurance
- (f) additional record-keeping rules: not applicable

The records and supporting documents must be made available upon request (see Article 19) or in the context of checks, reviews, audits or investigations (see Article 25).

If there are on-going checks, reviews, audits, investigations, litigation or other pursuits of claims under the Agreement (including the extension of findings; see Article 25), the beneficiaries must keep these records and other supporting documentation until the end of these procedures.

The beneficiaries must keep the original documents. Digital and digitalised documents are considered originals if they are authorised by the applicable national law. The granting authority may accept non-original documents if they offer a comparable level of assurance.

## 20.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, costs or contributions insufficiently substantiated will be ineligible (see Article 6) and will be rejected (see Article 27), and the grant may be reduced (see Article 28).

Such breaches may also lead to other measures described in Chapter 5.

## ARTICLE 21 — REPORTING

### 21.1 Continuous reporting

The beneficiaries must continuously report on the progress of the action (e.g. **deliverables, milestones, outputs/outcomes, critical risks, indicators**, etc; if any), in the Portal Continuous Reporting tool and in accordance with the timing and conditions it sets out (as agreed with the granting authority).

Standardised deliverables (e.g. progress reports not linked to payments, reports on cumulative expenditure, special reports, etc; if any) must be submitted using the templates published on the Portal.

### 21.2 Periodic reporting: Technical reports and financial statements

In addition, the beneficiaries must provide reports to request payments, in accordance with the schedule and modalities set out in the Data Sheet (see Point 4.2):

- for additional prefinancings (if any): an **additional prefinancing report**
- for interim payments (if any) and the final payment: a **periodic report**.

The prefinancing and periodic reports include a technical and financial part.

The technical part includes an overview of the action implementation. It must be prepared using the template available in the Portal Periodic Reporting tool.

The financial part of the additional prefinancing report includes a statement on the use of the previous prefinancing payment.

The financial part of the periodic report includes:

- the financial statements (individual and consolidated; for all beneficiaries/affiliated entities)
- the explanation on the use of resources (or detailed cost reporting table, if required)
- the certificates on the financial statements (CFS) (if required; see Article 24.2 and Data Sheet, Point 4.3).

The **financial statements** must detail the eligible costs and contributions for each budget category and, for the final payment, also the revenues for the action (see Articles 6 and 22).

All eligible costs and contributions incurred should be declared, even if they exceed the amounts indicated in the estimated budget (see Annex 2). Amounts that are not declared in the individual financial statements will not be taken into account by the granting authority.

By signing the financial statements (directly in the Portal Periodic Reporting tool), the beneficiaries confirm that:

- the information provided is complete, reliable and true
- the costs and contributions declared are eligible (see Article 6)
- the costs and contributions can be substantiated by adequate records and supporting documents (see Article 20) that will be produced upon request (see Article 19) or in the context of checks, reviews, audits and investigations (see Article 25)
- for the final periodic report: all the revenues have been declared (if required; see Article 22).

Beneficiaries will have to submit also the financial statements of their affiliated entities (if any). In case of recoveries (see Article 22), beneficiaries will be held responsible also for the financial statements of their affiliated entities.

### **21.3 Currency for financial statements and conversion into euros**

The financial statements must be drafted in euro.

Beneficiaries with general accounts established in a currency other than the euro must convert the costs recorded in their accounts into euro, at the average of the daily exchange rates published in the C series of the *Official Journal of the European Union* (ECB website), calculated over the corresponding reporting period.

If no daily euro exchange rate is published in the *Official Journal* for the currency in question, they must be converted at the average of the monthly accounting exchange rates published on the European Commission website (InforEuro), calculated over the corresponding reporting period.

Beneficiaries with general accounts in euro must convert costs incurred in another currency into euro according to their usual accounting practices.

#### **21.4 Reporting language**

The reporting must be in the language of the Agreement, unless otherwise agreed with the granting authority (see Data Sheet, Point 4.2).

#### **21.5 Consequences of non-compliance**

If a report submitted does not comply with this Article, the granting authority may suspend the payment deadline (see Article 29) and apply other measures described in Chapter 5.

If the coordinator breaches its reporting obligations, the granting authority may terminate the grant or the coordinator's participation (see Article 32) or apply other measures described in Chapter 5.

### **ARTICLE 22 — PAYMENTS AND RECOVERIES — CALCULATION OF AMOUNTS DUE**

#### **22.1 Payments and payment arrangements**

Payments will be made in accordance with the schedule and modalities set out in the Data Sheet (see Point 4.2).

They will be made in euro to the bank account indicated by the coordinator (see Data Sheet, Point 4.2) and must be distributed without unjustified delay (restrictions may apply to distribution of the initial prefinancing payment; see Data Sheet, Point 4.2).

Payments to this bank account will discharge the granting authority from its payment obligation.

The cost of payment transfers will be borne as follows:

- the granting authority bears the cost of transfers charged by its bank
- the beneficiary bears the cost of transfers charged by its bank
- the party causing a repetition of a transfer bears all costs of the repeated transfer.

Payments by the granting authority will be considered to have been carried out on the date when they are debited to its account.

#### **22.2 Recoveries**

Recoveries will be made, if — at beneficiary termination, final payment or afterwards — it turns out that the granting authority has paid too much and needs to recover the amounts undue.

The general liability regime for recoveries (first-line liability) is as follows: At final payment, the coordinator will be fully liable for recoveries, even if it has not been the final recipient of the undue amounts. At beneficiary termination or after final payment, recoveries will be made directly against the beneficiaries concerned.

Beneficiaries will be fully liable for repaying the debts of their affiliated entities.

In case of enforced recoveries (see Article 22.4):

- the beneficiaries will be jointly and severally liable for repaying debts of another beneficiary under the Agreement (including late-payment interest), if required by the granting authority (see Data Sheet, Point 4.4)
- affiliated entities will be held liable for repaying debts of their beneficiaries under the Agreement (including late-payment interest), if required by the granting authority (see Data Sheet, Point 4.4).

## 22.3 Amounts due

### 22.3.1 Prefinancing payments

The aim of the prefinancing is to provide the beneficiaries with a float.

It remains the property of the EU until the final payment.

For **initial prefinancings** (if any), the amount due, schedule and modalities are set out in the Data Sheet (see Point 4.2).

For **additional prefinancings** (if any), the amount due, schedule and modalities are also set out in the Data Sheet (see Point 4.2). However, if the statement on the use of the previous prefinancing payment shows that less than 70% was used, the amount set out in the Data Sheet will be reduced by the difference between the 70% threshold and the amount used.

Prefinancing payments (or parts of them) may be offset (without the beneficiaries' consent) against amounts owed by a beneficiary to the granting authority — up to the amount due to that beneficiary.

For grants where the granting authority is the European Commission or an EU executive agency, offsetting may also be done against amounts owed to other Commission services or executive agencies.

Payments will not be made if the payment deadline or payments are suspended (see Articles 29 and 30).

### 22.3.2 Amount due at beneficiary termination — Recovery

In case of beneficiary termination, the granting authority will determine the provisional amount due for the beneficiary concerned. Payments (if any) will be made with the next interim or final payment.

The **amount due** will be calculated in the following step:

Step 1 — Calculation of the total accepted EU contribution

#### Step 1 — Calculation of the total accepted EU contribution

The granting authority will first calculate the 'accepted EU contribution' for the beneficiary for all reporting periods, by calculating the 'maximum EU contribution to costs' (applying the funding rate to the accepted costs of the beneficiary), taking into account requests for a lower contribution to costs and CFS threshold cappings (if any; see Article 24.5) and adding the contributions (accepted unit, flat-rate or lump sum contributions and financing not linked to costs, if any).



After that, the granting authority will take into account grant reductions (if any). The resulting amount is the ‘total accepted EU contribution’ for the beneficiary.

The **balance** is then calculated by deducting the payments received (if any; see report on the distribution of payments in Article 32), from the total accepted EU contribution:

$$\begin{aligned} & \{ \text{total accepted EU contribution for the beneficiary} \\ & \text{minus} \\ & \{ \text{prefinancing and interim payments received (if any)} \} \}. \end{aligned}$$

If the balance is **positive**, the amount will be included in the next interim or final payment to the consortium.

If the balance is **negative**, it will be **recovered** in accordance with the following procedure:

The granting authority will send a **pre-information letter** to the beneficiary concerned:

- formally notifying the intention to recover, the amount due, the amount to be recovered and the reasons why and
- requesting observations within 30 days of receiving notification.

If no observations are submitted (or the granting authority decides to pursue recovery despite the observations it has received), it will confirm the amount to be recovered and ask this amount to be paid to the coordinator (**confirmation letter**).

The amounts will later on also be taken into account for the next interim or final payment.

### 22.3.3 Interim payments

Interim payments reimburse the eligible costs and contributions claimed for the implementation of the action during the reporting periods (if any).

Interim payments (if any) will be made in accordance with the schedule and modalities set out the Data Sheet (see Point 4.2).

Payment is subject to the approval of the periodic report. Its approval does not imply recognition of compliance, authenticity, completeness or correctness of its content.

The **interim payment** will be calculated by the granting authority in the following steps:

Step 1 — Calculation of the total accepted EU contribution

Step 2 — Limit to the interim payment ceiling

#### Step 1 — Calculation of the total accepted EU contribution

The granting authority will calculate the ‘accepted EU contribution’ for the action for the reporting period, by first calculating the ‘maximum EU contribution to costs’ (applying the funding rate to the accepted costs of each beneficiary), taking into account requests for a lower contribution to costs, and CFS threshold cappings (if any; see Article 24.5) and adding the contributions (accepted unit, flat-rate or lump sum contributions and financing not linked to costs, if any).

After that, the granting authority will take into account grant reductions from beneficiary termination (if any). The resulting amount is the ‘total accepted EU contribution’.

#### Step 2 — Limit to the interim payment ceiling

The resulting amount is then capped to ensure that the total amount of prefinancing and interim payments (if any) does not exceed the interim payment ceiling set out in the Data Sheet (see Point 4.2).

Interim payments (or parts of them) may be offset (without the beneficiaries’ consent) against amounts owed by a beneficiary to the granting authority — up to the amount due to that beneficiary.

For grants where the granting authority is the European Commission or an EU executive agency, offsetting may also be done against amounts owed to other Commission services or executive agencies.

Payments will not be made if the payment deadline or payments are suspended (see Articles 29 and 30).

### **22.3.4 Final payment — Final grant amount — Revenues and Profit — Recovery**

The final payment (payment of the balance) reimburses the remaining part of the eligible costs and contributions claimed for the implementation of the action (if any).

The final payment will be made in accordance with the schedule and modalities set out in the Data Sheet (see Point 4.2).

Payment is subject to the approval of the final periodic report. Its approval does not imply recognition of compliance, authenticity, completeness or correctness of its content.

The **final grant amount for the action** will be calculated in the following steps:

Step 1 — Calculation of the total accepted EU contribution

Step 2 — Limit to the maximum grant amount

Step 3 — Reduction due to the no-profit rule

#### Step 1 — Calculation of the total accepted EU contribution

The granting authority will first calculate the ‘accepted EU contribution’ for the action for all reporting periods, by calculating the ‘maximum EU contribution to costs’ (applying the funding rate to the total accepted costs of each beneficiary), taking into account requests for a lower contribution to costs, CFS threshold cappings (if any; see Article 24.5) and adding the contributions (accepted unit, flat-rate or lump sum contributions and financing not linked to costs, if any).

After that, the granting authority will take into account grant reductions (if any). The resulting amount is the ‘total accepted EU contribution’.

#### Step 2 — Limit to the maximum grant amount

If the resulting amount is higher than the maximum grant amount set out in Article 5.2, it will be limited to the latter.



### Step 3 — Reduction due to the no-profit rule

If the no-profit rule is provided for in the Data Sheet (see Point 4.2), the grant must not produce a profit (i.e. surplus of the amount obtained following Step 2 plus the action's revenues, over the eligible costs and contributions approved by the granting authority).

'Revenue' is all income generated by the action, during its duration (see Article 4), for beneficiaries that are profit legal entities.

If there is a profit, it will be deducted in proportion to the final rate of reimbursement of the eligible costs approved by the granting authority (as compared to the amount calculated following Steps 1 and 2 minus the contributions).

The **balance** (final payment) is then calculated by deducting the total amount of prefinancing and interim payments already made (if any), from the final grant amount:

$$\left. \begin{array}{l} \{\text{final grant amount} \\ \text{minus} \\ \{\text{prefinancing and interim payments made (if any)}\} \} \end{array} \right\}$$

If the balance is **positive**, it will be **paid** to the coordinator.

The final payment (or part of it) may be offset (without the beneficiaries' consent) against amounts owed by a beneficiary to the granting authority — up to the amount due to that beneficiary.

For grants where the granting authority is the European Commission or an EU executive agency, offsetting may also be done against amounts owed to other Commission services or executive agencies.

Payments will not be made if the payment deadline or payments are suspended (see Articles 29 and 30).

If the balance is **negative**, it will be **recovered** in accordance with the following procedure:

The granting authority will send a **pre-information letter** to the coordinator:

- formally notifying the intention to recover, the final grant amount, the amount to be recovered and the reasons why
- requesting observations within 30 days of receiving notification.

If no observations are submitted (or the granting authority decides to pursue recovery despite the observations it has received), it will confirm the amount to be recovered (**confirmation letter**), together with a **debit note** with the terms and date for payment.

If payment is not made by the date specified in the debit note, the granting authority will **enforce recovery** in accordance with Article 22.4.

#### **22.3.5 Audit implementation after final payment — Revised final grant amount — Recovery**

If — after the final payment (in particular, after checks, reviews, audits or investigations; see

Article 25) — the granting authority rejects costs or contributions (see Article 27) or reduces the grant (see Article 28), it will calculate the **revised final grant amount** for the beneficiary concerned.

The **beneficiary revised final grant amount** will be calculated in the following step:

Step 1 — Calculation of the revised total accepted EU contribution

#### Step 1 — Calculation of the revised total accepted EU contribution

The granting authority will first calculate the ‘revised accepted EU contribution’ for the beneficiary, by calculating the ‘revised accepted costs’ and ‘revised accepted contributions’.

After that, it will take into account grant reductions (if any). The resulting ‘revised total accepted EU contribution’ is the beneficiary revised final grant amount.

If the revised final grant amount is lower than the beneficiary’s final grant amount (i.e. its share in the final grant amount for the action), it will be **recovered** in accordance with the following procedure:

The **beneficiary final grant amount** (i.e. share in the final grant amount for the action) is calculated as follows:

$$\left\{ \begin{array}{l} \{\text{total accepted EU contribution for the beneficiary} \\ \text{divided by} \\ \text{total accepted EU contribution for the action}\} \\ \text{multiplied by} \\ \text{final grant amount for the action} \end{array} \right\}.$$

The granting authority will send a **pre-information letter** to the beneficiary concerned:

- formally notifying the intention to recover, the amount to be recovered and the reasons why and
- requesting observations within 30 days of receiving notification.

If no observations are submitted (or the granting authority decides to pursue recovery despite the observations it has received), it will confirm the amount to be recovered (**confirmation letter**), together with a **debit note** with the terms and the date for payment.

Recoveries against affiliated entities (if any) will be handled through their beneficiaries.

If payment is not made by the date specified in the debit note, the granting authority will **enforce recovery** in accordance with Article 22.4.

## 22.4 Enforced recovery

If payment is not made by the date specified in the debit note, the amount due will be recovered:

- (a) by offsetting the amount — without the coordinator or beneficiary’s consent — against any amounts owed to the coordinator or beneficiary by the granting authority.

In exceptional circumstances, to safeguard the EU financial interests, the amount may be offset before the payment date specified in the debit note.

For grants where the granting authority is the European Commission or an EU executive agency, debts may also be offset against amounts owed by other Commission services or executive agencies.

- (b) by drawing on the financial guarantee(s) (if any)
- (c) by holding other beneficiaries jointly and severally liable (if any; see Data Sheet, Point 4.4)
- (d) by holding affiliated entities jointly and severally liable (if any, see Data Sheet, Point 4.4)
- (e) by taking legal action (see Article 43) or, provided that the granting authority is the European Commission or an EU executive agency, by adopting an enforceable decision under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 100(2) of EU Financial Regulation 2018/1046.

The amount to be recovered will be increased by **late-payment interest** at the rate set out in Article 22.5, from the day following the payment date in the debit note, up to and including the date the full payment is received.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2015/2366<sup>17</sup> applies.

For grants where the granting authority is an EU executive agency, enforced recovery by offsetting or enforceable decision will be done by the services of the European Commission (see also Article 43).

## 22.5 Consequences of non-compliance

**22.5.1** If the granting authority does not pay within the payment deadlines (see above), the beneficiaries are entitled to **late-payment interest** at the rate applied by the European Central Bank (ECB) for its main refinancing operations in euros ('reference rate'), plus the rate specified in the Data Sheet (Point 4.2). The reference rate is the rate in force on the first day of the month in which the payment deadline expires, as published in the C series of the *Official Journal of the European Union*.

If the late-payment interest is lower than or equal to EUR 200, it will be paid to the coordinator only on request submitted within two months of receiving the late payment.

Late-payment interest is not due if all beneficiaries are EU Member States (including regional and local government authorities or other public bodies acting on behalf of a Member State for the purpose of this Agreement).

If payments or the payment deadline are suspended (see Articles 29 and 30), payment will not be considered as late.

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<sup>17</sup> Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC (OJ L 337, 23.12.2015, p. 35).

Late-payment interest covers the period running from the day following the due date for payment (see above), up to and including the date of payment.

Late-payment interest is not considered for the purposes of calculating the final grant amount.

**22.5.2** If the coordinator breaches any of its obligations under this Article, the grant may be reduced (see Article 28) and the grant or the coordinator may be terminated (see Article 32).

Such breaches may also lead to other measures described in Chapter 5.

## **ARTICLE 23 — GUARANTEES**

### **23.1 Prefinancing guarantee**

If required by the granting authority (see Data Sheet, Point 4.2), the beneficiaries must provide (one or more) prefinancing guarantee(s) in accordance with the timing and the amounts set out in the Data Sheet.

The coordinator must submit them to the granting authority in due time before the prefinancing they are linked to.

The guarantees must be drawn up using the template published on the Portal and fulfil the following conditions:

- (a) be provided by a bank or approved financial institution established in the EU or — if requested by the coordinator and accepted by the granting authority — by a third party or a bank or financial institution established outside the EU offering equivalent security
- (b) the guarantor stands as first-call guarantor and does not require the granting authority to first have recourse against the principal debtor (i.e. the beneficiary concerned) and
- (c) remain explicitly in force until the final payment and, if the final payment takes the form of a recovery, until five months after the debit note is notified to a beneficiary.

They will be released within the following month.

### **23.2 Consequences of non-compliance**

If the beneficiaries breach their obligation to provide the prefinancing guarantee, the prefinancing will not be paid.

Such breaches may also lead to other measures described in Chapter 5.

## **ARTICLE 24 — CERTIFICATES**

### **24.1 Operational verification report (OVR)**

Not applicable

### **24.2 Certificate on the financial statements (CFS)**

If required by the granting authority (see Data Sheet, Point 4.3), the beneficiaries must provide

certificates on their financial statements (CFS), in accordance with the schedule, threshold and conditions set out in the Data Sheet.

The coordinator must submit them as part of the periodic report (see Article 21).

The certificates must be drawn up using the template published on the Portal, cover the costs declared on the basis of actual costs and costs according to usual cost accounting practices (if any), and fulfil the following conditions:

- (a) be provided by a qualified approved external auditor which is independent and complies with Directive 2006/43/EC<sup>18</sup> (or for public bodies: by a competent independent public officer)
- (b) the verification must be carried out according to the highest professional standards to ensure that the financial statements comply with the provisions under the Agreement and that the costs declared are eligible.

The certificates will not affect the granting authority's right to carry out its own checks, reviews or audits, nor preclude the European Court of Auditors (ECA), the European Public Prosecutor's Office (EPPO) or the European Anti-Fraud Office (OLAF) from using their prerogatives for audits and investigations under the Agreement (see Article 25).

If the costs (or a part of them) were already audited by the granting authority, these costs do not need to be covered by the certificate and will not be counted for calculating the threshold (if any).

### **24.3 Certificate on the compliance of usual cost accounting practices (CoMUC)**

Not applicable

### **24.4 Systems and process audit (SPA)**

Not applicable

### **24.5 Consequences of non-compliance**

If a beneficiary does not submit a certificate on the financial statements (CFS) or the certificate is rejected, the accepted EU contribution to costs will be capped to reflect the CFS threshold.

If a beneficiary breaches any of its other obligations under this Article, the granting authority may apply the measures described in Chapter 5.

## **ARTICLE 25 — CHECKS, REVIEWS, AUDITS AND INVESTIGATIONS — EXTENSION OF FINDINGS**

### **25.1 Granting authority checks, reviews and audits**

#### **25.1.1 Internal checks**

The granting authority may — during the action or afterwards — check the proper implementation of

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<sup>18</sup> Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts or similar national regulations (OJ L 157, 9.6.2006, p. 87).

the action and compliance with the obligations under the Agreement, including assessing costs and contributions, deliverables and reports.

### 25.1.2 Project reviews

The granting authority may carry out reviews on the proper implementation of the action and compliance with the obligations under the Agreement (general project reviews or specific issues reviews).

Such project reviews may be started during the implementation of the action and until the time-limit set out in the Data Sheet (see Point 6). They will be formally notified to the coordinator or beneficiary concerned and will be considered to start on the date of the notification.

If needed, the granting authority may be assisted by independent, outside experts. If it uses outside experts, the coordinator or beneficiary concerned will be informed and have the right to object on grounds of commercial confidentiality or conflict of interest.

The coordinator or beneficiary concerned must cooperate diligently and provide — within the deadline requested — any information and data in addition to deliverables and reports already submitted (including information on the use of resources). The granting authority may request beneficiaries to provide such information to it directly. Sensitive information and documents will be treated in accordance with Article 13.

The coordinator or beneficiary concerned may be requested to participate in meetings, including with the outside experts.

For **on-the-spot visits**, the beneficiary concerned must allow access to sites and premises (including to the outside experts) and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the review findings, a **project review report** will be drawn up.

The granting authority will formally notify the project review report to the coordinator or beneficiary concerned, which has 30 days from receiving notification to make observations.

Project reviews (including project review reports) will be in the language of the Agreement.

### 25.1.3 Audits

The granting authority may carry out audits on the proper implementation of the action and compliance with the obligations under the Agreement.

Such audits may be started during the implementation of the action and until the time-limit set out in the Data Sheet (see Point 6). They will be formally notified to the beneficiary concerned and will be considered to start on the date of the notification.

The granting authority may use its own audit service, delegate audits to a centralised service or use external audit firms. If it uses an external firm, the beneficiary concerned will be informed and have the right to object on grounds of commercial confidentiality or conflict of interest.

The beneficiary concerned must cooperate diligently and provide — within the deadline requested —



any information (including complete accounts, individual salary statements or other personal data) to verify compliance with the Agreement. Sensitive information and documents will be treated in accordance with Article 13.

For **on-the-spot** visits, the beneficiary concerned must allow access to sites and premises (including for the external audit firm) and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the audit findings, a **draft audit report** will be drawn up.

The auditors will formally notify the draft audit report to the beneficiary concerned, which has 30 days from receiving notification to make observations (contradictory audit procedure).

The **final audit report** will take into account observations by the beneficiary concerned and will be formally notified to them.

Audits (including audit reports) will be in the language of the Agreement.

## **25.2 European Commission checks, reviews and audits in grants of other granting authorities**

Where the granting authority is not the European Commission, the latter has the same rights of checks, reviews and audits as the granting authority.

## **25.3 Access to records for assessing simplified forms of funding**

The beneficiaries must give the European Commission access to their statutory records for the periodic assessment of simplified forms of funding which are used in EU programmes.

## **25.4 OLAF, EPPO and ECA audits and investigations**

The following bodies may also carry out checks, reviews, audits and investigations — during the action or afterwards:

- the European Anti-Fraud Office (OLAF) under Regulations No 883/2013<sup>19</sup> and No 2185/96<sup>20</sup>
- the European Public Prosecutor's Office (EPPO) under Regulation 2017/1939
- the European Court of Auditors (ECA) under Article 287 of the Treaty on the Functioning of the EU (TFEU) and Article 257 of EU Financial Regulation 2018/1046.

If requested by these bodies, the beneficiary concerned must provide full, accurate and complete information in the format requested (including complete accounts, individual salary statements or

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<sup>19</sup> Regulation (EU, Euratom) No 883/2013 of the European Parliament and of the Council of 11 September 2013 concerning investigations conducted by the European Anti-Fraud Office (OLAF) and repealing Regulation (EC) No 1073/1999 of the European Parliament and of the Council and Council Regulation (Euratom) No 1074/1999 (OJ L 248, 18/09/2013, p. 1).

<sup>20</sup> Council Regulation (Euratom, EC) No 2185/96 of 11 November 1996 concerning on-the-spot checks and inspections carried out by the Commission in order to protect the European Communities' financial interests against fraud and other irregularities (OJ L 292, 15/11/1996, p. 2).

other personal data, including in electronic format) and allow access to sites and premises for on-the-spot visits or inspections — as provided for under these Regulations.

To this end, the beneficiary concerned must keep all relevant information relating to the action, at least until the time-limit set out in the Data Sheet (Point 6) and, in any case, until any ongoing checks, reviews, audits, investigations, litigation or other pursuits of claims have been concluded.

## **25.5 Consequences of checks, reviews, audits and investigations — Extension of results of reviews, audits or investigations**

### **25.5.1 Consequences of checks, reviews, audits and investigations in this grant**

Findings in checks, reviews, audits or investigations carried out in the context of this grant may lead to rejections (see Article 27), grant reduction (see Article 28) or other measures described in Chapter 5.

Rejections or grant reductions after the final payment will lead to a revised final grant amount (see Article 22).

Findings in checks, reviews, audits or investigations during the action implementation may lead to a request for amendment (see Article 39), to change the description of the action set out in Annex 1.

Checks, reviews, audits or investigations that find systemic or recurrent errors, irregularities, fraud or breach of obligations in any EU grant may also lead to consequences in other EU grants awarded under similar conditions ('extension to other grants').

Moreover, findings arising from an OLAF or EPPO investigation may lead to criminal prosecution under national law.

### **25.5.2 Extension from other grants**

Results of checks, reviews, audits or investigations in other grants may be extended to this grant, if:

- (a) the beneficiary concerned is found, in other EU grants awarded under similar conditions, to have committed systemic or recurrent errors, irregularities, fraud or breach of obligations that have a material impact on this grant and
- (b) those findings are formally notified to the beneficiary concerned — together with the list of grants affected by the findings — within the time-limit for audits set out in the Data Sheet (see Point 6).

The granting authority will formally notify the beneficiary concerned of the intention to extend the findings and the list of grants affected.

If the extension concerns **rejections of costs or contributions**: the notification will include:

- (a) an invitation to submit observations on the list of grants affected by the findings
- (b) the request to submit revised financial statements for all grants affected
- (c) the correction rate for extrapolation, established on the basis of the systemic or recurrent errors, to calculate the amounts to be rejected, if the beneficiary concerned:



- (i) considers that the submission of revised financial statements is not possible or practicable or
- (ii) does not submit revised financial statements.

If the extension concerns **grant reductions**: the notification will include:

- (a) an invitation to submit observations on the list of grants affected by the findings and
- (b) the **correction rate for extrapolation**, established on the basis of the systemic or recurrent errors and the principle of proportionality.

The beneficiary concerned has **60 days** from receiving notification to submit observations, revised financial statements or to propose a duly substantiated **alternative correction method/rate**.

On the basis of this, the granting authority will analyse the impact and decide on the implementation (i.e. start rejection or grant reduction procedures, either on the basis of the revised financial statements or the announced/alternative method/rate or a mix of those; see Articles 27 and 28).

## 25.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, costs or contributions insufficiently substantiated will be ineligible (see Article 6) and will be rejected (see Article 27), and the grant may be reduced (see Article 28).

Such breaches may also lead to other measures described in Chapter 5.

## ARTICLE 26 — IMPACT EVALUATIONS

### 26.1 Impact evaluation

The granting authority may carry out impact evaluations of the action, measured against the objectives and indicators of the EU programme funding the grant.

Such evaluations may be started during implementation of the action and until the time-limit set out in the Data Sheet (see Point 6). They will be formally notified to the coordinator or beneficiaries and will be considered to start on the date of the notification.

If needed, the granting authority may be assisted by independent outside experts.

The coordinator or beneficiaries must provide any information relevant to evaluate the impact of the action, including information in electronic format.

### 26.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the granting authority may apply the measures described in Chapter 5.

## CHAPTER 5 CONSEQUENCES OF NON-COMPLIANCE

## **SECTION 1 REJECTIONS AND GRANT REDUCTION**

### **ARTICLE 27 — REJECTION OF COSTS AND CONTRIBUTIONS**

#### **27.1 Conditions**

The granting authority will — at beneficiary termination, interim payment, final payment or afterwards — reject any costs or contributions which are ineligible (see Article 6), in particular following checks, reviews, audits or investigations (see Article 25).

The rejection may also be based on the extension of findings from other grants to this grant (see Article 25).

Ineligible costs or contributions will be rejected.

#### **27.2 Procedure**

If the rejection does not lead to a recovery, the granting authority will formally notify the coordinator or beneficiary concerned of the rejection, the amounts and the reasons why. The coordinator or beneficiary concerned may — within 30 days of receiving notification — submit observations if it disagrees with the rejection (payment review procedure).

If the rejection leads to a recovery, the granting authority will follow the contradictory procedure with pre-information letter set out in Article 22.

#### **27.3 Effects**

If the granting authority rejects costs or contributions, it will deduct them from the costs or contributions declared and then calculate the amount due (and, if needed, make a recovery; see Article 22).

### **ARTICLE 28 — GRANT REDUCTION**

#### **28.1 Conditions**

The granting authority may — at beneficiary termination, final payment or afterwards — reduce the grant for a beneficiary, if:

- (a) the beneficiary (or a person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has committed:
  - (i) substantial errors, irregularities or fraud or
  - (ii) serious breach of obligations under this Agreement or during its award (including improper implementation of the action, non-compliance with the call conditions, submission of false information, failure to provide required information, breach of ethics or security rules (if applicable), etc.), or
- (b) the beneficiary (or a person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has committed — in other EU grants

awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (see Article 25).

The amount of the reduction will be calculated for each beneficiary concerned and proportionate to the seriousness and the duration of the errors, irregularities or fraud or breach of obligations, by applying an individual reduction rate to their accepted EU contribution.

## 28.2 Procedure

If the grant reduction does not lead to a recovery, the granting authority will formally notify the coordinator or beneficiary concerned of the reduction, the amount to be reduced and the reasons why. The coordinator or beneficiary concerned may — within 30 days of receiving notification — submit observations if it disagrees with the reduction (payment review procedure).

If the grant reduction leads to a recovery, the granting authority will follow the contradictory procedure with pre-information letter set out in Article 22.

## 28.3 Effects

If the granting authority reduces the grant, it will deduct the reduction and then calculate the amount due (and, if needed, make a recovery; see Article 22).

## SECTION 2 — SUSPENSION AND TERMINATION

### ARTICLE 29 — PAYMENT DEADLINE SUSPENSION

#### 29.1 Conditions

The granting authority may — at any moment — suspend the payment deadline if a payment cannot be processed because:

- (a) the required report (see Article 21) has not been submitted or is not complete or additional information is needed
- (b) there are doubts about the amount to be paid (e.g. ongoing audit extension procedure, queries about eligibility, need for a grant reduction, etc.) and additional checks, reviews, audits or investigations are necessary, or
- (c) there are other issues affecting the EU financial interests.

#### 29.2 Procedure

The granting authority will formally notify the coordinator of the suspension and the reasons why.

The suspension will **take effect** the day the notification is sent.

If the conditions for suspending the payment deadline are no longer met, the suspension will be **lifted** — and the remaining time to pay (see Data Sheet, Point 4.2) will resume.

If the suspension exceeds two months, the coordinator may request the granting authority to confirm if the suspension will continue.

If the payment deadline has been suspended due to the non-compliance of the report and the revised report is not submitted (or was submitted but is also rejected), the granting authority may also terminate the grant or the participation of the coordinator (see Article 32).

## ARTICLE 30 — PAYMENT SUSPENSION

### 30.1 Conditions

The granting authority may — at any moment — suspend payments, in whole or in part for one or more beneficiaries, if:

- (a) a beneficiary (or a person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has committed or is suspected of having committed:
  - (i) substantial errors, irregularities or fraud or
  - (ii) serious breach of obligations under this Agreement or during its award (including improper implementation of the action, non-compliance with the call conditions, submission of false information, failure to provide required information, breach of ethics or security rules (if applicable), etc.), or
- (b) a beneficiary (or a person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has committed — in other EU grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant.

If payments are suspended for one or more beneficiaries, the granting authority will make partial payment(s) for the part(s) not suspended. If suspension concerns the final payment, the payment (or recovery) of the remaining amount after suspension is lifted will be considered to be the payment that closes the action.

### 30.2 Procedure

Before suspending payments, the granting authority will send a **pre-information letter** to the beneficiary concerned:

- formally notifying the intention to suspend payments and the reasons why and
- requesting observations within 30 days of receiving notification.

If the granting authority does not receive observations or decides to pursue the procedure despite the observations it has received, it will confirm the suspension (**confirmation letter**). Otherwise, it will formally notify that the procedure is discontinued.

At the end of the suspension procedure, the granting authority will also inform the coordinator.

The suspension will **take effect** the day after the confirmation notification is sent.

If the conditions for resuming payments are met, the suspension will be **lifted**. The granting authority will formally notify the beneficiary concerned (and the coordinator) and set the suspension end date.

During the suspension, no prefinancing will be paid to the beneficiaries concerned. For interim payments, the periodic reports for all reporting periods except the last one (see Article 21) must not contain any financial statements from the beneficiary concerned (or its affiliated entities). The coordinator must include them in the next periodic report after the suspension is lifted or — if suspension is not lifted before the end of the action — in the last periodic report.

## ARTICLE 31 — GRANT AGREEMENT SUSPENSION

### 31.1 Consortium-requested GA suspension

#### 31.1.1 Conditions and procedure

The beneficiaries may request the suspension of the grant or any part of it, if exceptional circumstances — in particular *force majeure* (see Article 35) — make implementation impossible or excessively difficult.

The coordinator must submit a request for **amendment** (see Article 39), with:

- the reasons why
- the date the suspension takes effect; this date may be before the date of the submission of the amendment request and
- the expected date of resumption.

The suspension will **take effect** on the day specified in the amendment.

Once circumstances allow for implementation to resume, the coordinator must immediately request another **amendment** of the Agreement to set the suspension end date, the resumption date (one day after suspension end date), extend the duration and make other changes necessary to adapt the action to the new situation (see Article 39) — unless the grant has been terminated (see Article 32). The suspension will be **lifted** with effect from the suspension end date set out in the amendment. This date may be before the date of the submission of the amendment request.

During the suspension, no prefinancing will be paid. Costs incurred or contributions for activities implemented during grant suspension are not eligible (see Article 6.3).

### 31.2 EU-initiated GA suspension

#### 31.2.1 Conditions

The granting authority may suspend the grant or any part of it, if:

- (a) a beneficiary (or a person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has committed or is suspected of having committed:
  - (i) substantial errors, irregularities or fraud or
  - (ii) serious breach of obligations under this Agreement or during its award (including improper implementation of the action, non-compliance with the call conditions,

submission of false information, failure to provide required information, breach of ethics or security rules (if applicable), etc.), or

(b) a beneficiary (or a person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has committed — in other EU grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant

(c) other:

(i) linked action issues: not applicable

(ii) additional GA suspension grounds: not applicable.

### 31.2.2 Procedure

Before suspending the grant, the granting authority will send a **pre-information letter** to the coordinator:

- formally notifying the intention to suspend the grant and the reasons why and
- requesting observations within 30 days of receiving notification.

If the granting authority does not receive observations or decides to pursue the procedure despite the observations it has received, it will confirm the suspension (**confirmation letter**). Otherwise, it will formally notify that the procedure is discontinued.

The suspension will **take effect** the day after the confirmation notification is sent (or on a later date specified in the notification).

Once the conditions for resuming implementation of the action are met, the granting authority will formally notify the coordinator a **lifting of suspension letter**, in which it will set the suspension end date and invite the coordinator to request an amendment of the Agreement to set the resumption date (one day after suspension end date), extend the duration and make other changes necessary to adapt the action to the new situation (see Article 39) — unless the grant has been terminated (see Article 32). The suspension will be **lifted** with effect from the suspension end date set out in the lifting of suspension letter. This date may be before the date on which the letter is sent.

During the suspension, no prefinancing will be paid. Costs incurred or contributions for activities implemented during suspension are not eligible (see Article 6.3).

The beneficiaries may not claim damages due to suspension by the granting authority (see Article 33).

Grant suspension does not affect the granting authority's right to terminate the grant or a beneficiary (see Article 32) or reduce the grant (see Article 28).

## ARTICLE 32 — GRANT AGREEMENT OR BENEFICIARY TERMINATION

### 32.1 Consortium-requested GA termination

#### 32.1.1 Conditions and procedure



The beneficiaries may request the termination of the grant.

The coordinator must submit a request for **amendment** (see Article 39), with:

- the reasons why
- the date the consortium ends work on the action ('end of work date') and
- the date the termination takes effect ('termination date'); this date must be after the date of the submission of the amendment request.

The termination will **take effect** on the termination date specified in the amendment.

If no reasons are given or if the granting authority considers the reasons do not justify termination, it may consider the grant terminated improperly.

### 32.1.2 Effects

The coordinator must — within 60 days from when termination takes effect — submit a **periodic report** (for the open reporting period until termination).

The granting authority will calculate the final grant amount and final payment on the basis of the report submitted and taking into account the costs incurred and contributions for activities implemented before the end of work date (see Article 22). Costs relating to contracts due for execution only after the end of work are not eligible.

If the granting authority does not receive the report within the deadline, only costs and contributions which are included in an approved periodic report will be taken into account (no costs/contributions if no periodic report was ever approved).

Improper termination may lead to a grant reduction (see Article 28).

After termination, the beneficiaries' obligations (in particular Articles 13 (confidentiality and security), 16 (IPR), 17 (communication, dissemination and visibility), 21 (reporting), 25 (checks, reviews, audits and investigations), 26 (impact evaluation), 27 (rejections), 28 (grant reduction) and 42 (assignment of claims)) continue to apply.

## 32.2 Consortium-requested beneficiary termination

### 32.2.1 Conditions and procedure

The coordinator may request the termination of the participation of one or more beneficiaries, on request of the beneficiary concerned or on behalf of the other beneficiaries.

The coordinator must submit a request for **amendment** (see Article 39), with:

- the reasons why
- the opinion of the beneficiary concerned (or proof that this opinion has been requested in writing)
- the date the beneficiary ends work on the action ('end of work date')

- the date the termination takes effect ('termination date'); this date must be after the date of the submission of the amendment request.

If the termination concerns the coordinator and is done without its agreement, the amendment request must be submitted by another beneficiary (acting on behalf of the consortium).

The termination will **take effect** on the termination date specified in the amendment.

If no information is given or if the granting authority considers that the reasons do not justify termination, it may consider the beneficiary to have been terminated improperly.

### 32.2.2 Effects

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a **report on the distribution of payments** to the beneficiary concerned
- (ii) a **termination report** from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, the financial statement, the explanation on the use of resources, and, if applicable, the certificate on the financial statement (CFS; see Articles 21 and 24.2 and Data Sheet, Point 4.3)
- (iii) a second **request for amendment** (see Article 39) with other amendments needed (e.g. reallocation of the tasks and the estimated budget of the terminated beneficiary; addition of a new beneficiary to replace the terminated beneficiary; change of coordinator, etc.).

The granting authority will calculate the amount due to the beneficiary on the basis of the report submitted and taking into account the costs incurred and contributions for activities implemented before the end of work date (see Article 22). Costs relating to contracts due for execution only after the end of work are not eligible.

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 21).

If the granting authority does not receive the termination report within the deadline, only costs and contributions which are included in an approved periodic report will be taken into account (no costs/contributions if no periodic report was ever approved).

If the granting authority does not receive the report on the distribution of payments within the deadline, it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that
- the beneficiary concerned must not repay any amount to the coordinator.

If the second request for amendment is accepted by the granting authority, the Agreement is **amended** to introduce the necessary changes (see Article 39).

If the second request for amendment is rejected by the granting authority (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the grant may be terminated (see Article 32).



Improper termination may lead to a reduction of the grant (see Article 31) or grant termination (see Article 32).

After termination, the concerned beneficiary's obligations (in particular Articles 13 (confidentiality and security), 16 (IPR), 17 (communication, dissemination and visibility), 21 (reporting), 25 (checks, reviews, audits and investigations), 26 (impact evaluation), 27 (rejections), 28 (grant reduction) and 42 (assignment of claims)) continue to apply.

### **32.3 EU-initiated GA or beneficiary termination**

#### **32.3.1 Conditions**

The granting authority may terminate the grant or the participation of one or more beneficiaries, if:

- (a) one or more beneficiaries do not accede to the Agreement (see Article 40)
- (b) a change to the action or the legal, financial, technical, organisational or ownership situation of a beneficiary is likely to substantially affect the implementation of the action or calls into question the decision to award the grant (including changes linked to one of the exclusion grounds listed in the declaration of honour)
- (c) following termination of one or more beneficiaries, the necessary changes to the Agreement (and their impact on the action) would call into question the decision awarding the grant or breach the principle of equal treatment of applicants
- (d) implementation of the action has become impossible or the changes necessary for its continuation would call into question the decision awarding the grant or breach the principle of equal treatment of applicants
- (e) a beneficiary (or person with unlimited liability for its debts) is subject to bankruptcy proceedings or similar (including insolvency, winding-up, administration by a liquidator or court, arrangement with creditors, suspension of business activities, etc.)
- (f) a beneficiary (or person with unlimited liability for its debts) is in breach of social security or tax obligations
- (g) a beneficiary (or person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has been found guilty of grave professional misconduct
- (h) a beneficiary (or person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has committed fraud, corruption, or is involved in a criminal organisation, money laundering, terrorism-related crimes (including terrorism financing), child labour or human trafficking
- (i) a beneficiary (or person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) was created under a different jurisdiction with the intent to circumvent fiscal, social or other legal obligations in the country of origin (or created another entity with this purpose)
- (j) a beneficiary (or person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has committed:

- (i) substantial errors, irregularities or fraud or
- (ii) serious breach of obligations under this Agreement or during its award (including improper implementation of the action, non-compliance with the call conditions, submission of false information, failure to provide required information, breach of ethics or security rules (if applicable), etc.)
- (k) a beneficiary (or person having powers of representation, decision-making or control, or person essential for the award/implementation of the grant) has committed — in other EU grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (extension of findings from other grants to this grant; see Article 25)
- (l) despite a specific request by the granting authority, a beneficiary does not request — through the coordinator — an amendment to the Agreement to end the participation of one of its affiliated entities or associated partners that is in one of the situations under points (d), (f), (e), (g), (h), (i) or (j) and to reallocate its tasks, or
- (m) other:
  - (i) linked action issues: not applicable
  - (ii) additional GA termination grounds: not applicable.

### 32.3.2 Procedure

Before terminating the grant or participation of one or more beneficiaries, the granting authority will send a **pre-information letter** to the coordinator or beneficiary concerned:

- formally notifying the intention to terminate and the reasons why and
- requesting observations within 30 days of receiving notification.

If the granting authority does not receive observations or decides to pursue the procedure despite the observations it has received, it will confirm the termination and the date it will take effect (**confirmation letter**). Otherwise, it will formally notify that the procedure is discontinued.

For beneficiary terminations, the granting authority will — at the end of the procedure — also inform the coordinator.

The termination will **take effect** the day after the confirmation notification is sent (or on a later date specified in the notification; ‘termination date’).

### 32.3.3 Effects

- (a) for **GA termination**:

The coordinator must — within 60 days from when termination takes effect — submit a **periodic report** (for the last open reporting period until termination).

The granting authority will calculate the final grant amount and final payment on the basis of the report submitted and taking into account the costs incurred and contributions for activities

implemented before termination takes effect (see Article 22). Costs relating to contracts due for execution only after termination are not eligible.

If the grant is terminated for breach of the obligation to submit reports, the coordinator may not submit any report after termination.

If the granting authority does not receive the report within the deadline, only costs and contributions which are included in an approved periodic report will be taken into account (no costs/contributions if no periodic report was ever approved).

Termination does not affect the granting authority's right to reduce the grant (see Article 28) or to impose administrative sanctions (see Article 34).

The beneficiaries may not claim damages due to termination by the granting authority (see Article 33).

After termination, the beneficiaries' obligations (in particular Articles 13 (confidentiality and security), 16 (IPR), 17 (communication, dissemination and visibility), 21 (reporting), 25 (checks, reviews, audits and investigations), 26 (impact evaluation), 27 (rejections), 28 (grant reduction) and 42 (assignment of claims)) continue to apply.

**(b) for beneficiary termination:**

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a **report on the distribution of payments** to the beneficiary concerned
- (ii) a **termination report** from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, the financial statement, the explanation on the use of resources, and, if applicable, the certificate on the financial statement (CFS; see Articles 21 and 24.2 and Data Sheet, Point 4.3)
- (iii) a **request for amendment** (see Article 39) with any amendments needed (e.g. reallocation of the tasks and the estimated budget of the terminated beneficiary; addition of a new beneficiary to replace the terminated beneficiary; change of coordinator, etc.).

The granting authority will calculate the amount due to the beneficiary on the basis of the report submitted and taking into account the costs incurred and contributions for activities implemented before termination takes effect (see Article 22). Costs relating to contracts due for execution only after termination are not eligible.

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 21).

If the granting authority does not receive the termination report within the deadline, only costs and contributions included in an approved periodic report will be taken into account (no costs/contributions if no periodic report was ever approved).

If the granting authority does not receive the report on the distribution of payments within the deadline, it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that
- the beneficiary concerned must not repay any amount to the coordinator.

If the request for amendment is accepted by the granting authority, the Agreement is **amended** to introduce the necessary changes (see Article 39).

If the request for amendment is rejected by the granting authority (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the grant may be terminated (see Article 32).

After termination, the concerned beneficiary's obligations (in particular Articles 13 (confidentiality and security), 16 (IPR), 17 (communication, dissemination and visibility), 21 (reporting), 25 (checks, reviews, audits and investigations), 26 (impact evaluation), 27 (rejections), 28 (grant reduction) and 42 (assignment of claims)) continue to apply.

### **SECTION 3 OTHER CONSEQUENCES: DAMAGES AND ADMINISTRATIVE SANCTIONS**

#### **ARTICLE 33 — DAMAGES**

##### **33.1 Liability of the granting authority**

The granting authority cannot be held liable for any damage caused to the beneficiaries or to third parties as a consequence of the implementation of the Agreement, including for gross negligence.

The granting authority cannot be held liable for any damage caused by any of the beneficiaries or other participants involved in the action, as a consequence of the implementation of the Agreement.

##### **33.2 Liability of the beneficiaries**

The beneficiaries must compensate the granting authority for any damage it sustains as a result of the implementation of the action or because the action was not implemented in full compliance with the Agreement, provided that it was caused by gross negligence or wilful act.

The liability does not extend to indirect or consequential losses or similar damage (such as loss of profit, loss of revenue or loss of contracts), provided such damage was not caused by wilful act or by a breach of confidentiality.

#### **ARTICLE 34 — ADMINISTRATIVE SANCTIONS AND OTHER MEASURES**

Nothing in this Agreement may be construed as preventing the adoption of administrative sanctions (i.e. exclusion from EU award procedures and/or financial penalties) or other public law measures, in addition or as an alternative to the contractual measures provided under this Agreement (see, for instance, Articles 135 to 145 EU Financial Regulation 2018/1046 and Articles 4 and 7 of Regulation 2988/95<sup>21</sup>).

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<sup>21</sup> Council Regulation (EC, Euratom) No 2988/95 of 18 December 1995 on the protection of the European Communities financial interests (OJ L 312, 23.12.1995, p. 1).

## **SECTION 4 FORCE MAJEURE**

### **ARTICLE 35 — FORCE MAJEURE**

A party prevented by force majeure from fulfilling its obligations under the Agreement cannot be considered in breach of them.

‘Force majeure’ means any situation or event that:

- prevents either party from fulfilling their obligations under the Agreement,
- was unforeseeable, exceptional situation and beyond the parties’ control,
- was not due to error or negligence on their part (or on the part of other participants involved in the action), and
- proves to be inevitable in spite of exercising all due diligence.

Any situation constituting force majeure must be formally notified to the other party without delay, stating the nature, likely duration and foreseeable effects.

The parties must immediately take all the necessary steps to limit any damage due to force majeure and do their best to resume implementation of the action as soon as possible.

## **CHAPTER 6 FINAL PROVISIONS**

### **ARTICLE 36 — COMMUNICATION BETWEEN THE PARTIES**

#### **36.1 Forms and means of communication — Electronic management**

EU grants are managed fully electronically through the EU Funding & Tenders Portal (‘Portal’).

All communications must be made electronically through the Portal, in accordance with the Portal Terms and Conditions and using the forms and templates provided there (except if explicitly instructed otherwise by the granting authority).

Communications must be made in writing and clearly identify the grant agreement (project number and acronym).

Communications must be made by persons authorised according to the Portal Terms and Conditions. For naming the authorised persons, each beneficiary must have designated — before the signature of this Agreement — a ‘legal entity appointed representative (LEAR)’. The role and tasks of the LEAR are stipulated in their appointment letter (see Portal Terms and Conditions).

If the electronic exchange system is temporarily unavailable, instructions will be given on the Portal.

#### **36.2 Date of communication**

The sending date for communications made through the Portal will be the date and time of sending, as indicated by the time logs.

The receiving date for communications made through the Portal will be the date and time the communication is accessed, as indicated by the time logs. Formal notifications that have not been accessed within 10 days after sending, will be considered to have been accessed (see Portal Terms and Conditions).

If a communication is exceptionally made on paper (by e-mail or postal service), general principles apply (i.e. date of sending/receipt). Formal notifications by registered post with proof of delivery will be considered to have been received either on the delivery date registered by the postal service or the deadline for collection at the post office.

If the electronic exchange system is temporarily unavailable, the sending party cannot be considered in breach of its obligation to send a communication within a specified deadline.

### **36.3 Addresses for communication**

The Portal can be accessed via the Europa website.

The address for paper communications to the granting authority (if exceptionally allowed) is the official mailing address indicated on its website.

For beneficiaries, it is the legal address specified in the Portal Participant Register.

## **ARTICLE 37 — INTERPRETATION OF THE AGREEMENT**

The provisions in the Data Sheet take precedence over the rest of the Terms and Conditions of the Agreement.

Annex 5 takes precedence over the Terms and Conditions; the Terms and Conditions take precedence over the Annexes other than Annex 5.

Annex 2 takes precedence over Annex 1.

## **ARTICLE 38 — CALCULATION OF PERIODS AND DEADLINES**

In accordance with Regulation No 1182/71<sup>22</sup>, periods expressed in days, months or years are calculated from the moment the triggering event occurs.

The day during which that event occurs is not considered as falling within the period.

‘Days’ means calendar days, not working days.

## **ARTICLE 39 — AMENDMENTS**

### **39.1 Conditions**

The Agreement may be amended, unless the amendment entails changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

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<sup>22</sup> Regulation (EEC, Euratom) No 1182/71 of the Council of 3 June 1971 determining the rules applicable to periods, dates and time-limits (OJ L 124, 8/6/1971, p. 1).



Amendments may be requested by any of the parties.

## 39.2 Procedure

The party requesting an amendment must submit a request for amendment signed directly in the Portal Amendment tool.

The coordinator submits and receives requests for amendment on behalf of the beneficiaries (see Annex 3). If a change of coordinator is requested without its agreement, the submission must be done by another beneficiary (acting on behalf of the other beneficiaries).

The request for amendment must include:

- the reasons why
- the appropriate supporting documents and
- for a change of coordinator without its agreement: the opinion of the coordinator (or proof that this opinion has been requested in writing).

The granting authority may request additional information.

If the party receiving the request agrees, it must sign the amendment in the tool within 45 days of receiving notification (or any additional information the granting authority has requested). If it does not agree, it must formally notify its disagreement within the same deadline. The deadline may be extended, if necessary for the assessment of the request. If no notification is received within the deadline, the request is considered to have been rejected.

An amendment **enters into force** on the day of the signature of the receiving party.

An amendment **takes effect** on the date of entry into force or other date specified in the amendment.

## ARTICLE 40 — ACCESSION AND ADDITION OF NEW BENEFICIARIES

### 40.1 Accession of the beneficiaries mentioned in the Preamble

The beneficiaries which are not coordinator must accede to the grant by signing the accession form (see Annex 3) directly in the Portal Grant Preparation tool, within 30 days after the entry into force of the Agreement (see Article 44).

They will assume the rights and obligations under the Agreement with effect from the date of its entry into force (see Article 44).

If a beneficiary does not accede to the grant within the above deadline, the coordinator must — within 30 days — request an amendment (see Article 39) to terminate the beneficiary and make any changes necessary to ensure proper implementation of the action. This does not affect the granting authority's right to terminate the grant (see Article 32).

### 40.2 Addition of new beneficiaries

In justified cases, the beneficiaries may request the addition of a new beneficiary.



For this purpose, the coordinator must submit a request for amendment in accordance with Article 39. It must include an accession form (see Annex 3) signed by the new beneficiary directly in the Portal Amendment tool.

New beneficiaries will assume the rights and obligations under the Agreement with effect from the date of their accession specified in the accession form (see Annex 3).

Additions are also possible in mono-beneficiary grants.

## **ARTICLE 41 — TRANSFER OF THE AGREEMENT**

In justified cases, the beneficiary of a mono-beneficiary grant may request the transfer of the grant to a new beneficiary, provided that this would not call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiary must submit a request for **amendment** (see Article 39), with

- the reasons why
- the accession form (see Annex 3) signed by the new beneficiary directly in the Portal Amendment tool and
- additional supporting documents (if required by the granting authority).

The new beneficiary will assume the rights and obligations under the Agreement with effect from the date of accession specified in the accession form (see Annex 3).

## **ARTICLE 42 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE GRANTING AUTHORITY**

The beneficiaries may not assign any of their claims for payment against the granting authority to any third party, except if expressly approved in writing by the granting authority on the basis of a reasoned, written request by the coordinator (on behalf of the beneficiary concerned).

If the granting authority has not accepted the assignment or if the terms of it are not observed, the assignment will have no effect on it.

In no circumstances will an assignment release the beneficiaries from their obligations towards the granting authority.

## **ARTICLE 43 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES**

### **43.1 Applicable law**

The Agreement is governed by the applicable EU law, supplemented if necessary by the law of Belgium.

Special rules may apply for beneficiaries which are international organisations (if any; see Data Sheet, Point 5).

### **43.2 Dispute settlement**

If a dispute concerns the interpretation, application or validity of the Agreement, the parties must bring action before the EU General Court — or, on appeal, the EU Court of Justice — under Article 272 of the Treaty on the Functioning of the EU (TFEU).

For non-EU beneficiaries (if any), such disputes must be brought before the courts of Brussels, Belgium — unless an international agreement provides for the enforceability of EU court judgements.

For beneficiaries with arbitration as special dispute settlement forum (if any; see Data Sheet, Point 5), the dispute will — in the absence of an amicable settlement — be settled in accordance with the Rules for Arbitration published on the Portal.

If a dispute concerns administrative sanctions, offsetting or an enforceable decision under Article 299 TFEU (see Articles 22 and 34), the beneficiaries must bring action before the General Court — or, on appeal, the Court of Justice — under Article 263 TFEU.

For grants where the granting authority is an EU executive agency (see Preamble), actions against offsetting and enforceable decisions must be brought against the European Commission (not against the granting authority; see also Article 22).

## ARTICLE 44 — ENTRY INTO FORCE

The Agreement will enter into force on the day of signature by the granting authority or the coordinator, depending on which is later.

### SIGNATURES

#### For the coordinator

Antonio De Sanctis with ECAS id n00315jn signed in the Participant Portal on 07/06/2023 at 13:50:24 (transaction id SigId-220823-QPUJiuVdqPAOn5iEA5jscMazzUveQ93Ptj0zs2YrrOI8BpM2Gh3bmfyZhMjze7ZBPt1nJbb3jhzME3eIU3zPyL5G-yntOf97TTHqjXwStD2tm9a-u2k BpWwHwtyzyvj3t9RyBNOx0XLwWpTlTKEqwTMHnUJNrV2I47fDECfBxLBjstUlaLLy2H70C2bvzXU9R8yRe). Timestamp by third party at 2023.06.07 13:50:30 CEST

#### For the granting authority

Signed by Anne BURRILL with ECAS id burrian as an authorised representative on 07-06-2023 14:12:34 (transaction id SigId-221260-Lzsw6ZwintnPkQFkXSApivF3uy0CHIGotOsGPzyv8qkYAFVLhr6ztDCFaVMGXPiwnqjNDJ27v7jff6kjM5s9xvkW-yntOf97TTHqjXwStD2tm9a-VtO3c9NIgXqUGzrxzKLGWYzajkSwcGsVZfxw1yG7ik7x6Mzx1UsT4cTSg6nrKpc6uyKhMaPmkgzYaGsWdBZR38G) 2023.06.07 14:12:38 CEST

**ANNEX 1**



**Programme for the Environment  
and Climate Action (LIFE)**

**Description of the action (DoA)**

**Part A**

**Part B**

## DESCRIPTION OF THE ACTION (PART A)

### COVER PAGE

*Part A of the Description of the Action (DoA) must be completed directly on the Portal Grant Preparation screens.*

<b>PROJECT</b>	
<i>Grant Preparation (General Information screen) — Enter the info.</i>	
<b>Project number:</b>	101114310
<b>Project name:</b>	Sustainable Innovations for Long-life Environmental Noise Technologies
<b>Project acronym:</b>	LIFE22-ENV-IT-LIFE SILENT
<b>Call:</b>	LIFE-2022-SAP-ENV
<b>Topic:</b>	LIFE-2022-SAP-ENV-ENVIRONMENT
<b>Type of action:</b>	LIFE-PJG
<b>Service:</b>	CINEA/D/02
<b>Project starting date:</b>	fixed date: 1 September 2023
<b>Project duration:</b>	60 months

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List of deliverables .....	24
List of milestones (outputs/outcomes) .....	32
List of critical risks .....	35

## PROJECT SUMMARY

### Project summary

*Grant Preparation (General Information screen) — Provide an overall description of your project (including context and overall objectives, planned activities and main achievements, and expected results and impacts (on target groups, change procedures, capacities, innovation etc)). This summary should give readers a clear idea of what your project is about.*

*Use the project summary from your proposal.*

The main scope of this proposal is the development of sustainable and eco-friendly solutions to mitigate noise in complex urban environments, where multiple and diverse noise sources, mainly roads and railways, coexist across densely populated areas. Low noise pavements and low-height noise barriers are the main targeted solutions, to be upgraded and revisited in order to abate their costs (LCC) and improve their sustainability. To that end, recycled materials (e.g., textiles, papers, cardboard) will be used. The need to reduce noise levels in outdoor urban areas is imperative since according to the World Health Organization, 20% of the European population is exposed to noise levels exceeding 65 dB(A) during the day, whereas the maximum recommended level is 55 dB(A). Mitigating noise in such environments generally excludes the use of solutions that might interfere with the urban context, such as noise barriers, for many reasons. First of all the proximity of receivers to the noise source, typically roads. Secondly, the visual impact: noise barriers reduce the visibility of the surroundings and air circulation, causing local temperature rise (especially in summer) and social denial. This is why noise mitigation measures acting directly on the source are recommended, such as low noise pavements and traffic calming for roads, dampers, rail grinding and silent brakes for railways. However, these solutions have been proven to be poorly effective over time and consequently quite expensive. In this proposal, innovative and sustainable low noise pavements and low height noise barriers will be developed and demonstrated in real test sites, to provide transport owners and managers solid information to support their widespread use. To that end, the proposal includes also the preparation of special procedures to manage their implementation in complex urban scenarios, as well as tools to standardize their characterization and plans to prepare their launch to the market.

## LIST OF PARTICIPANTS

### PARTICIPANTS

*Grant Preparation (Beneficiaries screen) — Enter the info.*

Number	Role	Short name	Legal name	Country	PIC
1	COO	ANAS	ANAS SPA	IT	950966467
2	BEN	RFI	RETE FERROVIARIA ITALIANA	IT	999434360
3	BEN	ITALFERR	ITALFERR SPA	IT	924683056
4	BEN	ARPAT	AGENZIA REGIONALE PER LA PROTEZIONE AMBIENTALE DELLA TOSCANA	IT	997237601
5	BEN	CNR	CONSIGLIO NAZIONALE DELLE RICERCHE	IT	999979500
6	BEN	UNIBO	ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA	IT	999993953
7	BEN	UNIRC	UNIVERSITA DEGLI STUDI MEDITERRANEA DI REGGIO CALABRIA	IT	997224894
8	BEN	MOPI	MOPI	IT	911227604
9	AP	TEBAID	Consorzio TEBAID	IT	888669575



## LIST OF WORK PACKAGES

<b>Work packages</b>						
<i>Grant Preparation (Work Packages screen) — Enter the info.</i>						
<b>Work Package No</b>	<b>Work Package name</b>	<b>Lead Beneficiary</b>	<b>Effort (Person-Months)</b>	<b>Start Month</b>	<b>End Month</b>	<b>Deliverables</b>
WP1	Project management and coordination	1 - ANAS	60.50	1	60	D1.1 – Quality Manual D1.2 – Extract of the project data from the LIFE KPI WEBTOOL D1.3 – First Progress Report D1.4 – Second Progress Report D1.5 – Summary of the achievements of Green Project Management
WP2	Noise solutions in complex environmental scenarios	4 - ARPAT	44.00	1	50	D2.1 – Development of a method for managing and implementing noise mitigation measures in complex scenarios
WP3	Design and characterization of enhanced low noise pavements	7 - UNIRC	43.00	1	12	D3.1 – Recycling cellulose waste into low noise pavements D3.2 – Highly sustainable and low-noise pavements
WP4	Design and characterization of innovative and sustainable low-height noise barriers(LHNB)	6 - UNIBO	59.00	1	22	D4.1 – Realization of the first prototype of sustainable low-height noise barriers including metamaterials D4.2 – Implementation of a new method for testing the acoustic performance of low-height noise barriers
WP5	Design and implementation of the developed solutions in the pilot area	2 - RFI	51.75	1	33	D5.1 – Design and implementation of the SILENT solutions in the pilot area
WP6	Impact monitoring and evaluations	5 - CNR	56.50	33	54	D6.1 – Acoustic and non-acoustic performance of the SILENT solutions.

<b>Work packages</b>						
<i>Grant Preparation (Work Packages screen) — Enter the info.</i>						
<b>Work Package No</b>	<b>Work Package name</b>	<b>Lead Beneficiary</b>	<b>Effort (Person-Months)</b>	<b>Start Month</b>	<b>End Month</b>	<b>Deliverables</b>
WP7	Sustainability, replication and exploitation of projects results	3 - ITALFERR	39.30	1	48	D7.1 – Life Cycle Sustainability Assessment D7.2 – Action Plan for future implementation, replication and exploitation of the LIFE SILENT solutions
WP8	From prototypes to market solutions	1 - ANAS	17.50	31	53	D8.1 – EPD Certification for the low noise pavement and LHNB D8.2 – Proposal for the preparation of a EU standard for low-height noise barriers characterization
WP9	Communication and Dissemination	1 - ANAS	47.00	1	60	D9.1 – Project pages on beneficiaries' websites D9.2 – Final Conference Proceedings



## Work package WP1 – Project management and coordination

<b>Work Package Number</b>	WP1	<b>Lead Beneficiary</b>	1. ANAS
<b>Work Package Name</b>	Project management and coordination		
<b>Start Month</b>	1	<b>End Month</b>	60

### Objectives

To guarantee a proper development and a successful implementation of the project;  
 To achieve the project's main goal within the given constraints (scope, time, quality and budget);  
 To provide guidance, efficient communication and supervision of the project;  
 To periodically submit the deliverables and both technical and financial progress reports of the project;  
 To ensure the timely delivery of the interim and final requests for payment;  
 To guarantee the timely distribution of the payments to the other beneficiaries;  
 To ensure the smooth execution of the contractual obligations (Grant Agreement, Consortium Agreement, etc);  
 To act as intermediary for all communications between the consortium and the granting authority.

### Description

The Project Management tasks will be carried out by the ANAS management team, led by a certified Project Manager (Patrizia Bellucci, ISIPM 12115), with the support of WP leaders, performing specific management, supervision and reporting activities, according to the Continuous Reporting Module. The Project Management Team will ensure the correct administration of the entire project and secure the achievement of the project objectives within budget restraints, quality and time schedule.

The Management Team is mainly composed of two working units with complementary and synergistic skills:

1. The technical unit, made up of experienced staff in tracking project and project control, reporting, communication and information.
2. The administrative unit, is composed of skilled personnel in monitoring and checking financial expenditure, auditing procedures and payments.

The management structure also includes:

- The Team Coordinators (TC) in charge of coordinating beneficiaries' team members (one for each beneficiary).
- The Work Package leaders (WPL) in charge of the coordination of Work Packages;
- The Task Leaders (TL), appointed by the corresponding WP Leader. The Task Leader shall be responsible for coordinating the work of the partners involved in the task.

Project Management activities have been broken down into three main tasks:

- T.1.1 Preliminary activities;
- T.1.2 Tracking project and project control;
- T.1.3. Project communication and information.

T.1.1 Preliminary activities [ANAS (COO)], M1-M9

This task is broken down into four main activities addressed to coordinate and strengthen the project plans, launch the project, define the details of the management structure, share with the consortium all the rules provided in the Grant Agreement, estimate and report the initial values of key performance indicators.

- T.1.1.1 Revision of the project plans. In this sub-task, the approved project plans will be reviewed to strengthen the project's goals, clarify the work plan, confirm the feasibility of time and resource estimates, and identify any potential criticality. Situations and circumstances that may have changed since the application was submitted will be reviewed. If necessary newly identified risks will be considered and related mitigation measures updated.
- T.1.1.2. Organization of the kick-off meeting. The first official meeting, sealing the start of the project, will be held within the first month from the Grant Agreement signature. The kick-off meeting will be held in Rome and hosted by the Coordinator.
- T.1.1.3 Preparation of the Quality Manual. The Quality Manual will describe and regulate in detail the management structure, partners' details and functions in the project, norming (standard and operating guidelines that govern partners' behaviour), management of documents to be produced in the project (format, distribution, approval), calendar (meetings, frequency of meetings, meeting agenda, minutes). The Quality Manual will be fully compatible with the Grant Agreement and the Consortium Agreements, regulating beneficiary rights and obligations, as well as their technical and financial involvement. The Quality Manual will also describe the rules and procedures to drive all partners (including private

companies) to engage in environmentally conscious behaviour and to adopt GPP criteria when purchasing goods and services. The Quality Manual will be drafted by the Project Manager within the first quarter from the official start date of the project. Beneficiaries will be informed about green management rules at the kick-off meeting.

- T.1.1.4 Estimate of key performance indicators (KPI). The preliminary activities also include the reporting of estimated key performance indicators (KPIs) in the LIFE KPI web tool within the first 9 months from the Grant Agreement signature.

T.1.2 Tracking project and project control [ANAS (COO), All Beneficiaries], M1-M60

In this task, a set of activities, addressed to tracking and controlling the project, is foreseen. This includes the monitoring and assessing of the technical and financial information and the adoption of any corrective actions on the project plans, if necessary.

- T.1.2.1 Checking the technical progress through the fulfilment of specific milestones and performance indicators, tailored to the expected results from single tasks and WPs. The Project Management Team will collect information coming from beneficiaries and will compare actual and foreseen performance in the work plan for the period, identify possible problems, formulate, and adopt corrective actions if necessary.

- T.1.2.2 Monitoring and checking financial expenditure. In this sub-task, effective monitoring of the budget spending will be ensured. In more detail, checks on personnel costs will be made monthly, using specific forms (timesheets), provided by the project management team. Likewise, information on financial expenditures will be regularly gathered by the Project Management Team, in order to verify their accordance with the project plan and determine how to address any possible deviation. This activity also involves checks on the compliance of the purchasing process with national procedures, internal partner and green management rules, as well as EU provisions. Purchase requisitions and documents to be delivered will be specified in the Quality Manual. To guarantee the application of the purchase rules, a formal check of the purchase documents will be done before forwarding the request to the supplier by the project's management teams. Defaulting beneficiaries will be urged to comply with the purchase rules. A report summarizing the quantified achievement of green project management will be delivered at the end of the project.

Check on the submission of the Financial Statements and on the quality of the contribution from participants will be performed under this subtask, including the technical assistance to the Auditor for the release of the related certification (CFS), upon specific request.

This task will be accomplished by the Project Management Team, led by a certified Project Manager (Patrizia Bellucci, ISIPM 12115), with the support of WP leaders, performing specific management, supervision and reporting activities, according to the Continuous Reporting Module. The Project Management Team will ensure the correct administration of the entire project and secure the achievement of the project objectives within budget restraints, quality and time schedule.

T.1.3. Project communication and information [ANAS(COO), All Beneficiaries], M1-M60

This task deals with two main activities:

- T.1.3.1 Communication and information among beneficiaries. Communication and information among partners will be formally carried out through regular reports and meetings.

- o Quarterly meetings are planned. Meetings will be mostly held via web, in order to reduce costs and especially environmental impacts. Face-to-face meetings will be arranged once a year and only if compatible with COVID-19 restrictions.

- o Informal project progress reports will be delivered quarterly, in close connection with quarterly meetings to inform beneficiaries of the project status, the possible problems encountered, and the corrective actions planned and adopted, as well as preview plans for the next period.

Reports, minutes, agenda and other documents will be produced according to the format/template described in the Quality Manual”.

Tab.3.1: Communication plan.

Meetings Due date Supporting documents

Kick-off meeting M1 Presentations from beneficiaries on the contents of the project

Web-meeting M4 Presentations from beneficiaries on the progress of project activities; quarterly report.

Web-meeting M7 Presentations from beneficiaries on the progress of project activities; quarterly report.

Web-meeting M10 Presentations from beneficiaries on the progress of project activities; quarterly report.

Face-to-face meeting M13 Presentations from beneficiaries on the progress of project activities; quarterly report.

Web-meeting M16 Presentations from beneficiaries on the progress of project activities; quarterly report.

Web-meeting M19 Presentations from beneficiaries on the progress of project activities; quarterly report.

Web-meeting M22 Presentations from beneficiaries on the progress of project activities; quarterly report.

Face-to-face meeting M25 Presentations from beneficiaries on the progress of project activities; quarterly report.

Web-meeting M28 Presentations from beneficiaries on the progress of project activities; quarterly report.  
 Web-meeting M31 Presentations from beneficiaries on the progress of project activities; quarterly report.  
 Web-meeting M34 Presentations from beneficiaries on the progress of project activities; quarterly report.  
 Face-to-face meeting M37 Presentations from beneficiaries on the progress of project activities; quarterly report.  
 Web-meeting M40 Presentations from beneficiaries on the progress of project activities; quarterly report.  
 Web-meeting M43 Presentations from beneficiaries on the progress of project activities; quarterly report.  
 Web-meeting M46 Presentations from beneficiaries on the progress of project activities; quarterly report.  
 Face-to-face meeting M49 Presentations from beneficiaries on the progress of project activities; quarterly report.  
 Web-meeting M52 Presentations from beneficiaries on the progress of project activities; quarterly report.  
 Web-meeting M55 Presentations from beneficiaries on the progress of project activities; quarterly report.

T.1.3.2 Continuous and periodic reporting to the EC. Regular updates on the status of the project will be provided through the Continuous Reporting Module, where progress in achieving milestones, deliverables, outputs/outcomes, critical risks, indicators, publications, communication activities, etc. will be tracked. Two official Progress Reports describing the progress of the activities will be delivered. The Coordinator will manage and keep the financial accounts related to the payments from the EC.

## Work package WP2 – Noise solutions in complex environmental scenarios

<b>Work Package Number</b>	WP2	<b>Lead Beneficiary</b>	4. ARPAT
<b>Work Package Name</b>	Noise solutions in complex environmental scenarios		
<b>Start Month</b>	1	<b>End Month</b>	50

### Objectives

To analyse the legislative requirements related to the preparation of action plans in complex environmental scenarios.  
 To define methods and procedures for setting up synergistic solutions in complex environmental scenarios.  
 To analyse costs and benefits of different possible solutions (at sources, on propagation paths, at receivers).

### Description

The Directive 49/2002/CE on Environmental Noise states that Strategic Noise Maps and Action Plans, related to the design and implementation of noise mitigation strategies, are prepared and implemented by EU Member States. The directive was transposed into Italian legislation in 2005 (decree 194/2005) and harmonized with the national decree DPCM 29/11/2000 in force, which obliges transport infrastructures owners and managers to implement noise mitigation measures when sound pressure levels overcome the prescribed national noise limits. The latter also states that in the presence of multiple noise sources, transport infrastructure owners and managers shall collaborate and share the cost of mitigation activities. However, specific indications or prescriptions are not provided in the decree. Due to the difficulty arising in the management and implementation of noise mitigation measures in such scenarios, typically urban environments, the decree was amended in 2017 (D.Lgs 42/2017). In order to ensure the coordination of the action plan drawn up by the companies and bodies managing public transport services or related infrastructures with the action plans of the agglomerations, the authority concerned (Local authority or the Ministry for the Environment, on a case by case basis) verifies with a specific provision the coherence and possible synergies between single actions and establishes the strategy to be adopted.

No guidelines are currently available for owners and managers of infrastructures to undertake shared solutions and to support the authorities involved in the coordination of these activities. Therefore, this work package is devoted to developing a general methodology, applicable at the European level, to address the management and implementation of noise mitigation measures in complex environments.

WP2 has been broken down into 3 tasks, as follows:

- T.2.1 Analysis of legislative requirements related to the preparation of action plans in complex environmental scenarios
- T.2.2 Definition of methods and procedures for setting up synergistic solutions in complex environmental scenarios
- T.2.3 Implementation of the developed methods and procedures in the pilot area

<p><b>T.2.1 Analysis of legislative requirements related to the preparation of action plans in complex environmental scenarios [ARPAT (BEN)], M1-M3</b></p> <p>In this task, an in-depth analysis of legislative requirements and literature at both European and national levels will be undertaken. This will include the analysis of previously funded projects (Life Hush, Effnoise, etc), as well as national guidelines and reports from EU Member States. The analysis will be carried out by ARPAT. ARPAT plays a relevant role in the National Network System for Environmental Protection in Italy, being also part of the EPON (Expert Panel on Noise) group of the European Environmental Protection Agency and of the Noise Working Group of DG Environment. At the end of this task, a short internal report will highlight the specific lack of knowledge on the matter that needs further investigation.</p>
<p><b>T.2.2 Definition of methods and procedures for setting up synergistic solutions in complex environmental scenarios [ARPAT(BEN), UNIBO(BEN), ANAS (COO), RFI (BEN)], M4-M15</b></p> <p>Based on the information gathered in task T.2.1, improvements to the existing methods will be suggested to fill the gaps in the management and implementation of noise mitigation measures in complex environmental scenarios. Particularly, in urban scenarios the combination of different noise sources and related owners/managers, requires that responsibilities and contributions to noise mitigation actions are correctly identified and implemented. ARPAT, UNIBO, ANAS, and RFI will perform this task, developing a method to harmonize noise mitigation solutions with a holistic approach, thus improving the effectiveness and efficiency of the overall mitigation action. In order to develop a general method, valid for different complex scenarios, ARPAT will compare and analyze the Action Plans prepared by ANAS and RFI in 5 different scenarios. The analysis will be validated by processing additional noise maps using common input data and tools (simulation software) for the same scenario and by checking the effectiveness and efficiency of the proposed solutions. This last step also involves the need for more in-depth investigations (further simulations) to check the possibility of optimizing (integrating) the planned solutions. To that end, ARPAT, UNIBO and ANAS will also undertake a cost-benefit analysis to determine the relative efficiency of the planned solutions compared to the integrated solutions. At the end of this task, a first draft of the method for managing and implementing noise mitigation measures in complex scenarios will be delivered (D2.1). Special attention will be given also to citizen evaluation of the solutions, being individuals or organizations and NGOs, to guarantee the social sustainability of the proposed measures. To that end, the feedback received from the public by RFI and ANAS on their Action Plans will be gathered and analyzed, as well as data from other European countries, in order to provide a more general method, valid and applicable at the European level.</p>
<p><b>T.2.3 Implementation of the developed methods and procedures in the pilot area [ANAS (COO), RFI(BEN), ARPAT (BEN)], M16 – M50</b></p> <p>The methodology developed in task T.2.2 will be tested and validated on a real test site, built by ANAS and RFI in task 5.3. The real test site will be equipped with the new solutions and the managerial procedures will be applied to check their ability to overcome the implementation problems described in T.2.2. The test will be undertaken by ANAS, RFI and ARPAT that will participate in the implementation of the procedures, strong in their experience at national level gained in ten years of action plans. The analysis of the procedure results, the difficulties encountered and the possible improvements will be used to fine-tune the whole methodology and draft the final version of the report, taking also into account the results of the monitoring activity, including people's response to the new solutions, performed in Task 6.3.</p>

**Work package WP3 – Design and characterization of enhanced low noise pavements**

<b>Work Package Number</b>	WP3	<b>Lead Beneficiary</b>	7. UNIRC
<b>Work Package Name</b>	Design and characterization of enhanced low noise pavements		
<b>Start Month</b>	1	<b>End Month</b>	12

<b>Objectives</b>
<p>Setting up procedures and strategies to recycle waste materials (cellulose fibres and crumb rubber from old tyres) into highly sustainable and low-noise pavements;</p> <p>Setting up and validating a highly sustainable and low-noise pavement mixture made of recycled materials;</p> <p>Increasing the lifetime of low-noise pavements without affecting safety performance, as well as the construction cost of the product.</p> <p>Achieving noise performance at least comparable to current low-noise pavements.</p>

<b>Description</b>
--------------------



WP3 has been broken down into the following tasks:

- T.3.1 State of the art on highly sustainable and low-noise pavements
- T.3.2 Development of procedures to recycle cellulose waste into low-noise pavements
- T.3.3 Design and test of sustainable long-life formulations for low-noise pavements
- T.3.4 Preliminary sustainability assessment of the proposed formulation

T.3.1 State of the art on highly sustainable and low-noise pavements [UNIRC (BEN), ANAS(COO), MOPI (BEN)], M1-M5

In this task, an accurate state-of-the-art on highly sustainable and low-noise pavements will be led by UNIRC with the support of ANAS (the Italian Road Administration) and MOPI. This review will be addressed not only to gather and report the technical characteristics of pavements, but also their costs over time (including construction, maintenance, and rehabilitation) and their environmental impacts (e.g., global energy requirement), based on processes (e.g. production) and materials, taking into account the use of recycled materials and their impact also on noise and durability.

This type of information (higher-level classification of urban surfaces, i.e., considering time-cost-impact conditions) is prodromic to design the new mixtures.

T.3.2 Development of procedures to recycle cellulose waste into low-noise pavements [TEBAID (AP), ANAS (COO), UNIRC (BEN)], M1-M5

This task involves the development of new asphalt binders integrating crumb rubber (CR) and functionalized cellulose fibres (FCF), extracted from waste materials (packaging and textiles) to strengthen the chemical bonds between bitumen and aggregates. This activity will stand on the results achieved under the national project IASNAF – Innovative Asphalts with natural fibres, funded by ANAS, where a small percentage of vegetable cellulose fibres (3%), extracted from broom and brush, was used to improve the mechanical resistance of bituminous mixtures (cf. A. Tursi, G. Chidichimo et al. 2019: Low-pressure plasma functionalized cellulose fibre for the remediation of petroleum hydrocarbons polluted water; A. Tursi, G. Chidichimo et al., 2018: Remediation of hydrocarbons polluted water by hydrophobic functionalized cellulose).

In the IASNAF project it was demonstrated that by functionalised cellulose fibres, rutting and plastic deformation can be notably reduced (up to 25%), thus leading to an appreciable improvement in terms of durability of the road surface. It is worth mentioning that these results were obtained on real mixtures.

In the LIFE SILENT project, the experience gained in the IASNAF project will be extended to fibres extracted from waste materials (cardboard, paper, textile) to increase the sustainability of the new low-noise surfaces. Here different formulations will be investigated to fit the final asphalt mixtures, as described in Task 3.3. This goal will be pursued by developing and testing two different binders:

- Binder Type A. This binder will be composed of 1) cellulose fibres functionalised by using urethane bonds between the cellulose hydroxyl group and an isocyanate reacting group; 2) neat bitumen (e.g., B50/70), as per IASNAF results.
- Binder Type B. This binder will be composed of 1) fibres that have been functionalised by using a urethane link between the cellulose hydroxyl group and an isocyanate reacting group). 2) An epoxide resin. 3) Amines. These three main components will be mixed with an appropriate asphalt binder, as per IASNAF results.

Both BINDER TYPE A and TYPE B will be tested for crumb rubber addition at mastic level (T.3.2) and /or at concrete level (cf. T.3.3)

For each binder type, different formulations will be investigated in order to achieve the optimal chemical composition for the final asphalt mixtures. Based on the process above, at least two optimized binders will be selected for lab-scale testing. These optimized binders will be used to achieve the corresponding concretes with lower VOC emissions, lower temperature of laying, improved reduction of noise, improved mechanical resistance and extended expected lifetime.

In this task, the procedures to recycle cellulose waste materials into bituminous mixtures will be also finalized.

T.3.2 activities will be led by TEBAID, with the support of ANAS to define the specifications of the new formulations and check their properties (co-design phase). UNIRC will also actively participate in this task, providing the expertise to test the new binders and return to TEBAID with the necessary feedback to fine-tune the products.

T.3.3 Design and test of sustainable long-life formulations for low-noise pavements [UNIRC(BEN), TEBAID (AP), MOPI(BEN), ANAS (COO)], M1-M12

This task aims at improving the durability of low-noise pavements by integrating the most promising solutions with functionalised cellulose fibres extracted from waste materials. T.3.3 will upscale the results achieved by UNIRC in other past projects, such as LIFE E-VIA (Noise control by assessment and optimisation of tyre/road interaction), LIFE SNEAK (optimized Surfaces against NoisE And vibrations produced by tramway track and road traffic) and IASNAF (as mentioned above, in cooperation with TEBAID and ANAS). In more detail, this includes 1) Improving the selection of cellulose from waste and its proportion into bituminous mixtures based on the rheological properties of the bituminous binder and the corresponding bituminous mastic (T.3.2.); 2) Setting up procedures to diffuse and make these mix design

procedures plain and simple; 3) Designing and testing asphalt concretes (i.e., sustainable long-life formulations for low-noise pavements).

This task entails the development of 4 different asphalt mixtures with low noise properties and low LCSA, implementing different formulations of asphalt binders, temperature laydown and content of crumb rubber:

- 1) BINDER TYPE A as a part of porous wearing courses with low nominal maximum aggregate size (NMAS).
- 2) BINDER TYPE A as a part of dense-graded wearing courses with low NMAS.
- 3) BINDER TYPE B as a part of porous wearing courses with low NMAS.
- 4) BINDER TYPE B as a part of dense-graded wearing courses with low NMAS.

The 4 asphalt mixtures above will be compared to a reference mix surface with known features in terms of noise, VOC, PAC, mechanical properties and durability. To this end, taking advantage of the results of the aforementioned projects (LIFE E-VIA and SNEAK and IASNAF), where the impact of the aggregate gradation on noise contribution emerged as a key factor, in this case, results will be compared with two reference surfaces:

- A) A friction course with quite a low nominal maximum aggregate size (as per ANAS technical specifications).
- B) The ISO 10844 surface.

Apart from its positive scientific effects, this two-fold approach will allow targeting both the national market (benchmark A above) and the European market (benchmark B above).

The new asphalt mixtures will be recursively prepared and tested at a lab scale until the expected results are reached. This action will run in parallel to T.3.2, in order to find the right balance among mix components. At the end of the testing phase, the two best solutions (in terms of mixture), namely ALFA and BETA, will be identified and the related formulations submitted to an optimization process for implementation at full-scale. These two formulations will form the basis for the following design phase (T.5.2). This action also involves the identification of the production plant specifications for the laydown of the new formulation in the pilot area.

The tests dealing with asphalt binder and mastic rheology will be carried out by UNIRC (test) and TEBAID (sampling preparation). The validation and testing of the asphalt concrete (mechanistic and functional properties) will be carried out by UNIRC. Surface-related characteristics and frequency response functions will be determined by UNIRC (fatigue tests) and MOPI. In this context, ANAS will play the role of supervisor to check the feasibility of the proposed solutions in a real environment.

T.3.4 Preliminary sustainability assessment of the proposed formulation [UNIRC (BEN), ITALFERR (BEN)], M1-M8  
In this task, a preliminary sustainability assessment of the proposed formulations will be done, in order to support the selection of the most sustainable materials among those considered appropriate for the design of the new surface. This process includes:

1. The identification of performance indicators (KPIs) and models to assess the sustainability of the formulations under development.
2. An in-depth analysis of the materials and processes involved in the implementation of the proposed formulations.
3. A preliminary sustainability evaluation and comparison of the proposed solutions to identify the most sustainable ones. This step involves also a recursive approach to refine and improve the formulations under development.
4. The final sustainability assessment of the proposed formulations at a prototypal phase. The overall sustainability assessment, including the complete aspects from the production phase to the disposal phase, will be analysed in WP7.

To this end UNIRC will cooperate with ITALFERR to define the KPIs and models to proceed with the aforementioned evaluations, taking into account the procedures set up in previous LIFE projects (e.g., E-VIA and SNEAK). The analysis at the prototypal phase will be mainly carried out by UNIRC to make the recursive design phase more efficient. Here, a first tentative implementation of the Life Cycle Sustainability Assessment (LCSA) will be carried out by combining LCA (according to product environmental footprint, PEF), LCC and S-LCA to compare the different solutions and identify the most sustainable product.

The activities carried out by the associated beneficiary TEBAID under this WP, require a workload of 17 P/M, corresponding to a cost of 102.000,00 €.

**Work package WP4 – Design and characterization of innovative and sustainable low-height noise barriers(LHNB)**

<b>Work Package Number</b>	WP4	<b>Lead Beneficiary</b>	6. UNIBO
<b>Work Package Name</b>	Design and characterization of innovative and sustainable low-height noise barriers(LHNB)		
<b>Start Month</b>	1	<b>End Month</b>	22

**Objectives**

Set up procedures and strategies to recycle waste materials into sustainable low-height noise barriers (LHNB);  
 Design an innovative LHNB manufactured from recycled materials;  
 Give to the new LHNB enhanced acoustic characteristics thanks to the implementation of the metamaterial's technology;  
 Make a preliminary sustainability assessment of the designed LHNB;  
 Implement and apply a method to characterize the acoustic effectiveness (insertion loss) of LHNB;  
 Install a new LHNB prototype in a controlled test site (laboratory premises or similar) and characterize its acoustic performance.

**Description**

Wp4 consists of the following tasks:

- T.4.1 State of the art on low-height noise barriers (LHNB)
- T.4.2 Selection of waste materials to be recycled in LHNB and preliminary sustainability assessment
- T.4.3 Design of LHNB with acoustic metamaterials for enhanced performance
- T.4.4 Implementation of the LHNB prototype
- T.4.5 Implementation of a new method for testing LHNB

T.4.1 State of the art on low-height noise barriers (LHNB) [UNIBO (BEN), RFI(BEN), ITALFERR(BEN), MOPI(BEN)], M1-M2

LHNB have a great potential for noise attenuation at reduced costs, but very little information is freely available on them. An effective test method for their acoustic performance does not exist. To fill this gap, the scientific literature on LHNB will be investigated, e.g. accessing major publishers' databases, as well as technical reports, e.g. from previous projects or tentative applications by authorities and manufacturers. All papers found will be placed in a repository provided by UNIBO. It will be accessible to all participants and supervisors. This will allow the team to know the theoretical studies, the tentative tests for characterization and the prototype realizations of LHNB around the world. UNIBO (BEN) has access to many scientific databases; RFI, ITALFERR, and MOPI will contribute mainly to providing information from previous tests or prototypes. The repository will highlight the positive experiences as well as the specific lack of knowledge that needs further investigation.

T.4.2 Selection of waste materials to be recycled in LHNB and preliminary sustainability assessment [MOPI (BEN), UNIBO (BEN), ITALFERR (BEN)], M1-M3

The new LHNB to be tested in T.4.5 will be made of recycled materials, shaped to get enhanced sound-absorbing performances (see T.4.3). In T.4.2 the waste materials will be selected, on the basis of a preliminary sustainability assessment, which will consider the main KPIs used in international standards like EN 15804. MOPI will lead the selection and set up of the preliminary sustainability assessment with the support of ITALFERR for the selection of the appropriate KPIs, while UNIBO will help evaluate the suitability for factory production with the support of an external supplier engaged to implement the prototype, and the fitness to shaping for sound absorption exploiting metamaterials technology.

T.4.3 Design of LHNB with acoustic metamaterials for enhanced performance [UNIBO (BEN), MOPI (BEN)], M2-M12  
 Metamaterials are engineered materials with extraordinary properties, e.g. enhanced sound absorption, due to their shape, independently of the raw materials used to make them. UNIBO is researching on this topic and is currently leading a national project on acoustic metamaterials, so it can transfer the acquired knowledge to the design of LHNB with good acoustic characteristics without employing artificial non-sustainable materials, like glass wool, polyurethane etc. Enhanced sound absorption can contribute to reducing the sound energy bouncing between the train and the LHNB, which finally could come out and overcome the LHNB. Moreover, a novel shape of LHNB could act also on diffracted sound, achieving a better overall insertion loss. UNIBO will also contribute to finding a design practicable



for manufacturing, with the support of an external supplier engaged to implement the prototype, and MOPI will assist in the best use of recycled material(s) selected in T.4.2.

**T.4.4 Implementation of the LHNB prototype [UNIBO (BEN), MOPI (BEN), UNIBO (BEN)], M13-M20**  
 In this task, the full-size components for the very first prototype of the new LHNB will be manufactured by an external supplier, according to UNIBO specifications. The structural and safety problems of securing the acoustic elements to the track will be carefully considered since the design phase. MOPI will check the sustainability of the manufacturing process. These prototype components will be installed on a controlled test site (at UNIBO Facility in Italy) where, during T4.5, UNIBO will also carry out experimental investigations to develop a method for testing low-height noise barriers.

**T.4.5 Implementation of a new method for testing LHNB [UNIBO (BEN), CNR (BEN), RFI (BEN), ITALFERR (BEN)], M16-M22**  
 At present no method exists for measuring the acoustic performance of LHNBs. UNIBO, with its great experience in advanced methods for characterizing noise barriers, proved in EU projects like ADRIENNE and QUIESST, will lead T4.5 to implement a method specifically tailored to LHNBs. The method will be preliminary tested on mock-ups and then on the prototype made in T4.4. CNR will test the method and get used to it in view of the long-term impact monitoring and evaluations in WP7. At the end of the LIFE project, UNIBO will present the method to international standardization bodies (UNIBO holds the convenorship of the CEN working group on railway noise barriers). ITALFERR and RFI will check the applicability of existing technical standards for testing the non-acoustic characteristics (fatigue test), with the support of UNIBO.

**Work package WP5 – Design and implementation of the developed solutions in the pilot area**

<b>Work Package Number</b>	WP5	<b>Lead Beneficiary</b>	2. RFI
<b>Work Package Name</b>	Design and implementation of the developed solutions in the pilot area		
<b>Start Month</b>	1	<b>End Month</b>	33

<b>Objectives</b>
To evaluate methods and procedures for setting up synergistic solutions in complex environmental scenarios, as defined in WP2; To accurately monitored and map the noise impact at receivers; To evaluate the actual noise emissions of road and rail in the pilot area; To design and implement real-size solutions in the pilot area.

<b>Description</b>
WP5 consists of: <ul style="list-style-type: none"> <li>- T.5.1 Assessment of the initial scenario and setting up of the mitigation strategies</li> <li>- T.5.2 Design of the mitigation measures</li> <li>- T.5.3 Implementation of the developed solutions in the pilot areas</li> </ul> <p><b>T.5.1 Assessment of the initial scenario and setting up of the mitigation strategies [ANAS (COO), RFI (BEN), ITALFERR (BEN), CNR (BEN), MOPI(BEN)], M1-M12</b>                  Methods and procedures for setting up synergistic solutions in complex environmental scenarios, as defined in T.2.2 by ARPAT and UNIBO, will be assessed. For this purpose, a critical area located in the city of Rome (Italy), named Muratella, will be used as a pilot area. Specifically, the selected area is part of the XI District of the city counting around 154.974 inhabitants. The pilot area is crossed by the Roma-Fiumicino Airport railway line, managed by RFI, and by the A91 Motorway, managed by ANAS.</p> <p>The railway line is characterized by passenger traffic with a maximum speed of 110 km/h and an overall traffic flow of more than 70.000 trains per year. According to the European Environmental Noise Directive 2002/49/CE (END), this railway line must be noise mapped every five years and an Action Plan must be drafted to define the strategy and the solutions to be implemented to mitigate the noise levels at receivers. According to RFI’s Action Plan, this railway section should be equipped with a couple of noise barriers 385 m and 704 m long respectively, and 4 and 5 m high. The road crossing the pilot area, named “A91 Motorway”, is an important national road linking Rome to Fiumicino</p>

Airport, with a high traffic flow of about 72.174 vehicles/day. Like the railway line, also this road must comply with END requirements. Therefore, an Action Plan for this road was prepared by ANAS as well.

The pilot area is mainly composed of residential buildings, 3-4 floors above ground level, mainly located along the north side of the road, at a minimum distance of 20 m from the railway and 40 m from the road. In this portion of the city, about 170 dwellings with 19.769 receivers (including residents, students, hospital staff and patients) are exposed to Lden levels greater than 55 dB(A). Specifically, high noise levels have been detected at the San Giovanni Battista Hospital, located along the A91 Motorway. To protect the Hospital, a 3 meters high noise barrier is currently installed along the motorway. However, due to the high noise levels detected at receivers, the mitigation measures planned by ANAS Action Plan include also a low noise pavement 1,9 km long and soundproof windows.

Ex-ante evaluations will be made to fix the baseline against which to assess the overall performance of the new pavement and the noise attenuation introduced by the LHNB.

In order to assess the sound power level of the noise sources and their impact on receivers, a comprehensive measurement campaign will be carried out to calibrate the noise model and design the appropriate mitigation measures. Five types of measurement will be made:

- Noise emissions from vehicles running along the road stretch. This measurement is based on ISO standard 11819 (Statistical Pass-By Method and Close Proximity Method), to evaluate the influence of the existing surface on traffic noise and calibrate the source model. Specifically, this evaluation will be made using the Urban Pass-By Method, developed under the project LIFE NEREiDE, in which a backing board is used to emulate the effect of an infinitely rigid and perfectly reflective surface, on which a microphone is placed in an appropriate and fixed position. The reflection on this surface doubles the measured sound pressure level, resulting in a variation ( $\Delta L$ ) of about +6 dB compared to the corresponding free field level. These measurements will be carried out by CNR (SPB) and MOPI (CPX).
- Noise levels at receiver locations, according to the Italian decree DM 16/03/1998, to calibrate the propagation model. These measurements will be performed by ANAS and ITALFERR.
- Ex-ante noise level evaluations, according to the method described in Section 1.1 and the method developed under WP 4, to measure the effectiveness of LHNB.
- Texture and mechanical impedance of the road surface, according to UNI CEN 13036-1 e UNI EN ISO 7626-5. These measurements will be carried out by MOPI.
- Ex-ante people annoyance. This evaluation will be performed by CNR, according to the guideline developed in the framework of the project LIFE NEREiDE, by means of Psychoacoustic investigations and social surveys.

Based on the inputs from the measurement campaign, the acoustic model will be calibrated and a series of scenarios will be simulated to map the overall noise level and the contributions from the single noise sources.

In order to ease monitoring the road stretch and make the results robust and reliable in the long term, the pilot area will be equipped with the DYNAMAP system, developed under the LIFE Dynamap project. Dynamap is an automatic system able to continuously measure noise levels and provide noise maps in real-time. The system relies on the information given by low-cost sound level meters and weather stations. Data from sensors are processed to autonomously update noise maps with a time-frequency of 30 s, using advanced calculation algorithms implemented on a GIS general-purpose platform. Therefore, the Dynamap system will measure in real-time the sound pressure levels generated by the road infrastructure, thus avoiding the need to arrange periodical monitoring campaigns to estimate noise levels at receivers before and after the implementation of the noise mitigation measures.

As for the Psychoacoustic investigations, the descriptors defined by Zwicker, ISO 532-1 and DIN 45692 (i.e. Loudness, Sharpness, Fluctuation strength, and Roughness) will be evaluated to assess the psychological and physiological response of local residents to noise, in terms of annoyance, by linking noise measurements to the subjective response of the inhabitants. To that end, the psycho-acoustical annoyance (related to psycho-acoustic descriptors), the probability of annoyance (related to acoustical descriptors) and perceived annoyance (related to the subjective response of persons) will be evaluated and related to each other. Moreover, a questionnaire will be prepared to standardize the evaluation of the response to noise according to the International Commission of the Biological Effects of Noise (ICBEN) consisting of two different scales of evaluation: a 5-point verbal scale and an 11-point numerical scale.

Ex-post evaluation of acoustic and structural issues will be carried out by ITALFERR, ANAS, CNR and MOPI in WP6.

#### T.5.2 Design of the mitigation measures [ITALFERR (BEN), RFI (BEN), ANAS (COO), UNIRC (BEN)], M19-M2

In this task, the solutions developed under WP3 and WP4 will be designed to meet the pilot area specifications. The LHNB will be applied along the railway stretch, whilst the new low-noise pavement will be laid down along the A91 Motorway.

ITALFERR will design the railway solution, i.e. the low-height noise barrier, under the supervision of RFI, according to the specifications defined in Task 4.3. The LHNB will be installed along a railway track 200 m long.

The intention is to have the LHNB installed on only one side since the most sensitive receivers are located on the southern side.

The LHNB will have a fixation mechanism that guarantees stability and will allow common track maintenance works such as tampering. In case of major maintenance works, the solution proposed can be disassembled easily leaving the fixation mechanism in place. This solution aims to mitigate noise right on the source where is created, stopping the propagation to the adjacent receivers.

The proposed solution, due to its reduced height, will provide a total landscape integration since it does not block any view from inside the train or to the neighbours. This is also a very important aspect, as this new concept of low-height noise barriers can be easily integrated into the landscape, thus reducing the impact usually attributed to traditional noise barriers.

UNIRC will design the road solution, under the supervision of ANAS (technical design and procedures), according to the specifications defined under Task 3.3. The new low-noise pavements will be laid down along a road stretch 1,9 km long. The design phase includes:

- The preliminary assessment of the urban context (e.g., super-elevation, slope, geometry, carriageway type, safety concerns, noise instances, and ancillary needs).
- The preliminary assessment of the characteristics of the production supply chain (e.g., asphalt plant(s) characteristics, distances, characteristics of available pavers, trucks, and rollers) and of the bid process (e.g., times, procedures, updated laws or bid procedures).
- The design of the mixtures, updating, when needed, the formulations set up in WP3 (e.g., gradations, binder percentage, functionalised fibre percentage, remaining percentage, in-plant and on-site procedures and details to lower failure risks). For the sake of clarity, it is here specified that one or two solutions (ALFA and/or BETA, as described in WP3), will be implemented, based on the results achieved during lab tests, along the same road stretch.
- The procedures for prompt product control and validation prior to acceptance procedures (e.g., QA/QC procedures in the plant and on-site, high-speed tests in the plant, during, and after the laydown and compaction, and compaction control).

It is worth noting that the points above have been set up to minimise the risk of delays and failures. These are based on the expertise gained by UNIRC and ANAS in past experimental projects.

Additionally, before and after the design phase, meetings will be arranged with local citizens to share the design approach and gather their feedback. The first meeting will serve to inform people about the developed solutions and the second one to show them the designed measures. A co-design approach will be promoted, in order to make people actively participate in the design phase and ease the acceptance of the new solutions. These activities will be carried out by ANAS and RFI, with the support of the local Municipality.

**T.5.3 Implementation of the developed solutions in the pilot areas [RFI (BEN), ANAS (COO)], M23-M33**

The implementation of the mitigation measures will be preceded by the preparation of the necessary documents to contract out the developed solutions and to achieve the required authorizations. These activities will be carried out by ANAS for the road solution and by RFI for the railway solution. The tender documents will be drawn out according to the criteria of Green Public Procurement, as defined in the Quality Manual. It will follow the contracting phase and then the implementation of the solutions. At the implementation phase, RFI will lead the work phase, by ensuring access to the railway track, safety conditions, power supply and traffic interruptions when installing the LHNB. All the activities will be performed according to RFI safety standards. The LHNB will be provided by STRAIL, including the support for the installation of the barrier, as an in-kind contribution to the project.

Likewise, ANAS skilled managers and technicians will supervise the contractor and support the laydown of the new low-noise pavement. When paving, special attention will be paid to the emissions of toxic substances as well as to the mixing process and timing, in order to ensure a smooth laydown of the surface. At this stage, environmental and product safety controls will be made, including VOC and PAC emissions.

## Work package WP6 – Impact monitoring and evaluations

<b>Work Package Number</b>	WP6	<b>Lead Beneficiary</b>	5. CNR
<b>Work Package Name</b>	Impact monitoring and evaluations		
<b>Start Month</b>	33	<b>End Month</b>	54

**Objectives**

To monitor the technical performance of the developed noise mitigation solutions;  
 To assess the noise impact at receivers;  
 To analyse the procedures prepared in WP2 and provide suggestions to fine-tune the process.

## Description

WP6 consists of:

- Task 6.1 – Testing and monitoring the acoustic and non-acoustic performance of low-noise pavements
- Task 6.2 – Testing and monitoring low-height noise barriers performance
- Task 6.3 – Ex-post monitoring of noise impacts at receivers
- Task 6.4 – Analysis and optimization of the procedure developed in WP2 for managing noise mitigation in complex environments

Task 6.1 – Testing and monitoring the acoustic and non-acoustic performance of low-noise pavements [CNR (BEN), UNIRC (BEN), ANAS (COO), MOPI (BEN), M33-M54

In this task, the acoustic performance of the new low-noise pavement laid down in the pilot area will be assessed. The evaluation involves the execution of four measurement campaigns, after 3, 6, 12 and 18 months, to check for any decay of the acoustic performance. The decay of the acoustic performance of a road surface over time (acoustic ageing) is a very complex phenomenon related to the mechanical, volumetric and surface properties of the road pavement, as well as to the exposure to traffic loads and meteorological conditions. Therefore, additional measurements on rolling noise levels, traffic flows and meteorological conditions will be carried out by ANAS after the end of the project, in order to achieve a more accurate estimate of the SILENT pavement durability.

Ex-post evaluations on the new pavements include two types of measurements:

- Noise levels emitted by vehicles running along the road stretch, made using the Urban Pass-By Method, developed under the project LIFE NEREiDE. These measurements will be carried out by CNR (SPB) and MOPI (CPX).
- Measurement of non-acoustic performance, such as texture, mechanical impedance and friction. These data will provide partners with insights about durability and fatigue test validation, as well as useful information for LCA and LCC (WP7). These measurements will be performed by MOPI, ANAS and UNIRC.

Task 6.2 – Testing and monitoring low-height noise barriers performance [ITALFERR (BEN), UNIBO (BEN), CNR (BEN), RFI (BEN)], M33-M54

In this task, the on-site real performance of the developed LHNB will be tested. The evaluation involves two types of measurements:

- Ex-post noise levels evaluations and measurements, according to the method described in Section 1.1 and the method developed under WP4, to measure the effectiveness of LHNB. These measurements will be carried out by UNIBO and CNR;
- Visual inspection by STRAIL, UNIBO and RFI.

Periodic tests will be performed by ITALFERR after the end of the project as well, in order to check the LHNB durability.

Task 6.3 – Ex-post monitoring of noise impacts at receivers [CNR (BEN), ANAS(COO), ITALFERR (BEN)], M33-M39  
 The impact on receivers of the implemented solutions will be evaluated by two types of assessments:

- Noise levels at receivers' locations, according to the Italian decree DM 16/03/1998. These measurements will be performed by ANAS and ITALFERR.
- Ex-post people's annoyance response. This evaluation will be performed by CNR, according to the guideline developed in the framework of the LIFE NEREiDE project by means of Psychoacoustic investigations and social surveys.

Ex-post people's annoyance will be evaluated using the indicators and method defined in WP5. In case of unavailability of the same statistical sample, tests will be performed on selected groups of people, clustered per gender, age, and education, according to the procedure developed in the framework of the project LIFE NEREiDE.

The DYNAMAP system will be used to deliver noise maps in real-time and easily inform local citizens about the results achieved.

Task 6.4 – Analysis and optimization of the procedure developed in WP2 for managing noise mitigation in complex environments [ARPAT (BEN), CNR (BEN), ANAS(COO), RFI (BEN), M33-M39

The results achieved in the previous tasks will be analysed by CNR to check the effectiveness and efficiency of the procedures defined in T.2.2. Specifically, this involves continuous monitoring of the process, from the definition of the



strategy to be implemented, up to the final step, when the designed mitigation measures will be delivered. Every step will be analysed in order to identify criticalities and suggest the most appropriate solutions. At the end of the process, the method proposed in WP2 will be updated by ARPAT in T2.2, taking into account also the results of the observations made by citizens and stakeholders (including municipality and other public administrations) involved in the survey.

## Work package WP7 – Sustainability, replication and exploitation of projects results

<b>Work Package Number</b>	WP7	<b>Lead Beneficiary</b>	3. ITALFERR
<b>Work Package Name</b>	Sustainability, replication and exploitation of projects results		
<b>Start Month</b>	1	<b>End Month</b>	48

### Objectives

To assess the sustainability of LIFE SILENT technologies, beyond noise reduction;  
 To identify potential barriers to the large-scale deployment of LIFE SILENT technologies;  
 To ensure a long-term outlook for the benefits in the pilot area;  
 To develop a strategy to replicate and exploit LIFE SILENT technologies in Italy and the EU.

### Description

WP7 consists of:

- T.7.1 Identification of methods and indicators for sustainability analysis
- T.7.2 Final sustainability assessment: ex-post evaluation of technical, environmental, social and economic issues
- T.7.3 Action plan for future implementation, replication and exploitation of the developed solutions

T.7.1 Identification of methods and indicators for sustainability analysis [ITALFERR (BEN), UNIBO (BEN), UNIRC (BEN), ANAS (COO)], M01-M35:

This task aims at defining metrics and Key Performance Indicators (KPI) to carry out the preliminary (T3.4, T4.2) and final (T7.2) sustainability assessments. To determine sustainability KPIs, the following aspects will be at least considered: technical (material selection, durability, adaptability etc.), environmental (carbon and water footprints, use of primary energy resources/consumption etc.), social (social acceptance, acceptance of the architectural design, community engagement, etc.) and economic (circularity potential, life cycle cost, income generation, etc.). KPIs definition will take into account the whole life cycle of noise reduction projects in the rail and road transport sectors: design, construction, maintenance and repair, and removal/demolition stages. Under the coordination of ITALFERR, KPIs identification will be supported by a review of the scientific literature including past EU-funded projects (FP7 QUIESST, H2020 LIFE DYNAMAP, etc.) by UNIBO and UNIRC; technical standards (latest releases of EN 1794-1/2, EN 14389-2, EN 16727-1/2/3, ISO EN 14040/14044, EN 15804, etc.) by UNIBO and ITALFERR; best practices available within the consortium (e.g., internal RFI guideline for the design of noise barriers, internal ITALFERR guidelines for Life Cycle Assessment and Stakeholder Engagement for rail infrastructures) by ITALFERR and ANAS. Using these sustainability KPIs might facilitate compliance with developing and established legislation/standards related to sustainability reporting, procurement, sustainability monitoring, and decision-making. Moreover, this approach will ensure that: the project delivers the expected impact with regard to sustainability; the project results can be benchmarked against alternative technologies; the proposed solutions are sustainable in the long run and provide benefits to stakeholders of the transport sector and society at large.

T.7.2 Final sustainability assessment: ex-post evaluation of technical, environmental, social and economic issues [ITALFERR (BEN), UNIRC (BEN), UNIBO (BEN), CNR (BEN) ANAS (COO)], M33-M45:

In this task, the sustainability of LIFE SILENT solutions will be assessed according to the KPIs defined in T7.1. The evaluation will refer to the implemented solutions in the pilot area and will include technical, environmental, social and economic aspects. All the assessments will be ex-post, i.e. after the implementation of the noise reduction technologies (T5.3).

Technical aspects will be assessed according to standardised methods and procedures: EN 1794-1/2 for the non-acoustic performance of road traffic noise-reducing devices; EN 14389-2 for the long-term non-acoustic performance of road traffic noise-reducing devices; EN 16727-1/2/3 for the non-acoustic performance of noise barriers and related devices acting on airborne sound propagation for railway track applications. Technical sustainability assessments will be carried out by UNIBO and ITALFERR for the rail technology and by UNIRC and ANAS for the road ones. The technical sustainability analysis will also leverage the findings resulting from tasks T6.1, T6.2 and T6.3.

The evaluation of environmental, social and economic positive and negative impacts throughout the life cycle of each technology will be carried out according to the Life Cycle Sustainability Assessment (LCSA). LCSA combines the environmental Life Cycle Assessment (LCA), with the Social Life Cycle Assessment (S-LCA) and the Life Cycle Costing (LCC). LCSA will be carried out according to ISO EN 14040/14044, EN 15804 and the UNEP/SETAC Guidelines for Social Life Cycle Assessment of Products. This will involve four phases: (i) goal and scope of the assessment; (ii) inventory; (iii) impact assessment; and (iv) interpretation. The LCA activity will also build on the knowledge generated within the framework of “BIM for Rail-LCA”, a nationally-funded R&I project led by ITALFERR which aims to combine LCA with the Building Information Modelling (BIM) methodology to expedite the sustainability evaluation of railway projects. LCSA activities will be carried out by ITALFERR with the support of UNIRC (cf. T.3.4) and UNIBO.

Information related to the current social acceptance of conventional noise reduction technologies and those implemented in the pilot area will be retrieved from the data collected with quantitative and qualitative methods (e.g., through interviews and surveys) in T6.3 by CNR that, in this task, will carry out further elaborations to identify potential social impediment to the deployment of LIFE SILENT solutions.

Technical, environmental, social and economic impacts evaluated with the aforementioned approach are all equally important from a sustainability perspective. To this end, the final sustainability assessment, to be carried out by ITALFERR with the support of UNIRC, will make use of Multi-Criteria Decision Making (MCDM) tools to benchmark the LIFE SILENT noise reduction solution against an Optimal Hypothetical Ideal Solution (OHIS) that will act as the baseline. The MCDM methodology will eventually lead to an Overall Sustainability Index (OSI) ranging from 0 to 1 that will allow to measure how the LIFE SILENT noise reduction solution is close to the OHIS (OSI=1).

Findings from the sustainability assessments will further support the development of tailored approaches to communicate the results of the sustainability assessment (WP9).

T.7.3 Action plan for future implementation, replication and exploitation of the developed solutions [ANAS (COO), RFI (BEN), ITALFERR (BEN), UNIBO (BEN), ARPAT (BEN)] – M44-M48.

To ensure the future implementation of the LIFE SILENT solutions, this task will aim at designing an Action Plan to guarantee fruitful sustainability of the project results. The action plan will include: a maintenance plan, to ensure the preservation and long life of the implemented solutions, competitive advantage considerations and market analysis, competitiveness assessment, expected business models, go-to-market strategy and estimated return on investment.

The maintenance plan is aimed at keeping operative the LIFE SILENT solutions beyond the project duration and at monitoring their acoustic and non-acoustic performance by means of periodical measurement campaigns, to check for any decay of the expected performance. Measurements on rolling noise levels, traffic flows and meteorological conditions will be carried out by ANAS after the end of the project for three years, in order to achieve a more accurate estimate of the LIFE SILENT pavement durability. These activities will be funded by ANAS within the framework of the research programme “Preserving the Environment”, meant to support innovation in the field of noise, air, water, soil and biodiversity. A team of skilled personnel from ANAS laboratories will be used to guarantee the reliability of test results. Test results will be the subject of future publications.

Likewise, ex-post low-height noise barrier evaluations will be carried out, according to the method developed under WP4, in order to measure the effectiveness of LHNB over time. Periodic tests will be carried out by ITALFERR’s skilled personnel after the end of the project in order to check the LHNB durability. Visual inspections will be carried out by RFI as part of ordinary maintenance activities. UNIBO will support data analysis and processing to check the LHNB behaviour over time and convey the results to the standardization bodies of Italy (UNI), Germany (DIN) and Spain (UNE), to be further submitted to CEN by the national representatives in CEN/TC256/SC1/WG40 (noise barriers for railways) and possibly in CEN/TC226/WG6 (road traffic noise reducing devices) (WP8).

The methodology set up to support the coordination and implementation of noise mitigation measures in complex environments will be also promoted and disseminated after the end of the project to local authorities and transport infrastructures administrations by ARPAT, as a leading member of the National Network System for Environmental Protection in Italy. The proposal will be also brought to the attention of EPA, the network of the European Environmental Protection Agencies. Furthermore, UNIBO, through its team leader prof. Massimo Garai, coordinator of the Acoustic and Vibration Committee for the Italian Standardization Body UNI, will promote the preparation of a standard for the management and implementation of noise mitigation measures in complex environments. ARPAT, through its team leader prof. Gaetano Licitra, as a member of the Noise Working group of DG Environment, will also convey the proposal to the Italian Ministry for the Ecological Transition and to the EC.

As for future implementation and replication of the developed solutions, the main challenge for the Action plan is to

find a way for achieving a sustainable competitive advantage over the other competing solutions in the target market. As such, quantitative and qualitative assessments will be carried out by ITALFERR with the support of ANAS to investigate the target markets, the go-to-market strategies and the business models already available as well as to estimate a return on investment. The market analysis will focus on updating the initial analysis of the reference market and related segmentation (including geography, budget profile, habits and preferences, etc.), constantly updating the competitor landscape (players, products, positioning, distribution, pricing), identifying strategies to launch a product/solution on the market with a roadmap, indicating the penetration strategies, sales channels, etc. Finally, the task will define the overall business plan with the expected investments, operating costs and revenues. The results of the business planning process (i.e. breakeven point, return on investment) will be used to interpret the validity and financial sustainability of the business model identified. ANAS and RFI will support and promote the marketing of the developed products by entrusting their production to qualified companies. As holders of the EPD certificates, they will also supervise the production procedures and the quality of the products made. Furthermore, specific contracts will be drawn up with the companies interested in the production of the developed solutions, for their supply to third parties.

The LIFE SILENT solutions developed in WPs 3 and 4 need to be scalable and replicable globally, considering both types of applications, i.e. low noise pavements and low-height noise barriers. To thoroughly evaluate and validate the applicability of LIFE SILENT solutions in the global market, 'Replication Sites' will be conceived by ANAS, RFI and ITALFERR during the project lifetime to consolidate the project results not only from a technical perspective (T6.1 and T6.2) but also in terms of socio-economic and environmental impacts (T7.1, T7.2) as well as to further test the applicability of the procedures developed under task T2.1 related to the management of noise mitigation measures in complex environments. Replication sites will be implemented after the end of the project in additional five complex scenarios, as part of ANAS and RFI Action Plans (Road and Rail managers), to refine the developed technologies and their production process. The replication sites will be chosen among the critical sites that emerged from the last cycle of the END (2024), with the highest priority, among a plethora of critical sites, for a total of 7.980 km of roads and rails. Confirmation of the replication sites will be given only following the results of the last END cycle and the approval of the next business plan of RFI and ANAS.

Replication Sites results will be considered as the baseline where "early adoption" of the LIFE SILENT solutions will be demonstrated.

This task is also devoted to setting up the exploitation strategy envisaged for the project outcomes that would maximise the benefits of the expected solutions among project partners. The consortium will work together to define a road map for the exploitation of the LIFE SILENT solutions and to pave the way for their commercialisation, through the study of potential regulatory barriers and constant monitoring of the market evolution. This will include the certification process (WP8), patenting of products, dissemination activities (participation in conferences, articles, workshops and visits to the experimental and replication sites) with the involvement of the main stakeholders, the support for standardisation in National and European Standard Bodies, the inclusion of the new products in the price list of ANAS, RFI AND ITALFER and GPP tools as an alternative to traditional noise mitigation measures, the promotion of the products with advertisement materials (TV spots, videos on social networks and partners' website, brochures, etc.).

The final goal of this task is to identify and periodically update target economic sectors, design suitable business strategies for marketable LIFE SILENT outputs, promote market awareness, understanding, acceptance and, whenever possible, investment in exploitable results, through contacts with end users, institutions or associations in connection with the project activities. By the end of the project, the consortium will have gathered enough experience with the LIFE SILENT solutions such that several exploitation strategies will be devised to support the LIFE SILENT solutions after the official end of the project and a final exploitation plan will be released by ANAS based on the inputs achieved from the consortium partners.

### Work package WP8 – From prototypes to market solutions

<b>Work Package Number</b>	WP8	<b>Lead Beneficiary</b>	1. ANAS
<b>Work Package Name</b>	From prototypes to market solutions		
<b>Start Month</b>	31	<b>End Month</b>	53

<b>Objectives</b>
To submit the developed solutions to Environmental Product Declaration (EPD);



To prepare a proposal for standardization of the acoustic characterization of low-height noise barriers.

### Description

In order to validate the developed technologies and boost their commercial potential, both the new low-noise pavement and LHNB will be subjected to the Environmental Product Declaration (EPD), whose objective is to promote environmental technologies by providing technology developers, manufacturers and investors access to third-party validation of the performance of innovative environmental technologies. EPD certification will help to prove the reliability of the SILENT solutions to potential customers and to accelerate their acceptance and diffusion.

Furthermore, as no standards exist on LHNB acoustic performance measurement, this work package also involves the preparation of a standardization proposal for LHNB characterization, based on the method developed under WP4.

T.8.1 –Environmental Product Declaration (EPD) for the new low noise pavement – [ANAS (COO), TEBAID (BEN), UNIRC (BEN)], M31-M52

The EPD process will start by choosing the right protocol to evaluate the product (Product Category Rules selection), followed by a Life Cycle Assessment (LCA), according to ISO 14040 and ISO 14044, that will be performed by ANAS with the support of UNIRC and TEBAID (link to T.7.2). Then, the results of the LCA study and other information mandated by the reference PCR and General Programme Instructions (GPI) will be compiled in EPD format. Next, an accredited certification body will perform the verification process of the LCA-based data, and additional environmental and general information, related to the GPI and PCR. Once the verification is completed, the organisation developing the EPD shall register the EPD in the EPD portal together with other mandatory documentation. The verified EPD will be provided in multiple languages and multiple versions formatted for desktop computers or mobile use.

The activities carried out by the associated beneficiary TEBAID under this task, require a workload of 4 P/M, corresponding to a cost of 24.000,00 €.

T.8.2 – Environmental Product Declaration (EPD) for the new LHNB - [ITALFERR (BEN), UNIBO(BEN), MOPI(BEN)], M31-M52

The EPD process will follow the same steps described in T.8.1. Therefore, it will start by choosing the right protocol to evaluate the product (Product Category Rules selection), followed by a Life Cycle Assessment (LCA), according to ISO 14040 and ISO 14044, that will be performed by ITALFERR with the support of UNIBO and MOPI (link to T.7.2). Then, the results of the LCA study and other information mandated by the reference PCR and General Programme Instructions (GPI) will be compiled in EPD format. Next, an accredited certification body will perform the verification process of the LCA-based data, and additional environmental and general information, related to the GPI and PCR. Once the verification is completed, the organisation developing the EPD shall register the EPD in the EPD portal together with other mandatory documentation. The verified EPD will be provided in multiple languages and multiple versions formatted for desktop computers or mobile use.

T.8.3 – Proposal for the preparation of a standard for low-height noise barriers characterization - [UNIBO(BEN), ITALFERR(BEN)], M44-M53

On the basis of report D4.2, UNIBO and ITALFERR will prepare a proposal to be submitted to the national standardization bodies of Italy (UNI), Germany (DIN) and Spain (UNE) to be further submitted to CEN by the national representatives in CEN/TC256/SC1/WG40 (noise barriers for railways) and possibly to CEN/TC226/WG6 (road traffic noise reducing devices). The proposal should include a cover letter, report D4.2, EPD D8.2 (EPD for the LHNB) and a selection of the articles published in scientific journals and congress proceedings during the project (see WP9).

## Work package WP9 – Communication and Dissemination

<b>Work Package Number</b>	WP9	<b>Lead Beneficiary</b>	1. ANAS
<b>Work Package Name</b>	Communication and Dissemination		
<b>Start Month</b>	1	<b>End Month</b>	60

### Objectives

To guarantee the maximum project disclosure;  
 To ensure the visibility of the project;  
 To guarantee an effective deployment of the project's results.

Description
<p>Wp9 consists of:</p> <ul style="list-style-type: none"> <li>- T.9.1 Participant’s websites, newsletters and social media</li> <li>- T.9.2 Dissemination and Networking events</li> </ul> <p>T.9.1 Participant’s websites, newsletters and social media [ANAS (COO), all], M01-M60</p> <p>Communication and information activities will be delivered through a dedicated page on the Coordinator beneficiary website. The page will be published within six months from the start of the project. In order to have a high-quality and effective tool, the page will contain at least:</p> <ul style="list-style-type: none"> <li>• the description of the project, including the project objectives, the main activities, and the expected results;</li> <li>• news to inform the public about the project-related activities and achievements and upcoming events, such as webinars, conferences, media presentations, press releases, project newsletters, etc.;</li> <li>• photo gallery with pictures and videos of the activities undertaken;</li> <li>• links to the LIFE program website, as well as to other relevant websites such as the European Commission and social networks (LinkedIn, YouTube, Twitter and Facebook) to solicit discussion and opinions on the matters arising from the project;</li> <li>• contact details of the coordinating beneficiary and of the other beneficiaries involved in the project;</li> <li>• the LIFE logo ;</li> <li>• the LIFE SILENT logo.</li> </ul> <p>The page will be monthly updated and maintained for 5 years after the end of the project. A static page dedicated to the project will be implemented also on the other beneficiaries’ websites. A link to the main coordinator’s webpage will be provided for updated information on the project. In that way, it is possible to have a unique website with a clear management policy and avoid discrepancies in content between the different beneficiaries’ websites. The project results will be also published on the LIFE Project Results platform.</p> <p>In addition to the website page, dedicated spaces on the Coordinator beneficiary social networks will be implemented, identified by a specific graphic theme. A detailed editorial plan will allow reaching a wider audience, thanks to a large number of followers of Anas corporate social networks (Facebook = 87.310; YouTube = 4.910; LinkedIn = 114.795; Twitter = 53.026).</p> <p>Finally, every month newsletters dedicated to the project will be prepared and sent via email to the main stakeholders, as well as published on social media and on the project web page.</p> <p>T.9.2 Dissemination and Networking events [ANAS (COO), all], M01-M60</p> <p>Dissemination activities include beneficiaries’ participation in public conferences to spread the results achieved and to promote the project. National and International conferences on the project matters will be attended at regular time intervals (see for details tables 9.1 and 9.2).</p> <p>In order to guarantee an effective deployment of the project’s results, dissemination activities will be carried out extensively. To that end, a series of events have been scheduled, as briefly reported in the following list:</p> <ul style="list-style-type: none"> <li>• 2 special events, one at the beginning and one at the end of the project. The first event will be organized to launch the project in the framework of the conference Internoise, planned in Nantes (FR) in 2024. The second one, the final conference, will be held in Rome to disseminate the project results. Invitations will be sent to the main stakeholders (representatives of the Ministry for the Ecological Transition and of the Ministry for Infrastructures and Sustainable Mobility, railways and roads Administrations, companies interested in the production of the developed solutions and researchers), to solicit their interest and support to the project. Information about the events will be sent to the LIFE communication team at least four weeks in advance for advertisement on LIFEnews and the LIFE website. About 100 attendants per event are expected. The local and national press will be also informed and invited to the event to raise awareness about the project. Information will be also delivered through the official website and partner information channels.</li> <li>• 2 special sessions. Two LIFE Silent Special Sessions will be arranged within European conferences on noise. The first one will be held in the framework of the conference Forum Acusticum or ICSV in 2025, with the aim of exchanging information and collating useful remarks and comments from participants to improve and refine the project before its implementation phase. The second one will be held during the second quarter of 2027 in conjunction with an International Congress. Invitations will be sent to the main stakeholders to solicit their interest and support for the project. Written invitations will be also sent to the desk officer from the Commission and external LIFE project monitor. Information about the event will be sent to the LIFE communication team at least four weeks in advance for advertisement on LIFEnews and the LIFE website. About 1500 attendants are expected at the conferences. It is envisaged that about 100 participants per event will attend the LIFE Silent Special Sessions.</li> <li>• 3 Webinars arranged by UNIRC, UNIBO and ARPAT, focused on low-noise pavements, low-height noise barriers and</li> </ul>

noise solutions in complex environmental scenarios respectively. It is envisaged that about 50 participants per event will attend the LIFE Silent webinars.

In order to ease the exchange of information between stakeholders and promote networking activities, all events will host presentations from other LIFE projects dealing with similar topics. The organization and participation in the planned events include the drafting and editing of presentations and/or posters, the production of informative material (leaflets, brochures), secretary service, linguistic revision and interpreting, catering and logistics.

The project also provides the involvement of the population resident in the pilot area. Before and after the design of the noise mitigation measures, two meetings will be arranged with local citizens to share the design approach and gather their feedback. The first meeting will serve to inform people about the developed solutions and the second one to show them the designed measures. A third meeting will be arranged to inform about the results achieved. These events will be advertised on the project web page, on social media and via press releases.

Finally, two promotional videos will be shot (in the middle and at the end of the project) for publishing on the web page and social networks, as well as for presentations at networking events.

#### T.9.3 Publications on journals and magazines [UNIBO (BEN), all], M01-M60

Several publications in journals and magazines are planned in order to share information about the project results. Scientific articles will be published in journals, such as “Applied Acoustics”, “Applied Sciences”, “La Rivista Italiana di Acustica”, etc. General public articles will be published on magazines, such as “Strade ed Autostrade”, “Le Strade dell’Informazione” (ANAS Magazine). In addition, congress papers will be presented during the Special Session at the international congresses listed above.

The activities carried out by the associated beneficiary TEBAID under this WP, require a workload of 5 P/M, corresponding to a cost of 30.000,00 €.

Moreover, The LIFE SILENT project team will keep disseminating the project results after the end of the project. Dissemination activities will include participation in national and international conferences, as well as the preparation of papers in scientific journals and magazines. Furthermore, information on the developed solutions and the results achieved will be published on beneficiaries’ websites and social media.

## STAFF EFFORT

<b>Staff effort per participant</b>										
<i>Grant Preparation (Work packages - Effort screen) — Enter the info.</i>										
<b>Participant</b>	<b>WP1</b>	<b>WP2</b>	<b>WP3</b>	<b>WP4</b>	<b>WP5</b>	<b>WP6</b>	<b>WP7</b>	<b>WP8</b>	<b>WP9</b>	<b>Total Person-Months</b>
1 - ANAS	38.00	3.00	2.00		3.50	3.50	1.80	4.00	10.00	65.80
2 - RFI	3.00	1.00		2.50	17.25	4.00	3.00		2.00	32.75
3 - ITALFERR	3.00		2.00	2.00	7.00	4.00	22.50	3.50	1.00	45.00
4 - ARPAT	2.00	35.00				4.00	3.00		4.50	48.50
5 - CNR	4.00	4.00		8.00	14.00	17.00			9.00	56.00
6 - UNIBO	3.00	1.00		30.50		6.00	5.00	4.00	10.50	60.00
7 - UNIRC	4.50		25.00		6.00	6.00	4.00	2.00	7.00	54.50
8 - MOPI	3.00		14.00	16.00	4.00	12.00		4.00	3.00	56.00
<b>Total Person-Months</b>	<b>60.50</b>	<b>44.00</b>	<b>43.00</b>	<b>59.00</b>	<b>51.75</b>	<b>56.50</b>	<b>39.30</b>	<b>17.50</b>	<b>47.00</b>	<b>418.55</b>



## LIST OF DELIVERABLES

### Deliverables

*Grant Preparation (Deliverables screen) — Enter the info.*

*The labels used mean:*

*Public — fully open (🚩 automatically posted online)*

*Sensitive — limited under the conditions of the Grant Agreement*

*EU classified — RESTREINT-UE/EU-RESTRICTED, CONFIDENTIEL-UE/EU-CONFIDENTIAL, SECRET-UE/EU-SECRET under Decision [2015/444](#)*

Deliverable No	Deliverable Name	Work Package No	Lead Beneficiary	Type	Dissemination Level	Due Date (month)
D1.1	Quality Manual	WP1	1 - ANAS	R — Document, report	PU - Public	3
D1.2	Extract of the project data from the LIFE KPI WEBTOOL	WP1	1 - ANAS	R — Document, report	PU - Public	9
D1.3	First Progress Report	WP1	1 - ANAS	R — Document, report	PU - Public	18
D1.4	Second Progress Report	WP1	1 - ANAS	R — Document, report	PU - Public	48
D1.5	Summary of the achievements of Green Project Management	WP1	1 - ANAS	R — Document, report	PU - Public	60
D2.1	Development of a method for managing and implementing noise mitigation measures in complex scenarios	WP2	4 - ARPAT	R — Document, report	PU - Public	50
D3.1	Recycling cellulose waste into low noise pavements	WP3	9 - TEBAID	R — Document, report	SEN - Sensitive	5
D3.2	Highly sustainable and low-noise pavements	WP3	7 - UNIRC	R — Document, report	SEN - Sensitive	12
D4.1	Realization of the first prototype of sustainable low-height noise barriers including metamaterials	WP4	6 - UNIBO	R — Document, report	SEN - Sensitive	20
D4.2	Implementation of a new method for testing	WP4	6 - UNIBO	R — Document, report	PU - Public	22

**Deliverables**

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<b>Deliverable No</b>	<b>Deliverable Name</b>	<b>Work Package No</b>	<b>Lead Beneficiary</b>	<b>Type</b>	<b>Dissemination Level</b>	<b>Due Date (month)</b>
	the acoustic performance of low-height noise barriers					
D5.1	Design and implementation of the SILENT solutions in the pilot area	WP5	2 - RFI	R — Document, report	PU - Public	33
D6.1	Acoustic and non-acoustic performance of the SILENT solutions.	WP6	5 - CNR	R — Document, report	PU - Public	54
D7.1	Life Cycle Sustainability Assessment	WP7	3 - ITALFERR	R — Document, report	PU - Public	45
D7.2	Action Plan for future implementation, replication and exploitation of the LIFE SILENT solutions	WP7	1 - ANAS	R — Document, report	PU - Public	48
D8.1	EPD Certification for the low noise pavement and LHNB	WP8	1 - ANAS	R — Document, report	PU - Public	52
D8.2	Proposal for the preparation of a EU standard for low-height noise barriers characterization	WP8	6 - UNIBO	R — Document, report	PU - Public	53
D9.1	Project pages on beneficiaries' websites	WP9	1 - ANAS	DEC — Websites, patent filings, videos, etc	PU - Public	6
D9.2	Final Conference Proceedings	WP9	1 - ANAS	DEC — Websites, patent filings, videos, etc	PU - Public	57



### Deliverable D1.1 – Quality Manual

<b>Deliverable Number</b>	D1.1	<b>Lead Beneficiary</b>	1. ANAS
<b>Deliverable Name</b>	Quality Manual		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	3	<b>Work Package No</b>	WP1

<b>Description</b>
Report describing the rules and procedure for project management. Format: electronic Language: English Pages: 35

### Deliverable D1.2 – Extract of the project data from the LIFE KPI WEBTOOL

<b>Deliverable Number</b>	D1.2	<b>Lead Beneficiary</b>	1. ANAS
<b>Deliverable Name</b>	Extract of the project data from the LIFE KPI WEBTOOL		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	9	<b>Work Package No</b>	WP1

<b>Description</b>
Report on the estimated key performance indicators (KPIs), extracted from the LIFE KPI webtool. Format: electronic Language: English

### Deliverable D1.3 – First Progress Report

<b>Deliverable Number</b>	D1.3	<b>Lead Beneficiary</b>	1. ANAS
<b>Deliverable Name</b>	First Progress Report		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	18	<b>Work Package No</b>	WP1

<b>Description</b>
Progress Report. Format: electronic; Language: English Pages: 30

### Deliverable D1.4 – Second Progress Report

<b>Deliverable Number</b>	D1.4	<b>Lead Beneficiary</b>	1. ANAS
<b>Deliverable Name</b>	Second Progress Report		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public



<b>Due Date (month)</b>	48	<b>Work Package No</b>	WP1
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<b>Description</b>
Progress Report. Format: electronic; Language: English Pages: 40

### Deliverable D1.5 – Summary of the achievements of Green Project Management

<b>Deliverable Number</b>	D1.5	<b>Lead Beneficiary</b>	1. ANAS
<b>Deliverable Name</b>	Summary of the achievements of Green Project Management		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	60	<b>Work Package No</b>	WP1

<b>Description</b>
Report on the achievements of green project management Format: electronic; Language: English Pages: 20

### Deliverable D2.1 – Development of a method for managing and implementing noise mitigation measures in complex scenarios

<b>Deliverable Number</b>	D2.1	<b>Lead Beneficiary</b>	4. ARPAT
<b>Deliverable Name</b>	Development of a method for managing and implementing noise mitigation measures in complex scenarios		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	50	<b>Work Package No</b>	WP2

<b>Description</b>
State of the art on methods for defining action plan in complex scenarios. Description of a method for managing and implementing noise mitigation measures in complex scenarios. Electronic (PDF) format. English language. Pages: 30

### Deliverable D3.1 – Recycling cellulose waste into low noise pavements

<b>Deliverable Number</b>	D3.1	<b>Lead Beneficiary</b>	9. TEBAID
<b>Deliverable Name</b>	Recycling cellulose waste into low noise pavements		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	SEN - Sensitive
<b>Due Date (month)</b>	5	<b>Work Package No</b>	WP3

Description	
Description of the developed procedures to recycle cellulose waste into low noise pavements. Format: pdf; Language: English; Pages: 30.	

### Deliverable D3.2 – Highly sustainable and low-noise pavements

<b>Deliverable Number</b>	D3.2	<b>Lead Beneficiary</b>	7. UNIRC
<b>Deliverable Name</b>	Highly sustainable and low-noise pavements		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	SEN - Sensitive
<b>Due Date (month)</b>	12	<b>Work Package No</b>	WP3

Description	
Description of the developed solutions, including the preliminary sustainability assessment. Format: pdf; Language: English; Pages: 30.	

### Deliverable D4.1 – Realization of the first prototype of sustainable low-height noise barriers including metamaterials

<b>Deliverable Number</b>	D4.1	<b>Lead Beneficiary</b>	6. UNIBO
<b>Deliverable Name</b>	Realization of the first prototype of sustainable low-height noise barriers including metamaterials		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	SEN - Sensitive
<b>Due Date (month)</b>	20	<b>Work Package No</b>	WP4

Description	
Report with list and detailed and replicable description of solutions per item. Electronic (PDF) format. English language. Pages: 40	

### Deliverable D4.2 – Implementation of a new method for testing the acoustic performance of low-height noise barriers

<b>Deliverable Number</b>	D4.2	<b>Lead Beneficiary</b>	6. UNIBO
<b>Deliverable Name</b>	Implementation of a new method for testing the acoustic performance of low-height noise barriers		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	22	<b>Work Package No</b>	WP4

Description	
Report with the description of the testing procedure and the results achieved on the prototype. Electronic (PDF) format. English language.	

Pages: 40

**Deliverable D5.1 – Design and implementation of the SILENT solutions in the pilot area**

<b>Deliverable Number</b>	D5.1	<b>Lead Beneficiary</b>	2. RFI
<b>Deliverable Name</b>	Design and implementation of the SILENT solutions in the pilot area		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	33	<b>Work Package No</b>	WP5

**Description**

Report describing the design and implementation of the SILENT solutions.  
Format: electronic  
Language: English  
Pages:40

**Deliverable D6.1 – Acoustic and non-acoustic performance of the SILENT solutions.**

<b>Deliverable Number</b>	D6.1	<b>Lead Beneficiary</b>	5. CNR
<b>Deliverable Name</b>	Acoustic and non-acoustic performance of the SILENT solutions.		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	54	<b>Work Package No</b>	WP6

**Description**

Report describing the methodologies used to test the acoustic and non-acoustic performance of the SILENT solutions and the results achieved.  
Format: Electronic (PDF) Language: English  
Pages: 50.

**Deliverable D7.1 – Life Cycle Sustainability Assessment**

<b>Deliverable Number</b>	D7.1	<b>Lead Beneficiary</b>	3. ITALFERR
<b>Deliverable Name</b>	Life Cycle Sustainability Assessment		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	45	<b>Work Package No</b>	WP7

**Description**

Ex-post Sustainability Assessment of LIFE SILENT noise reduction technologies.  
Electronic version, English language, number of estimated pages: 30.

**Deliverable D7.2 – Action Plan for future implementation, replication and exploitation of the LIFE SILENT solutions**

<b>Deliverable Number</b>	D7.2	<b>Lead Beneficiary</b>	1. ANAS
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<b>Deliverable Name</b>	Action Plan for future implementation, replication and exploitation of the LIFE SILENT solutions		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	48	<b>Work Package No</b>	WP7

<b>Description</b>
Action Plan covering: Exploitation plan, including replication of the solutions, Business Plan and Maintenance Plan. Electronic version, English language, number of estimated pages: 45.

### Deliverable D8.1 – EPD Certification for the low noise pavement and LHNB

<b>Deliverable Number</b>	D8.1	<b>Lead Beneficiary</b>	1. ANAS
<b>Deliverable Name</b>	EPD Certification for the low noise pavement and LHNB		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	52	<b>Work Package No</b>	WP8

<b>Description</b>
EPD Certification for the low noise pavement and LHNB Format: electronic Language: Italian and English N° of pages: 8

### Deliverable D8.2 – Proposal for the preparation of a EU standard for low-height noise barriers characterization

<b>Deliverable Number</b>	D8.2	<b>Lead Beneficiary</b>	6. UNIBO
<b>Deliverable Name</b>	Proposal for the preparation of a EU standard for low-height noise barriers characterization		
<b>Type</b>	R — Document, report	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	53	<b>Work Package No</b>	WP8

<b>Description</b>
Proposal for the preparation of an EU standard for low-height noise barriers characterization. Language: English N° of pages: 2 (cover letter) + 40 (D4.2) + 4 (D8.2) + 30 (selected articles)

### Deliverable D9.1 – Project pages on beneficiaries' websites

<b>Deliverable Number</b>	D9.1	<b>Lead Beneficiary</b>	1. ANAS
<b>Deliverable Name</b>	Project pages on beneficiaries' websites		
<b>Type</b>	DEC —Websites, patent filings, videos, etc	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	6	<b>Work Package No</b>	WP9

<b>Description</b>
Electronic format. Link to the project pages on beneficiaries' websites.

### Deliverable D9.2 – Final Conference Proceedings

<b>Deliverable Number</b>	D9.2	<b>Lead Beneficiary</b>	1. ANAS
<b>Deliverable Name</b>	Final Conference Proceedings		
<b>Type</b>	DEC —Websites, patent filings, videos, etc	<b>Dissemination Level</b>	PU - Public
<b>Due Date (month)</b>	57	<b>Work Package No</b>	WP9

<b>Description</b>
Special issue on the LIFE SILENT project on Applied Acoustic: final conference proceedings publication



## LIST OF MILESTONES

<b>Milestones</b>						
<i>Grant Preparation (Milestones screen) — Enter the info.</i>						
<b>Milestone No</b>	<b>Milestone Name</b>	<b>Work Package No</b>	<b>Lead Beneficiary</b>	<b>Means of Verification</b>	<b>Due Date (month)</b>	
1	Kick-off meeting	WP1	1-ANAS	Signed presence list, minute, presentations and pictures of the event.	1	
2	First Year Face to Face meeting	WP1	1-ANAS	Signed presence list, minute, presentations and pictures of the event.	13	
3	Second Year Face to Face meeting	WP1	1-ANAS	Signed presence list, minute, presentations and pictures of the event.	25	
4	Third Year Face to Face meeting	WP1	1-ANAS	Signed presence list, minute, presentations and pictures of the event.	37	
5	Fourth Year Face to Face meeting	WP1	1-ANAS	Signed presence list, minute, presentations and pictures of the event.	49	
6	Delivery of the first draft of the report on the management and implementation of noise mitigation measures in complex scenarios	WP2	4-ARPAT	Internal delivery of the first draft of the report	15	
7	Implementation of the method in the pilot area	WP2	1-ANAS	Internal delivery of a report describing the results, the difficulties encountered and the possible improvements.	36	
8	Delivery of the final report on the management and implementation of noise mitigation measures in complex scenarios	WP2	4-ARPAT	Delivery of the final report D.2.1	50	
9	Procedure for recycling waste materials completed	WP3	9-TEBAID	Report delivery (D3.1)	5	
10	Final formulation of the mixture to be used in the pilot area	WP3	7-UNIRC	Report delivery (D3.2).	12	

<b>Milestones</b>						
<i>Grant Preparation (Milestones screen) — Enter the info.</i>						
<b>Milestone No</b>	<b>Milestone Name</b>	<b>Work Package No</b>	<b>Lead Beneficiary</b>	<b>Means of Verification</b>	<b>Due Date (month)</b>	
11	Preliminary sustainability assessment of recycled waste materials for LHNB	WP4	8-MOPI	Report delivery (T4.2)	3	
12	Design of the prototype LHNB completed	WP4	6-UNIBO	Report delivery (T4.3) (confidential at this stage)	12	
13	Implementation of the low-height noise barrier prototype	WP4	6-UNIBO	Prototype ready (T4.4)	20	
14	Implementation of a new method for testing low-height noise barriers	WP4	6-UNIBO	Report delivery (T4.5)	22	
15	Initial acoustic scenario assessment completed	WP5	1-ANAS	Internal report on measurement results, noise maps and Dynamap system up and running	15	
16	Design of the mitigation measures completed	WP5	3-ITALFERR	Internal report describing the designed solutions	24	
17	Pilot site ready	WP5	2-RFI	Pictures of the implemented solutions ante e post operam	33	
18	First and second ex-post evaluations of the low noise pavement performance completed	WP6	5-CNR	Technical report on the results achieved	36	
19	Third and fourth ex-post evaluations of the low noise pavement performance completed	WP6	5-CNR	Technical report on the results achieved	41	
20	End of all test on the LHNB and on receivers	WP6	5-CNR	Technical report on the results achieved	53	
21	KPIs for preliminary sustainability assessment identified	WP7	3-ITALFERR	Internal report	5	
22	Identification of KPIs for sustainability assessment completed	WP7	3-ITALFERR	First draft of Deliverable D7.1 with KPIs description	35	
23	Sustainability assessment complete	WP7	3-ITALFERR	Submission of Deliverable D7.1	45	
24	Action Plan for future implementation,	WP7	1-ANAS	Submission of Deliverable D7.2	48	





<b>Milestones</b>						
<i>Grant Preparation (Milestones screen) — Enter the info.</i>						
<b>Milestone No</b>	<b>Milestone Name</b>	<b>Work Package No</b>	<b>Lead Beneficiary</b>	<b>Means of Verification</b>	<b>Due Date (month)</b>	
	replication and exploitation of the LIFE SILENT solutions ready					
25	EPD of low noise pavement completed	WP8	1-ANAS	EPD Certification for the low noise pavement	52	
26	EPD of LHNB completed	WP8	3-ITALFERR	EPD Certification for the low-height noise barrier	52	
27	Standardization proposal ready	WP8	6-UNIBO	Delivery of a written proposal to CEN	53	
28	Project pages on beneficiaries' websites ready	WP9	1-ANAS	Link to the project pages	6	
29	Launch of the project	WP9	1-ANAS	Photos and documents related to the event will be published on the project pages and social media. Signed participant list.	7	
30	Webinar “Low Noise pavements”	WP9	1-ANAS	Photos and documents related to the event will be published on the project pages and social media. Participant list.	13	
31	Webinar “Noise solutions in complex environmental scenarios”	WP9	1-ANAS	Photos and documents related to the event will be published on the project pages and social media. Participant list.	25	
32	Webinar “Low-height noise barriers”	WP8	1-ANAS	Photos and documents related to the event will be published on the project pages and social media. Participant list.	35	
33	Final Conference	WP9	1-ANAS	Photos and documents related to the event will be published on the project pages and social media. Signed participant list. Conference Proceedings.	54	

## LIST OF CRITICAL RISKS

<b>Critical risks &amp; risk management strategy</b>			
<i>Grant Preparation (Critical Risks screen) — Enter the info.</i>			
<b>Risk number</b>	<b>Description</b>	<b>Work Package No(s)</b>	<b>Proposed Mitigation Measures</b>
1	Problem with in-time availability of data and information from project partners [medium, low]	WP1	Early information requests and reminders; regular project partner meetings; availability of an in-cloud repository for storing project information from beneficiaries.
2	Delays in the development of the innovative noise reduction technologies due to technical issues [low, medium]	WP3, WP4	Tight monitoring of the engineering and production progress with meetings in short intervals (quarterly). The proposed solutions are an update of products developed in previous European projects, so the risk that uncontrollable delays can occur is low.
3	Delays and errors in the supply chain from the design to the implementation of low noise surfaces (e.g., the on-site pavement doesn't comply with the bid requirements) [low, medium]	WP5, WP3	Quality control/quality assurance and process-related strategies and controls. Note. These measures were detailed in T5.2.
4	Difficulties to gather enough robust data for sustainability analysis [medium, medium]	WP7, WP3, WP4	Early definition of the necessary data and dedicated discussion during project meetings on how and where critical data can be acquired (e.g. scientific literature)
5	Need to change the pilot area due to unforeseen circumstances [low, medium]	WP5	Early identification of at least two potential backup sites with similar urban noise issues and impact potential.
6	Shortage of material supply (e.g. Steel o recycled material) [low, medium]	WP5	Establish good long-term relationships with existing suppliers, early detection of capacity bottlenecks, and use alternative suppliers. As for the provision of cellulose fibres and CR, in section 2.1 the availability of sufficient quantities was analysed and confirmed. Therefore, the risk of recycled material shortage is rather low. However, to avoid any problems, during WP3 (Design and characterization of enhanced low-noise pavements) and WP4 (Design and characterization of innovative and sustainable low-height noise barriers), suppliers will be promptly asked to provide the required quantities for implementing the designed solutions in WP5.
7	Delays in the tendering phase for the installation of the noise mitigation solutions [medium, medium]	WP5	Early review of the legal requirements and early planning of the tenders. Timely communication of the project evolution to stakeholders.
8	Restricted access to the pilot area [low, medium]	WP5, WP6	Early review and solving of the safety issues and other requirements to easily access the pilot area for periodical monitoring activities.

<b>Critical risks &amp; risk management strategy</b>				
<i>Grant Preparation (Critical Risks screen) — Enter the info.</i>				
<b>Risk number</b>	<b>Description</b>	<b>Work Package No(s)</b>	<b>Proposed Mitigation Measures</b>	
9	Acoustic performance targets not met by demonstrators [low, high]	WP6	Extensive lab testing on the prototypes, extensive use of simulations during the design phase to explore a wide range of acoustic scenarios, strict protocols to assess measurement repeatability and accuracy ex-ante and ex-post	
10	Difficulties in defining solid business cases for the exploitation of the technologies [low, low]	WP7	Extensive market analysis of dynamics related to raw and secondary material value chains to scout a portfolio of suppliers. In-depth analysis of economies of scale and scope to lower production costs. Showcasing of project results to boost stakeholder engagement.	
11	Difficulties in obtaining the EPD Certification [low, low]	WP8	Early review of ISO 14034 and early contact with ISO 17020 compliant certification body to define the requirements and plan the tests for the Environmental Product Declaration.	
12	Difficulties in attracting the interest of stakeholders, resulting in low impact of dissemination [low, medium]	WP9	Tailored communication tactics for each stakeholder group. Continuous community building based on regular information flow and well-scheduled events.	
13	Failure from STRAIL to supply the barrier samples necessary for the experimental phase and the implementation of the pilot area	WP5, WP4	This risk will be mitigated by the signature of a formal agreement with Kraiburg STRAIL for the provision of the promised LHNB supply. Should STRAIL fail to honour the agreement, the coordinating beneficiary will provide the necessary resources for the purchase of the basic LHNB.	



ANNEX 1



# Programme for the Environment and Climate Action (LIFE)

## Description of the action (DoA)

### Part B



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## 1. RELEVANCE

### 1.1 Background and general project objectives

#### Background and general project objectives

*Explain the problem and the needs to be addressed in the project. Describe the background, starting point / quantified baseline of the project.*

*Please explain in which location and/or sector the main activities of the project will take place and justify that choice.*

*For Nature and Biodiversity:*

*Provide a clear and quantified description of the conservation issue and threats targeted, as well as relevant background information and quantified figures defining the baseline to justify the proposed Interventions by*

*At stage 1 (concept note) when relevant, describe the main species/habitats directly targeted by the project: scientific name; refer to the Annex(es) of the EU Birds or Habitats Directive where they are listed; population size within each project area; conservation status; habitat name and Natura 2000 code; % of the cover within each project area; conservation status.*

*At stage 2 (full proposals), when relevant, provide a brief description of the areas where conservation actions will be implemented and main species and / or main habitats directly targeted by the project, and submit the following annexes:*

- maps
- description of sites
- description of species and habitats

*Describe the previous conservation efforts in the project area or for the habitats/species targeted.*

*For Circular Economy and Quality of Life (n/a to Environmental governance topics):*

*Describe the previous technical preparatory work and results of previous research and development activities, showing the status of technical development achieved for the proposed solution, including the technical readiness level (TRL) where relevant and proving its technical feasibility.*

*Explain the scale at which such results have been obtained and if prototypes have been already developed and tested. Their scale/dimension and relevant results and conclusions have to be clearly presented. Illustrate available best practices in the relevant sector (state of the art) and clearly and concisely explain the environmental, technical and economical improved performances/ advantages introduced by the proposed solution in case this is claimed to be innovative/ demonstrative.*

#### BACKGROUND

**The following project proposal was previously submitted under the call LIFE-2021-SAP-ENV, proposal 101074416 – LIFE-ENV-IT-LIFE SILENT. Although the proposal received a favourable evaluation, given the budget limit of the call, it was put on the reserve list, but finally not funded.**

**Scope of the project.** The Main objective of this proposal is the development of sustainable and eco-friendly solutions to mitigate noise in complex urban environments, where multiple and diverse noise sources, mainly roads and railways, coexist across densely populated areas. The need to reduce noise levels in outdoor urban areas is paramount, since according to the World Health Organization, 20% of the European population is exposed to noise levels exceeding 65 dB(A) during the day, whereas the maximum recommended level is 55 dB(A). Mitigating noise in such environments generally excludes the use of solutions that might interfere with the urban context, such as noise barriers, for many reasons. First of all, the proximity of receivers to the noise source, typically roads. Secondly, the visual impact: noise barriers reduce the visibility of the surroundings and air circulation, causing local temperature rise (especially in summer) and social denial. This is why noise mitigation measures acting directly on the source are recommended, such as low noise pavements and traffic calming for roads, dampers, rail grinding and silent brakes for railways. However, these solutions have been proven to be poorly effective over time and consequently quite expensive.

In this proposal, innovative and sustainable low noise pavements and low-height noise barriers will be developed and demonstrated in a real test environment, to provide transport infrastructure owners and managers with solid information to support their widespread use. To this end, the proposal accounts for the preparation of special procedures to manage their implementation in complex urban scenarios.

**Low-noise pavements.** Low noise pavements for urban environments are mainly achieved by implementing one or more of the following approaches: 1) Surface texture (and corresponding strategies to affect it, e.g., gradation); 2) Volume; 3) Addition or use of alternative materials, e.g., rubberised asphalts or rubber and resins (without bituminous binders), where promising but not fully understood mechanisms are emerging [1] [17] [18] [19]).



Currently, low noise pavements can reduce noise by 3-5 dB (approximately corresponding to about LCPX=90 dB(A) at 50 km/h), depending on the type of material used and texture, even if higher reductions were obtained in some European projects at prototypal level (cf. PERSUADE and LIFE NEREIDE projects). More importantly, in the attempt to improve noise-related performance, disappointing results were often obtained in terms of durability. In this context, the balance between durability and quietness has become crucial. Therefore, in the last years several projects have been proposed to identify a trade-off between technical, environmental, and economic issues (e.g., LIFE NEREIDE, LIFE C-LOW-N, LIFE E-VIA, LIFE SNEAK-in progress, IASNAF).

Some of these projects have demonstrated the feasibility of many solutions with good results in terms of noise mitigation, but whose sustainability and durability were somehow questionable.

On the other hand, projects like IASNAF, funded by ANAS and leading partner of this proposal, have shown 1) the possibility to match the durability and acoustic properties by adding functionalised cellulose fibres; 2) the crucial role of sustainable additives to strengthen the bonds between components [1] [2]; 3) the need to functionalize cellulose fibres to increase the durability of the bituminous mixture [3] [4].

However, some of the abovementioned projects have been carried out mainly in laboratories or in controlled test sites (a relevant environment) and not in real contexts (operational environment). Likewise, other projects have focused only on noise-related features.

Therefore, further implementations are needed to validate in real test sites the promising results obtained in the laboratory, such as those achieved by the IASNAF project, where functionalized fibres (brooms and more in general waste cellulose) have been added to bituminous mixtures to increase the durability of low noise pavements. Here the target is not only to improve the lifetime of the solution, but also its sustainability, by lowering costs, the depletion of virgin materials and the impact on human health during the construction phase, keeping acoustic and safety performance unchanged. This should lead to noise attenuation comparable or better with respect to the best current commercial products, extended lifetime of the road pavement, savings in terms of landfill and virgin material (thanks to the use of waste material), lower emissions of CO<sub>2</sub> and costs.

Based on the results achieved from past and ongoing projects, in the LIFE SILENT project, **the TRL will be raised from 4 to 7/8**, by means of additional validation tests (particularly for fatigue life), the deployment of information and results achieved by other projects (upscale), implementation and test of the solution in a real operational environment.

**Low-height noise barriers (LHNB).** LHNB have recorded an increased interest in the last decade, but their potential has not been fully exploited yet. LHNB are usually installed at a close distance (about 1.70 m) from the axis of the nearest track and have a height of about 0.5-1 m. They are easier to install than conventional noise barriers, at a reduced cost. Their limited height fits in many urban and suburban contexts, e.g., to reduce sound emissions from light trains (metro) and tramways, a significant urban noise source. LHNB noise reduction broadly lies between 5 and 10 dB, depending on their height, their distance from receivers, receiver height and type of ground. This value can be further increased by placing LHNB between rail tracks. Moreover, LHNB can be used to shield pedestrians or cyclists from noise coming from a heavily trafficked driveway. From a physical-acoustical point of view, LHNB combines the effects of sound absorption, insulation, and diffraction in a different manner from the conventional high-rise noise barriers, achieving good performance with a reduced height. LHNB are directly linked to the concrete sleepers of the rail track or to the concrete base plate. Because of that, LHNB have often been acknowledged as a measure at the source, thus being considered a product different from traditional noise barriers, acting on the noise propagation path from the source to receivers. The main expected advantage of LHNB relies on the Benefit/Cost ratio, which can be optimized by removing foundation costs, as they are not needed anymore. Further advantages lie on the reduced impact on the landscape and the possibility of implementing noise mitigation measures inside current maintenance contracts, without the need for an additional design and tender phase. Drawbacks for LHNB are represented by the noise reduction action confined to the rail-wheel or road-tyre interaction source, the possible interference with maintenance operations and the rapid ageing of traditional sound-absorbing materials when used on the barrier surface.



(a)



(b)

Fig. 1.1: LHNB built by STRAIL in (a) Neuss (Germany) and (b) San Cugat (Spain).

The effectiveness of LHNB has been assessed in several studies, mostly based on numerical modelling

and scale measurements. Horoshenkov et al. (1999) tested, using scale-model measurements, a simple absorbing low-height barrier meant to mitigate noise in an urban canyon, and got a noise reduction of 8 dB(A) for pedestrians [5]. Baulac et al. (2005) considered a typical urban traffic noise situation and optimized the shape and the sound absorption of an LHNB using boundary element method (BEM) simulations and genetic algorithms, showing that an insertion loss of 10 dB(A) is achievable situations [6]. Ding et al (2011) modelled a porous traffic LHNB with an advanced time-domain method, predicting an insertion loss up to 10 dB(A) depending on the type of vehicle and receiver locations [7]. Koussa studied numerically a sonic crystal LHNB for tramway noise mitigation made of parallel cylinders of different diameters [8]. Those barriers can provide up to 6 dB(A) of attenuation by themselves; when a rigid screen is added behind the sonic crystal the effectiveness reaches 10 dB(A), and more than 15 dB(A) when both the cylinders and the screen are absorbent. A few types of tramways LHNB have already been studied [8, 9, 10, 11]; in these cases, the multiple reflections between the barrier and tram body strongly influence the insertion loss, and therefore treating the barrier with absorptive material seems critical in these contexts. Particularly, Jolibois et al. (2015) studied the acoustic performance of a full-scale LHNB prototype for tramway noise [11]. The prototype was made of an inverted L-shape assembly of pressed wood boards covered on the source side with fibrous absorbing material and was set up temporarily in a residential area in Saint-Martin-d'Hères, France.

Apart from numerical studies and mock-ups, several companies equipped test sites with prototypes of LHNB, both on urban rail or road networks and on long-distance rail tracks, with the aim of exploring the possibility of a widespread application of LHNB. These prototypes were made of materials currently used for traditional noise barriers (i.e., precast concrete or metallic cassettes filled with sound-absorbing mats). A full-scale experiment in Lyon [8], has demonstrated that a vegetated LHNB close to an urban traffic lane provided about 5 dB(A) of attenuation as well as an improvement of the subjective impression of the soundscape. Deutsche Bahn, the German rail company, has implemented LHNB on several different test sites, obtaining a noise reduction from 3 to 5 dB(A) [9]. Nieuwenhuizen and Yntema (2018) measured the noise reduction performance of LHNB (height 0.76 m, distance from the track 1.75 m) built by ProRail as a pilot project in Hilversum, The Netherlands [14]. The results were compared with calculations according to the Dutch calculation scheme for conventional barriers, finding a good match on the overall noise level; however, the spectral results do not match as well as the total noise reduction. The Spanish research centre Tecnalia designed a prototype LHNB made of absorptive concrete, capable of achieving a noise abatement of 5-9 dB(A) [15]. In Finland, the company Soundim in cooperation with the Finnish Transport Agency developed a prototype LHNB installed in a first pilot project near Helsinki in 2011. A second pilot project was installed in June 2013 in Tampere. In 2014 the first commercial project, 2200 m in length, was placed on the Helsinki Ring; it was opened to traffic in July 2015. The Soundim LHNB has a hinge mechanism for lowering the barrier, e.g., for maintenance, and a built-in channel for cables. Insertion loss values of about 10 dB(A) were recorded in some sites [16]. In 2017 Strail LHNB [20] developed and fatigue tested a mini sound protection wall for Deutsche Bahn. It has approximately 1800 mm long and 550 mm high and consists of a recycled rubber core which is fully covered with fibre cord and new rubber. Steel reinforcing elements (L-holding plates, thickness 5 mm, with boreholes and steel tubes as spacer sleeves 60.3x3.65 mm in the area of the boreholes; steel grade S235 or S355) are vulcanised into the sound protection element in the area of the lowest step plate of the sound protection wall in order to locally reinforce the rubber element in the area of penetrations. Here, the sound-absorbing elements are clamped to the existing sleepers and rails using mechanical steel fastening elements. Noise reduction (insertion loss) ranging from 1,5 to 3 dB are reported, depending on the relative position of the noise source with respect to receivers. These values are limited by the fact that the prototype LHNB has a sound-reflecting surface, letting sound bounce repeatedly between the LHNB and the train body and finally overcoming the LHNB. Better results could be obtained by making the surface of the LHNB sound-absorbing but applying traditional sound-absorbing materials (like mineral wool) over the rubber product would strongly decrease the durability of the LHNB in an outdoor environment.

Overall, most of the studies mentioned above have been limited to an experimental proof of concept; only occasionally, very few of them, such as the Strail LHNB have been tested in a relevant environment for a short period of time.

Most of the mentioned samples are temporary mock-ups not capable of withstanding weathering as in real life. All the above-reported studies suffer from two drawbacks. First, the reported acoustic performance strongly depends on the installation site (source-barrier-receiver geometry, ground profile, ground impedance, local weather, etc.), i.e., placing the same LHNB in another site will change the achieved insertion loss (IL). In other words, **insertion loss is a site-dependent characteristic** of LHNB (extrinsic characteristic). Secondly, the reported acoustic performances were measured with different methods – very simplified indeed – on a case-by-case basis on samples different in height and surface characteristics. Therefore, all these declared performances are non-comparable among them, and any baseline can't be traced on the acoustic performance of LHNB.

In the LIFE SILENT project, LHNB will be brought beyond the current state of the art by optimizing several aspects of their design.

1. Environmental sustainability will be considered from the beginning, selecting suitable recycled materials to build the LHNB base with a preliminary sustainability assessment. This will

improve the empirical mix of new and recycled materials used so far.

2. Then, **these materials will be appropriately shaped using the most recent metamaterial modelling findings** to get enhanced sound-absorbing performances and longer working life with reduced use of virgin materials. Unlike traditional composites, acoustic metamaterials can exceed known bounds on conventional material properties. That is accomplished by exploiting subwavelength microstructure fabricated from ordinary materials (e.g., recycled rubber). This microstructure enables metamaterials to manipulate acoustic wave fields in ways that are impossible to achieve with naturally occurring materials or traditional composite materials [21,22,23]. So, the rubber surface of the LHNB facing the train will be “structured” with new shapes giving rise to enhanced sound-absorbing characteristics. This is possible by using fewer virgin materials and avoiding mineral wool, contributing to decreasing the environmental impacts while enhancing sound attenuation. The performance indicator used to rate sound absorption of the new surface will be  $DL_{\alpha}$  ref. rail noise spectrum as per EN 16272-3-2. The expected improvement is 3 dB over the baseline of the existing Strail prototype, supplied by STRAIL free of charge for comparison.
3. Since no standard methods exist for measuring the in situ acoustic performance of a LHNB and the insertion loss is site-dependent (see above), a suitable baseline against which to assess the new LHNB will be established. This will be done by comparing the acoustic performance of the LHNB made of metamaterial with a 30 m long standard LHNB of the same height, made of the same rubber (the prototype Strail product) and installed in the same way on the same site. The measured acoustic indicator will be the insertion loss, IL in dB, at 7,5 m from the track axis, at a height of 1,2 m above the top of the rail, as usual in many specifications for railways (see ISO 3095). The performance indicator used to rate the in-situ performance will be the insertion loss, IL in dB. The expected improvement in IL is 2 dB over the baseline of the existing Strail prototype on the same site. At the current state of knowledge, no reliable calculation method exists for such LHNBs, therefore, any assessment must be necessarily done by measurements.
4. LIFE Silent will go further beyond the state of the art: a **new measurement method** specifically tailored to LHNB qualification will be defined, taking advantage of some research results by UNIBO not yet published. This will allow the comparison of different products without installing them on the same site. After the end of the project, this method will be submitted to CEN for possible standardization.
5. Finally, the functional perspective will be treated in detail, in close cooperation with rail and road authorities (RFI, Italferr, ANAS) to solve maintenance and safety issues as far as possible. Prototypes will be built during the project and eventually installed in real operational environments, **to reach TRL 8 (system complete and qualified)**.

**Management and implementation of noise mitigation measures in complex environments.** The way noise can be reduced in complex environments is just a part of the problem. Usually, targeted noise sources are managed by different transport owners and managers. This makes the implementation of the solutions more difficult, especially when the different noise sources interfere with each other. The Italian decree DPCM 29/11/2000 on environmental noise, states that in presence of multiple noise sources, transport infrastructure owners and managers shall collaborate and share the cost of mitigation activities, but without giving clear indications on how to fulfil this obligation. In 2017 the need to ensure the coordination of Action Plans, drawn up according to the directive 2002/49/CE by companies and bodies managing public transport services or related infrastructures was reiterated. Based on this decree, local authorities shall verify with a specific provision the coherence and possible synergies between the various types of actions and interventions on the territory and establish the necessary prescriptions. Furthermore, the Legislative Decree 42/2017 obliges transport owners and managers to duly consider the presence of other transport infrastructures when arranging the environmental impact assessment in the design phase.

However, no guidelines are currently available to undertake shared solutions and to support the authorities involved in the coordination of these activities.

In the LIFE SILENT project, this problem will be further addressed by developing and testing an operative methodology to support the coordination and implementation of noise mitigation measures of different nature and types, like those included in the project proposal, from a plurality of subjects, to ensure integration of the planned solutions and optimal results, both in terms of effectiveness and efficiency.

#### GENERAL OBJECTIVE OF THE PROJECT

The LIFE SILENT project pursues three main objectives:

6. To improve the durability of low noise pavements and lower their cost (reduced LCC), leaving acoustical and safety performance unchanged.



7. To improve the overall performance of LHNB, in terms of acoustical, structural and safety properties, through the design and validation of an innovative product.
8. To define procedures for managing and implementing noise mitigation measures in complex environmental scenarios.

The first objective will be achieved by adding to bitumen functionalized cellulose fibres from waste materials (e.g., textiles, papers, cardboards) to improve the resistance of road pavements to fatigue, with an expected increase in durability by 20% with respect to state-of-the-art solutions, keeping acoustic and safety performance unchanged. This will lead to cost reductions in the long run (LCC) and to overall sustainability improvements.

The second objective will be achieved by developing and testing an optimized solution with performance compared to currently available products. Particular attention will be given to safety and maintenance issues, as well as to the sustainability of the artefact, by using a high percentage (estimated 85%) of recycled materials. The latter will be properly shaped according to the metamaterial's technology, so as to get enhanced sound-absorbing performances without using non-durable fibrous materials. Furthermore, since no method exists for measuring the acoustic performance of an LHNB, a new method specifically tailored to LHNB will be developed and subsequently proposed for standardization.

The third objective will be achieved by developing and testing an operative methodology to support the coordination and implementation of noise mitigation measures of different nature and types, like those included in the project proposal from a plurality of subjects, to ensure integration of the planned solutions and optimal results, both in terms of effectiveness and efficiency.

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## 1.2 Specific project objectives

### Specific project objectives

*Describe the specific objectives of your project (clear, measurable, realistic and achievable within the duration of the project).*

The project pursues the following specific objectives:

- To increase the lifespan of low noise pavements by 20% and decrease their cost (reduced LCC) by at least 14%, without affecting acoustic and safety performance. This objective will be achieved by adding to bitumen functionalized cellulose fibres from waste materials (e.g., textiles, papers, cardboards).
- To develop and test an innovative low-height noise barrier made of recycled materials, with enhanced acoustic properties given by the application of metamaterials technology, which was already proven to provide excellent results in terms of sound absorption.
- To develop an accurate method for measuring low-height noise barriers acoustic performance. The method will refer to already established measurement techniques and will be adapted to low-height noise barriers.
- To decrease the use of natural resources by 16 tons per km for low noise pavements (estimate base on a 10 m wide urban road) and by at least 205 tons per km for LHNB 0,5 m high. This will allow promoting the exploitation of recycled materials, thus activating a virtuous path for circular economy in the field of road and rail noise.
- To define methods and procedures for setting up synergistic solutions to ease the management and implementation of noise mitigation measures in complex environmental scenarios. This will be achieved by involving road and rail owners and managers, as well as representatives of Environmental Agencies and Local Authorities.
- To implement and test the developed solutions in a real test site, located in a densely populated area (Number of inhabitants exposed to  $L_{DEN} \geq 55$  dB(A): 19.769;

To reduce noise impact on average by at least  $3 \pm 5$  dB(A) on receivers located in the pilot area, by implementing the developed solutions with a holistic approach, according to the management method set-up in the project.

### 1.3 Compliance with LIFE programme objectives and call topic

#### Compliance with LIFE Programme objectives

*Explain how the project contributes to the specific objectives of the LIFE Programme and the sub-programme targeted by the call (Nature and Biodiversity, Circular Economy and Quality of Life, Climate Change Mitigation and Adaptation or Clean Energy Transition).*

The LIFE SILENT project is aligned to the general objective of the European Green Deal related to the protection of health and well-being of citizens from environment, being mainly focused on the reduction of noise in urban and suburban areas. The proposed solutions for noise abatement also meet the specifications of the programme for the Environment and Climate Action, by supporting the transition to a circular economy and protecting and improving the quality of EU's natural resources. Indeed, the noise mitigation measures that will be developed in the project will be partially made of recycled material, thus contributing to save natural resources, and landfilling with waste.

Specifically, the project is fully compliant with the objectives of the sub-programme Circular Economy and Quality of Life, as it involves:

- *The development, demonstration and promotion of innovative techniques, methods, and approaches for reaching the objectives of EU legislation and policy on environment and to contribute to the knowledge base and the application of best practices.* To this end, the project includes the development and demonstration of two innovative technological solutions, i.e., enhanced low noise road pavements and low-height noise barriers, thus contributing to broaden and improve the range of available solutions in complex urban scenarios, where the implementation of traditional noise mitigation measures, such as noise barriers, is inapplicable. The new solutions will support the implementation of the Action Plans prepared by transport infrastructure owners and managers according to the European Directive on Environmental Noise 2002/49/EC.
- *To support the development, implementation, monitoring and enforcement of the EU legislation and policy on environment, including by improving governance at all levels, through enhancing capacities of public and private actors and the involvement of civil society.* The LIFE SILENT project also entails the preparation of methods and procedures to harmonize and ease the implementation of the Action Plans, prepared according to the Directive 2002/49/EC by different transport infrastructure owners and managers. This will help public and private sectors to enhance their capacities in managing and implementing noise mitigation measures in complex environments. Furthermore, the project intends to involve civil society, by checking the impact and acceptance of the new solutions with social surveys.
- *To catalyse the large-scale deployment of successful technical and policy-related solutions for implementing the EU legislation and policy on environment, by replicating results, integrating related objectives into other policies and into public and private sector practices, mobilising investment and improving access to finance.* The LIFE SILENT project also involves a series of actions addressed to deploy the developed solutions on a large scale. From a technical perspective, the new solution will be subjected to a third-party validation process (EPD) to assess the performance of the technology based on independent and credible information, according to the internationally recognised ISO standard 14034. The result will be a 'Environmental Product Declaration' certifying that the technology performance claims are complete, fair, and based on reliable test results. With proof of performance credibly assured, innovations can expect easier market access and/or a larger market share. This will help the technology providers to reach the market with a competitive advantage. The project also includes an Action Plan for the future implementation of the developed solutions (replication sites), where competitive advantage considerations and market analysis, estimated return on investment, expected business models, competitiveness assessment will be outlined. To that end, the consortium will work together to define a road map for the exploitation of the SILENT solutions and to pave the way for their commercialization, through the study of potential regulatory barriers and constant monitoring of the market evolution all over the project duration. The goal of this action is to identify and periodically update target economic sectors, design suitable business strategies for marketable SILENT outputs, promote market awareness, understanding, acceptance and, whenever possible, investment in exploitable results, through contacts with end-users, institutions, or associations in connection with the project activities.

Moreover, the LIFE SILENT project will facilitate the transition toward a sustainable, circular, toxic-free economy in the field of the noise sector. Indeed, the developed solutions will boost the use of toxic-free recycle materials, reduce the use of virgin materials, such as bitumen, rubber, and concrete, thus bringing down waste generation and accumulation in landfills, as well as abating air pollution.

Finally, the project meets the requirement of diminishing the exposure to harmful noise levels, by

developing solutions specifically designed to abate noise in urban and suburban areas, where traditional solutions, such as noise barriers, can't be applied.

### Compliance with the call topic

*Indicate the call topic to which your proposal relates, and explain how the proposed project addresses the scope of the topic description in the Call document.*

The LIFE SILENT project is focused on the topic **noise**, under the sub-programme Circular Economy and Quality of Life. This topic is addressed to solutions able to abate noise inside densely populated urban areas, such as low noise surfaces and/or tyres, having life cycle costs comparable to those of standard surfaces and/or tyres, low-height barriers with low landscape impact and eco-friendly materials, or lowering noise from railway traffic or airport.

In the LIFE SILENT project low noise surfaces, as well as low-height noise barriers (LHNB) will be developed and tested in a real test site, located in Rome (Italy), to check their effectiveness and sustainability.

Particular attention will be given to the sustainability aspects: low noise pavements, as well as LHNB will be designed and implemented using recycle materials. Crumb rubber from old tyres and cellulose fibres from waste materials, such as cardboard, papers and textiles will be used, thus contributing to feeding the virtuous path of the circular economy.

Specifically, the use of functionalized cellulose fibres in the road mixture will contribute to strengthening the chemical bonds between bitumen and aggregates, thus increasing the lifetime of the road pavement, and consequently lowering its cost in the long term (lower LCC).

Likewise, for low-height noise barriers, new sound absorbing metamaterials will be designed. Metamaterials are engineered materials with extraordinary properties, e.g., enhanced sound absorption, due to their shape, independently of the raw materials used to make them. Therefore, they will be made of recycled materials, such as crumb rubber from old tires, shaped to get enhanced sound-absorbing performances.

These solutions will be developed having in mind an eco-design approach based on a life cycle analysis, in order to pursue the following main objectives:

- to minimize the environmental impact;
- to boost the reuse of waste materials;
- to improve noise and safety performance;
- to keep costs of the new solutions comparable to commercial products.

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## 1.4 Concept and methodology

### Concept and methodology

*Describe the overall intervention logic of the project, including the main idea and assumptions (i.e. how are the proposed activities and steps of your project expected to lead to the intended changes in terms of outcomes and impacts).*

*Explain the methodology, i.e. the main tools, techniques, methods and procedures you will use to implement the technical part of your project. Justify why the proposed methodology is the most suitable for achieving the project's objectives.*

*For Clean Energy Transition:*

*Describe the market barriers, the needs and constraints of market actors, and how your concept will address them concretely.*

*For Circular Economy and Quality of Life (n/a to Environmental governance topics):*

*Describe the technical details of the proposed solution (process, material, product etc.) using a flowchart and including, where possible, the general mass and energy balance. Explain how you plan to establish your supply chain.*

*Specify the scale (e.g. production capacity) and output of the project (e.g. quantity produced/sold during the project). The chosen technical scale should be one that allows the evaluation of the technical and economic viability of the proposed solution. In case of close-to-market conditions the target should be industrial/commercial scale already during the project.*



## Concept

As mentioned in the previous paragraphs, the LIFE SILENT project pursues three main goals:

- To improve the durability of low noise pavements and lower their cost (reduced LCC) and, at the same time, to keep on improving their acoustical and safety performance;
- To improve the overall performance of low-height noise barriers (LHNB), in terms of acoustical, structural and safety properties.
- To define procedures for managing and implementing noise mitigation measures in complex environmental scenarios.

The first goal will be pursued by adding to bitumen functionalized cellulose fibres from waste materials (e.g., textiles and packaging) to improve the resistance of road pavements to fatigue, with an expected increase in durability by 20% compared to current solutions (10 years on average), keeping on improving acoustic and safety performance at the same time. This will lead to abate costs in the long run (LCC) and improve their sustainability.

The second goal will be achieved by developing and testing an optimized solution with a superior performance compared to currently available products. Particular attention will be given to safety and maintenance issues, as well as to the sustainability of the artefact, by using a high percentage (estimated 85%) of recycled materials. It will be properly shaped according to the metamaterial's technology, which represents the core innovation of the proposed solution, so as to get enhanced sound-absorbing performances without using non-durable fibrous materials. Furthermore, since no method exists for measuring the acoustic performance of an LHNB, a new method specifically tailored to LHNB will be developed with the intention to propose it for standardization. The development and design of the metamaterial panels, as well as the development of the new measurement method, will be carried out by the University of Bologna, which is the European leader on this specific research topic.

The third goal will be pursued by developing and testing an operative methodology to support the coordination and implementation of noise mitigation measures of different nature and types, like those included in the project proposal from a plurality of subjects, to ensure integration of the planned solutions and optimal results, both in terms of effectiveness and efficiency.

The proposal will leverage on the experience gained so far on recycling technologies and new materials:

- bio-waste recycling into bitumen, crumb rubber recycling into pavements and low-height noise barriers;
- metamaterials shaping of recycled crumb rubber, to build low-height noise barriers highly effective in terms of circular economy (at least 85%met of recycled materials).

The proposed solutions will upscale and take advantage of the results achieved by previous European and national projects to exploit their potential and achieve even more performing products. Specifically, the experience gained by Kraiburg STRAIL on this matter will be exploited. From its side, Kraiburg STRAIL, as an interested third party in this project, will support the testing and implementation phase by providing free of charge (as an in-kind contribution) the necessary components and support for testing and implementing the LHNB. More specifically, STRAIL will provide 40 m of reflecting mSW, plus 20 m of absorbing mSW for testing and 150 m of reflecting mSW, plus 50 m of absorbing mSW for the implementation of the LHNB in the pilot site. This will also lead to taking a step forward in the industrialization process of the developed products and to easing their launch to the market.

To do so, the proposal includes also actions devoted to accurately testing the solutions, both in the laboratory and on real sites, validations, and sustainability assessments, as well as business and market analysis.

## Methodology

The methodology applied to this project follows the logical scheme shown in figure 1.2.

The first phase of the project is devoted to:

- the definition of methods and procedures for setting up synergistic solutions in complex environmental scenarios (WP2);
- the design and characterization of enhanced low noise pavements (WP3);
- the design and characterization of innovative and sustainable low-height noise barriers (WP4).

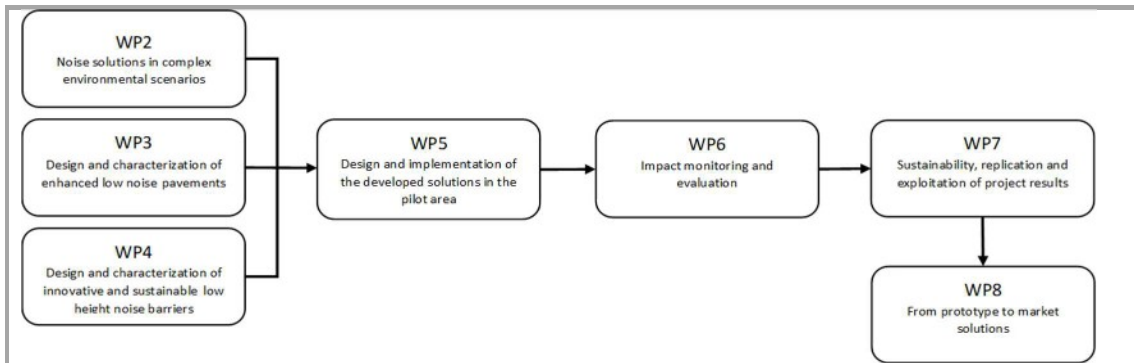


Fig. 1.2: Flow chart of the actions involved in the projects.

The development of methods and procedures to harmonize and optimize noise mitigation measures in complex environments (WP2), will require at first in-depth analysis of legislative specifications and literature at both European and national level, in order to outline a general method, valid for different complex scenarios and EU Member States. To do so, the Action Plans prepared by ANAS and RFI for the national road (10.428 km) and railway (17.163 km) networks will be compared and analysed. The analysis will be validated by processing additional noise maps using common input data and tools (simulation software) for the same scenario and by checking the effectiveness and efficiency of the proposed solutions. This last step also involves the need for more in-depth investigations (further simulations) to check the possibility of optimizing (integrating) the planned solutions. Costs-benefits analysis will be also undertaken to determine the relative efficiency of the planned solutions with respect to the integrated solutions. At the end of this phase, a first draft of the method for managing and implementing noise mitigation measures in complex scenarios will be delivered. Special attention will be given also to citizen evaluation of the solutions, being individuals or organizations or NGOs, to guarantee the social sustainability of the proposed measures. To that end, the feedback received from the public by RFI and ANAS on their Action Plans will be gathered and analysed, as well as data from other European countries, in order to provide a more general method, valid and applicable at European level.

The design and characterization of the new low noise pavement (WP3) will stand mainly on the results achieved on a preparatory project, named IASNAF and funded by ANAS, where a highly sustainable and low noise surface mixture, including crumb rubber and cellulose fibres extracted from brooms, was developed. Under the IASNAF project, it was demonstrated that functionalised cellulose fibres are able to increase the resistance of road pavements to fatigue, keeping acoustic and safety performance unchanged. This leads to abate costs in the long run (LCC) and to improve their sustainability. In the LIFE SILENT project, this solution will be further improved by replacing natural fibres with waste materials (packaging and textiles), thus enhancing its sustainability appeal by reducing the use of virgin materials and waste burial/disposal in landfills. The design and test of the new formulations will be performed using a recursive approach, in which the amount of the different mixture components will be modified as a function of the in-lab test results, until the achievement of the desired outcomes. The production procedures will be finally refined at the end of the on-site testing phase, to optimize the mixture formulations, in terms of workability conditions, including the emissions reduction of volatile organic compounds and polycyclic aromatic compounds when laying down the new surface.

The design and characterization of innovative and sustainable low-height noise barriers (WP4), will be based on the outcomes and experience gained in previous studies and projects, including the products already developed at a prototypal stage by Kraiburg STRAIL, who's going to support the project with the supply of their product free of charge (in-kind contribution), as a third interested party. **The STRAIL's LHNB is a mini sound protection wall 0,55 m high made of fibre-reinforced hard rubber mats, developed for the Deutsche Bahn lines. Here, the sound-absorbing elements are clamped to the existing sleepers and rails using mechanical steel fastening elements.** Noise reduction ranging from 1,5 to 3 dB are reported, depending on the relative position of the noise source with respect to receivers.

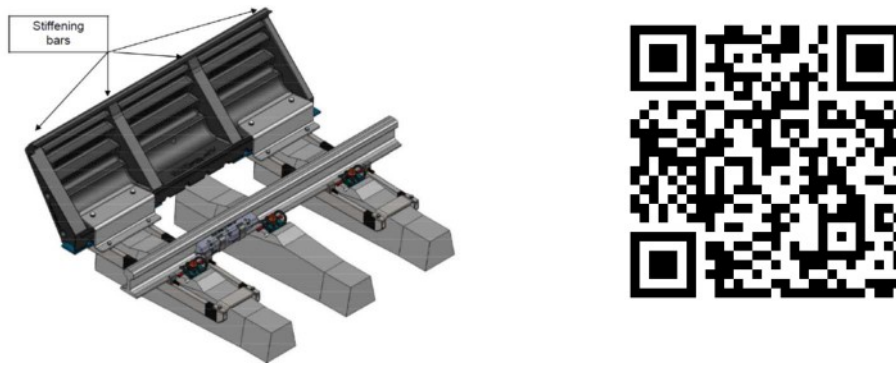


Fig.1.3: LHNB by Strail in built-in condition (schematic). Video on installing procedure (QR code)

**In this proposal, this solution will be upgraded and made more sustainable by using recycled material, shaped to get enhanced sound absorbing performance.** The waste materials will be selected based on a preliminary sustainability assessment, which will consider the main KPIs used in international standards like EN 15804. The improved absorbing performance will be achieved by implementing the metamaterials technology, whose properties are independent of the material used and given solely by its shape. Enhanced sound absorption characteristics are important to reduce the sound energy bouncing between the train and the LHNB, which finally could come out and overcome the LHNB. In the design process, particular attention will be devoted to the structural and safety problems for securing the acoustic elements to rail tracks and overcoming the maintenance issues. Fatigue tests will be done on the new elements to demonstrate their fitness for purpose. Furthermore, since no method exists for measuring the acoustic performance of LHNBs, a method specifically tailored to LHNBs, will be developed. The method will be preliminary tested on the prototype and then applied to the implemented solution in the demonstration site. At the end of the project, the method will be proposed to CEN “Working Group on railway noise barriers” for standardization.

The solutions developed and tested in the laboratory at a prototypal stage will be implemented in a real test site (WP5), located in a densely populated area (Muratella (Rome), Italy), including both roads and railways at close distance (see figure 1.4). A road stretch of 1,9 km will be equipped with the new low noise pavement and a LHNB 200 m long will be installed along the railway line Rome – Fiumicino Airport.

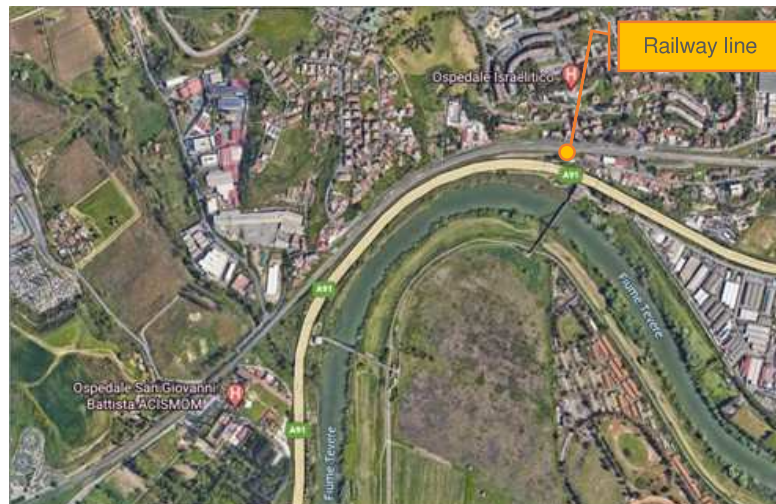


Fig.1.4: View of the pilot area (Muratella (Rome)) crossed by the A91 Motorway and the railway line Rome – Fiumicino Airport.

A design phase will precede the implementation phase, during which the methodology developed under WP2 will be applied to integrate, harmonize, and optimize the solutions proposed by roads and railway managers/owners in their respective Action Plans.

Impact and monitoring actions will follow the implementation phase to test the acoustical performance of the developed solutions, assess the beneficiaries at receiver locations, analyse the procedures prepared under WP2 and provide suggestions to fine-tune the process.



The final steps will be devoted to performing an accurate sustainability analysis of the solutions, as well as to paving the way for the future implementation, replication, and exploitation of the project results. To this end, WP7 involves the preparation of an action plan including competitive advantage considerations and market analysis, estimated return on investment, expected business models, competitiveness assessment.

To ease the developed technologies to reach the market with a competitive advantage, the new formulations of low noise pavements, as well as the LHNb will be submitted to a third-party validation process, namely the Environmental Product Declaration (EPD). With proof of performance credibility assured by independent evaluators, innovations can expect easier market access and/or a larger market share, with reduced technological risk for contracting authorities.

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## 1.5 Upscaling results of other EU funded projects

### Upscaling results of other EU funded projects *(n/a for concept note)*

*Explain if and how the proposal builds on or up-scales results of other EU funded projects.*

The LIFE SILENT project builds on the results of several past European and national projects:

**PERSUADE** - This is an EU funded project aiming at developing a poroelastic road surface (PERS), mainly made of rubber granules from recycled tyres, bound with a synthetic resin, such as polyurethane. PERS test tracks in Japan and Sweden have demonstrated that extreme noise reductions can be achieved (up to 12 dB(A)) in comparison with conventional dense asphalt concrete or SMA pavements. However, they have shown also inadequate durability. Therefore, despite the excellent performance in terms of noise reduction, they have never been used.

The LIFE SILENT project intends to take advantage of the PERSUADE project results to reduce the mechanical impedance of the road surface (lowering noise) and improve its lifetime by adding to bitumen functionalized cellulose fibres, whose effectiveness has been already tested at laboratory scale under the IASNAF project.

The results of other EU-funded projects, such as **LIFE NEREIDE** (where crumb rubber was mixed in the road surface), **LIFE C-LOW-N** (where the urban heat island effect was considered), and **LIFE E-VIA** (where the noise generation from electric vehicles was estimated), will be considered when developing the new road mixture. Despite the appreciable results achieved by these projects in terms of noise mitigation and pavement durability, further efforts are needed to improve low noise pavements LCC. ARPAT and UNIRC were members of these projects.

**LIFE SustainEuroRoad** targeting the drastic reduction of road construction and maintenance activities' effect on the environment in Europe. In the LIFE SILENT project attention will be paid to the emissions of toxic substances when paving the road surface. About this, in the IASNAF project it was shown that functionalised cellulose fibres are also able to absorb the volatile component of the bitumen (for example BTEX, i.e., Benzene, Toluene, Ethylbenzene and Xylene), especially during the hot stage of road paving, with the related consequences on safety and health of working crews, and to reduce the emission of petroleum components such as Polycyclic Aromatic Compounds (PAC), that were found to be carcinogenic for the presence of benzo[a]pyrene (BAP), benzo[a]anthracene, benzo[b]fluoranthene, chrysene and dibenz[a,h]anthracene.

The results of the LIFE SustainEuroRoad will be used in the design phase of the project to estimate the generation of toxic substances and to reduce greenhouse gas emissions attributable to road construction and maintenance operations.

**LIFE SNEAK - optimized Surfaces against Noise And vibrations produced by tramway track and road traffic.** This project aims at demonstrating the synergistic effect of low-noise pavements and train/rail-related strategies in mitigating noise and vibrations in urban environments. The LIFE SILENT project will also build on the LIFE SNEAK approach, as a base tool to set up a holistic approach for the management and integration of noise solutions from different transport owners and managers. In this proposal, the LIFE SNEAK approach will be exploited to involve the participation of citizens affected by noise, as well as of local authorities to harmonize noise mitigation strategies. MOPI and UNIRC are partners in this project.

**ADRIENNE and QUIESST** are the reference projects for the development of a new test method to measure the acoustic performance of low-height noise barriers (now included in the EN 1793-5 and EN 1793-6 standards) and to estimate their sustainability. UNIBO, WP leader of LHNb design in LIFE SILENT, was also one of the leading members of those well-known and fully deployed projects. Both the ADRIENNE and QUIESST projects will form the basis for developing a customized solution to accurately evaluate LHNb acoustic performance. Moreover, QUIESTT will provide solid models and

tools to estimate the sustainability of the developed solutions.

**LIFE HUSH.** This project is focused on strategies for homogeneous action plans, and it is addressed to solve the managerial problems that emerged from the publication of the European Directive on Environmental Noise 2002/49/EC. The LIFE SILENT project will build on the results achieved by LIFE HUSH by developing procedures to smooth the implementation process of Action Plans in complex environmental scenarios. ARPAT was one of the leading members of the LIFE HUSH project.

**LIFE DYNAMAP – Dynamic Acoustic Mapping.** The LIFE Dynamap project aimed to develop a dynamic noise mapping system able to detect and represent in real time the acoustic impact of road infrastructures. The system relies on the information given by low-cost sound level meters and weather stations. Data from sensors are processed to automatically update noise maps with a time frequency of 30 s, using advanced calculation algorithms implemented on a GIS general purpose platform. The system was implemented in Rome, along the motorway A90, and inside a significant portion of the city of Milan (IX District). In the LIFE SILENT project, the system will be replicated to automatically provide updated information on noise levels. The system will be also used to monitor the acoustic climate during the work phase. The LIFE DYNAMAP project was led by ANAS.

## 1.6 Complementarity with other actions

### Complementarity with other actions *(n/a for concept note)*

*Explain how the project is complementary to other regional, national or international initiatives/activities/projects. How will it integrate the results from these other actions?*

The LIFE SILENT project combines, interacts, and enhances the following regional, national and international projects:

**IASNAF – Innovative Asphalts with Natural Fibres.** This is a national project, funded by ANAS, also involving the participation of UNIRC and TEBAID. IASNAF aimed at improving the mechanical, functional, and environmental performance of low noise pavements by implementing advanced technological solutions, based on an innovative mix design, embodying modified cellulose fibres able to create physical-chemical bonds between asphalt binder and aggregates. In the IASNAF project, good results were achieved at a laboratory scale and only using natural fibres. In the LIFE SILENT project, the application of functionalized cellulose fibres will move from natural (broom) to waste materials (packaging and textiles). Besides, the new low noise pavement will be laid down on a real test site, to check its performance under traffic conditions.

**RFI and ANAS ACTION PLANS.** According to the European Directive on Environmental Noise 2002/49/EC, ANAS and RFI have drafted an Action Plan addressed to abate noise in critical areas by means of appropriate mitigation measures. In complex environmental scenarios, where multiple noise sources coexist, Action Plans should be harmonized, to integrate and optimize the solutions designed by single transport infrastructure owners/managers separately. In the SILENT project ANAS and RFI Action Plans will be analysed to find how these plans can be harmonized, thus complementing the lack of information coming from separate plans, such as: the contribution to the noise of other transport infrastructures; the total number of receivers affected by noise, that is different from the sum of receivers identified by single Action Plans; diverse accuracy in the estimate of noise levels due to various tools and digital models to simulate the environmental scenarios; inconsistencies in input data.

**APPLICATION OF A MINI SOUND PROTECTION WALL MADE OF FIBRE-REINFORCED HARD RUBBER MATS UNDER FATIGUE STRESS ON RAILWAY LINES OF DEUTSCHE BAHN.** In this project, a new, low-height mini noise protection wall system (mSW) made of fibre-reinforced hard rubber mats was developed and tested by Strail for existing and new lines of Deutsche Bahn (German Railways). Regarding the material "fibre-reinforced hard rubber" there was no experiences or specifications in the relevant standards and guidelines for the application on railway lines of Deutsche Bahn. For this reason, KRAIBURG STRAIL GmbH & Co. KG commissioned a series of tests to create an expert's report on the behaviour of the actual mini sound protection wall under fatigue stress. The LIFE SILENT project will take advantage of this experience to define tests and reference values for the non-acoustic characteristics of LHNB (safety margins for fatigue, ageing, material scatter and temperature).

**SOPRANOISE.** This project, finished in March 2022, is funded by CEDR, the conference of European Directors of Roads, in the framework of the Transnational Road Research Programme Call 2018. Its primary objective is developing innovative quick and safe methods to easily characterize noise barriers in-situ, with the clear intention to submit those methods to CEN for standardization. The aim of this research is also to provide key information to infrastructure owners and managers on how to plan,

procuring and maintain noise barriers over the whole lifetime. The LIFE SILENT project will complement the developed measurement method with a brand-new method purposely developed for low-height noise barriers (see WP4). Moreover, the LIFE SILENT project will complement the SOPRANOISE project with a specific guide on how to plan, procure and maintain low-height noise barriers over the whole lifetime. UNIBO is one of the WP leaders of the SOPRANOISE project.

**PRIN 2017 Prot. 2017T8SBH9.** This project, still ongoing, is funded by the Italian Ministry for University and Research on the theme “Theoretical modelling and experimental characterization of sustainable porous materials and acoustic metamaterials for noise control”. Metamaterials are composite materials created artificially that present extraordinary physical properties designed for specific applications and made shaping common materials, e.g., by additive manufacturing. The main purpose of the research - which is highly interdisciplinary - is the design and characterization of new sustainable acoustic metamaterials to be used as sound-absorbing and/or sound-insulating panels able to absorb/reduce sound in the frequency range 50-5000 Hz. The LIFE SILENT project will take advantage of this experience to design an innovative LHNB having enhanced sound absorption properties without using non-durable porous materials. UNIBO is the coordinator of this PRIN project.

## 1.7 Synergies and co-benefits with other LIFE sub-programmes

### Synergies and co-benefits with other LIFE sub-programmes *(n/a for concept note)*

*Describe synergies with other LIFE sub-programmes (Nature and Biodiversity, Circular Economy and Quality of Life, Climate Change or Clean Energy Transition). Describe spillover effects (co-benefits) in addition to those targeted by the project. If possible, quantify the contribution.*

*Identify the activities/tasks that address these policy objectives of other LIFE sub-programmes.*

The LIFE SILENT project aims at the sub-programme **Circular Economy and Quality of life**. No close links with the other sub-programs have been identified, but some indirect spill over effects can be attributed to the use of recycled materials for the implementation of low noise pavements and LHNB. Specifically, the use of recycled materials reduces virgin materials consumption and consequently the amount of CO<sub>2</sub> needed for the related extraction and manufacturing. Furthermore, the pavement mixture will be designed to reduce CO<sub>2</sub> and other volatile organic compounds and polycyclic aromatic compounds emissions. These aspects can be indirectly bound to the sub-programme **Climate Change Adaptation and Mitigation**, as precursors to prevent temperature rise. It is estimated to reduce the emission of CO<sub>2</sub> by at least 17% with the implementation of the proposed solutions (see WP3 for details).

Likewise, some other indirect effects can be linked to the sub-programme “**Clean Energy Transition**”, in terms of **increased energy efficiency**. This effect can be also attributed to the new SILENT low noise pavement, which is expected to be more durable (i.e., adding “treated” waste cellulose increases the expected lifetime of the low noise surfaces) compared to traditional low noise wearing courses (i.e., without adding functionalized and hydrophobized fibres). Despite the negligible variations in terms of energy per life cycle, the extended duration of the new surface implies an annual energy reduction by about 16%. In other terms, the construction process of the new low noise pavement is expected to be more energy efficient.

More evident is the contamination between the topics of the sub-programme **Circular Economy and Quality of Life**:

- *Circular economy and waste.* As already mentioned, the implementation of the proposed solutions involves the use of recycled materials, namely rubber from exhausted tires, textiles, and packaging. Specifically, waste material from the textile and packaging sectors will be used to extract and produce functionalised cellulose fibres (FCF), like those proposed to improve road pavements durability. **2 kg of waste FCF per ton of asphalt material is needed (about 2 tons per kilometre for a 10 m wide road). Likewise, 20 kg of end-of-life tyres per ton of asphalt concrete is needed to achieve the necessary amount of crumb rubber (CR). They correspond to about 14 tons of CR per kilometre of road, corresponding in total to 14+2=16 tons of waste material.**
- *Circular economy and the Environment.* The LIFE SILENT project aims at reducing the use of natural resources (oil derivatives and stone materials) and promotes the use of recycled content in new products (low noise pavements and LHNB). This approach allows extending the lifetime of natural resources (secondary life). Furthermore, some of the recycled materials, i.e., cellulose fibres, are also used to extend the durability of the manufactured products, thus reducing the LCC of the proposed solutions as well.
- *Air and chemical.* In terms of air quality, the contribution of the LIFE SILENT project can be tied



up to the specific objective of reducing the emissions of volatile organic compounds (VOC) and polycyclic aromatic compounds (PAC), especially during the hot stage of road paving. Cellulose fibres, like those embodied in the asphalt mixture to improve the mechanical and functional performance of the low noise pavement, are also proved to absorb the volatile components of bitumen (for example BTEX), and to reduce the emission of petroleum components, such as Polycyclic Aromatic Compounds (PAC), that were found to be carcinogenic for the presence of benzo[a]pyrene (BAP), benzo[a]anthracene, benzo[b]fluoranthene, chrysene and dibenz[a,h]anthracene. The reduction of those emissions also leads to the reduction of harmful effects and health risks for road workers.

More generally, the LIFE SILENT project contributes to the implementation of safe and sustainable-by-design solutions. The overall sustainability is ensured by minimizing the whole environmental footprint on climate change, resource use and ecosystem from a life cycle perspective.

## 1.8 Synergies and co-benefits with other EU policy areas

### Synergies and co-benefits with other EU policy areas *(n/a for concept note)*

Describe the synergies and positive spillover effects (co-benefits) with other EU policy areas (for example agriculture, health, civil protection, jobs and growth, etc.). If possible, quantify the contribution.

Identify the activities/tasks that address these other EU policy objectives.

The SILENT project can be linked to other EU policy areas, mainly:

- Public health and quality of life;
- Justice and fundamental rights;
- Competitiveness and economic growth;
- Standardization.

#### Public health and quality of life

Both low noise pavements and LHNB have the main objective to reduce the noise exposure of people living close to road and rail infrastructures. Exposure to prolonged or excessive noise has been shown to cause a variety of health problems ranging from stress, poor concentration, productivity losses in the workplace, and communication difficulties and fatigue from lack of sleep to more serious issues such as cardiovascular disease, cognitive impairment, tinnitus, and hearing loss.

More than 100 million people in Europe are exposed to harmful levels of environmental noise pollution (see Table 1.1). The major proportion of the people affected live in urban areas. This figure corresponds to the number of people above the END reporting thresholds (i.e.  $L_{den} \geq 55$  dB and  $L_{night} \geq 50$  dB). This means that in reality there may be more people exposed to unhealthy noise levels than those that can be assessed with the current END thresholds.

Table 1.1: Number of people exposed to harmful noise levels. Source: <https://www.eea.europa.eu>

Source		Number of people exposed to harmful noise levels (millions)		
		Inside urban areas	Outside urban areas	Total
Road	$L_{den}$	81.7	31.1	112.8
	$L_{night}$	57.4	21.1	78.6
Rail	$L_{den}$	10.7	10.9	21.6
	$L_{night}$	8.1	9.0	17.1

The WHO environmental noise guidelines (WHO Europe, 2018) also provide exposure response functions for health outcomes, including annoyance and sleep disturbance, as well as risk ratios for cardiovascular health outcomes. These provide the basis for quantifying the number of people suffering from specific health effects due to noise.

The range and magnitude of negative health impacts of noise in Europe are significant, with many suffering effects such as annoyance, sleep disturbance, ischaemic heart disease, mortality due to ischaemic heart disease and even learning impairments in children (see Table 1.2). People in urban areas are most badly affected, and the main source contributing to negative health effects is road traffic

noise.

Long-term exposure to environmental noise is estimated to contribute to 48.000 new cases of heart disease and 12.000 premature deaths every year in Europe. In addition, 22 million people suffer high annoyance, and 6.5 million people suffer high sleep disturbance. It is estimated that more than 12.000 school children suffer learning impairments due to aircraft noise (Source <https://www.eea.europa.eu>).

*Table 1.2: Estimated number of people suffering from various health effects due to environmental noise in 2017.*

	High annoyance	High sleep disturbance	Ischaemic heart disease	Premature mortality (*)	Reading impairment in children
<b>Road</b>					
Inside urban areas	12 525 000	3 242 400	29 500	7 600	
Outside urban areas	4 625 500	795 500	10 900	2 500	
<b>Railway</b>					
Inside urban areas	1 694 700	795 500	3 100	800	
Outside urban areas	1 802 400	962 900	3 400	900	

In terms of quality of life, the WHO has also quantified the burden of disease from environmental noise using the DALY (Disability Adjusted Life Years) indicator. The DALY estimates how much disease affects the life of the population by combining the burden from:

- mortality, in terms of years lost because of premature death due to disease;
- morbidity, in terms of years of life lived adversely affected by disease.

One DALY corresponds to one lost year of healthy life, attributable to morbidity, mortality, or both. The sum of DALYs across a population provides a measurement of the gap between actual health status and an ideal situation in which the entire population lives to an advanced age, free of disease and disability.

The most important causes of disability due to environmental noise are annoyance and sleep disturbance. High annoyance accounts for 30-50 % of all years lived with disability, and high sleep disturbance account for 20-55 %, depending on the source and disability weight used (Table 1.3). While annoyance and sleep disturbance are not severe health outcomes, the large number of people affected, illustrated using DALYs, demonstrates the relevance of this indicator.

As stated in the above figures, synergies with the LIFE SILENT project are evident, as the proposed solutions and noise management methods will help to reduce the noise impact on the population, especially in urban areas, where the effectiveness of noise mitigation measures become more critical and uncertain. With noise mitigation measures acting directly on the source, the effectiveness uncertainty can be drastically reduced, and noise levels decreased by at least 3 up to 5 dB.

*Table 1.3: Estimated number of DALYs due to road and rail in areas covered under the END.*

Source	Health effect	Years lived with disability	Years of life lost	DALYs/year
Road	High annoyance	172 000-343 000	0	172 000-343 000
	High sleep disturbance	78 000-311 000	0	78 000-311 000
	Ischaemic heart disease	15 000	117 000	131 000
Rail	High annoyance	35 000-70 000	0	35 000-70 000
	High sleep disturbance	31 000-123 000	0	31 000-123 000
	Ischaemic heart disease	2 457	18 643	21 100

### Justice and fundamental rights

Article 31 of the EU Charter of fundamental rights states that “Every worker has the right to working conditions which respect his or her health, safety and dignity”. In the LIFE SILENT project, special attention has been paid to health-related issues for workers, particularly during the laydown of the low noise pavement and the installation/maintenance of the low-height noise barrier.

As for the low noise pavement, the integration of functionalised cellulose fibres in the upper layer allows

reducing the emissions of volatile organic compounds (VOC) and polycyclic aromatic compounds (PAC), especially during the hot stage of road paving. Cellulose fibres are proved to absorb the volatile components of bitumen (for example BTEX) and to reduce the emission of petroleum components, such as PAC, that was found to be carcinogenic for the presence of benzo[a]pyrene (BAP), benzo[a]anthracene, benzo[b]fluoranthene, chrysene and dibenz[a,h]anthracene. The reduction of those emissions also leads to the reduction of harmful effects and health risks for road workers.

Besides, toxins and impurities in cellulose fibres, due to the original material, such as lead paint or spray cans, which could pass into the recycled product, will be entrapped into the asphalt, and strongly diluted in space and time in such a way that no effect will be released on the environment because of the gradual road's abrasion.

Moreover, Article 35 of the EU Charter of fundamental rights states that "A high level of human health protection shall be ensured in the definition and implementation of all Union policies and activities". This article is strongly bonded to the fundamental right to health and quality of life, as described in the previous subparagraph.

Finally, in the LIFE SILENT project, space will be given to women's participation in leading roles. This objective is bonded to article 23 of the EU Charter of fundamental rights. This article states that "Equality between women and men must be ensured in all areas, including employment, work and pay. The principle of equality shall not prevent the maintenance or adoption of measures providing for specific advantages in favour of the under-represented sex". In LIFE SILENT the equality of gender will be achieved by appointing a woman as project manager and 4 out of 9 WP package leaders. Increasing women's participation in the labour market contributes also to increasing growth and making a stronger economy in Europe.

### **Competitiveness and economic growth**

The coronavirus pandemic has hit the EU and other major economies severely. Both demand and supply sides of the world economy have been impacted significantly, with major disruptions. In response to this extraordinary shock, EU governments had put in place strict containment measures and planned a wide range of economic and financial policies to prevent the collapse of the economy and to protect businesses, jobs, and livelihoods. In response to this crisis the European Commission has delivered huge funding to boost the economic growth and competitiveness, mainly addressed to three main sectors: environment (including climate change issues), digitalization and energy.

The LIFE SILENT project is strictly linked to the first targeted sector: the environment. It will contribute to boosting the market of low-height noise barriers and consolidate the market for low noise pavements made with recycled material, dispelling any doubts about their safety and non-toxicity. Specifically, the market for low noise pavements could be exploited by improving their durability. Longer duration means lower costs, thus making low noise surfaces competitive with ordinary road pavements. This would lead to an extensive application of low noise pavements and to a reduction of more expensive noise mitigation measures solutions, such as traditional noise barriers. Indeed, KPMG (J. Klooster, "Cost-effectiveness of road traffic noise measures", The Hague: KPMG, 2005) indicates that low-noise asphalts can reduce investments in noise abatement measures by up to 80% compared to high noise barriers. Based on this assumption the potential market would be huge, covering in principle the range of major roads with traffic flow more than 3 Mil/year (see European Directive on Environmental Noise 2002/49/EC), equal to 154.593 km (source Eionet.eu), corresponding to a potential European market of more than 10 billion euros.

Likewise, growing demand for low-height noise barriers is expected from the railway sector, due to their potential in abating noise without impairing the landscape and obscuring the view of the neighbouring receivers. Because of the low height of these noise barriers great landscape integration is achieved as opposed to high walls. The target of the installation of LHNB includes all the urban areas densely populated in different countries where track noise is an issue and there is a need for a solution that has a minimal visual impact on the surroundings. A market potential of more than 7.5 billion euros is also expected for low-height noise barriers, corresponding to 23% of the total European mapped railways (45.609 km, source Eionet.eu). Moreover, the proposed LHNB are made with a high percentage of crumb rubber coming from the recycling of waste tyres, thus contributing to preserving the environment and boosting a circular economy implementation.

In the LIFE SILENT project competitive advantage considerations and market analysis, competitiveness assessment, expected business models, go-to-market strategy and estimated return on investment will be carried out under WP7, thus contributing to defining the market potential of the developed solutions.

To ensure the future implementation of the SILENT solutions, an Action Plan will be drafted to guarantee fruitful sustainability of the project results, with the main challenge to find a way for achieving a sustainable competitive advantage over the other competing solutions in the target market. As such, quantitative and qualitative assessments will be carried out to investigate the target markets, the go-to-market strategies, and the business models already available as well as to estimate a return on investment. The market analysis will focus on updating the initial analysis of the reference market and

related segmentation (including geography, budget profile, habits, and preferences, etc.), constantly updating the competitor landscape (players, products, positioning, distribution, pricing), identifying strategies to launch a product/solution on the market with a roadmap, indicating the penetration strategies, sales channels, etc. Finally, an overall business plan will be prepared with the expected investments, operating costs, and revenues. The results of the business planning process (i.e., breakeven point, return on investment) will be used to interpret the validity and financial sustainability of the business model identified.

In the LIFE SILENT project attention will be also paid to the issue of youth unemployment. Each beneficiary will undertake to include young researchers in the project to facilitate their insertion into the job market.

### Standardization

The European Commission has published a roadmap for standardization, open since February 2021. It is a response to the need to be more assertive and strategic at the international level and seeks to better respond to standardisation needs arising from the green and digital transformation of the EU's industrial ecosystem. Standards will help manufacturers to reduce costs, anticipate technical requirements and increase productive and innovative efficiency. They also help to remove trade barriers, support regulatory convergence at the international level and avoid the emergence of protectionist measures. This would bring EU industry and businesses to establish worldwide partnerships and sell their products or services globally.

In the LIFE SILENT project, the need for standards and regulatory measures is highlighted and pursued in WP 2 and WP 8.

In WP 2 an operative methodology to support the coordination and implementation of noise mitigation measures of different nature and types from a plurality of subjects, like those included in the project proposal (low noise pavements and low-height noise barriers), will be proposed to ensure integration of the planned solutions and optimal results, both in terms of effectiveness and efficiency.

The methodology will be promoted and proposed for transposition to the Italian Ministry of the Environment and Energy Security and EC, as well as to the Italian Standardization Body UNI.

In WP8, a standardization proposal for the characterization of LHNB will be prepared, based on the method developed under WP4. The proposal will be submitted to the national standardization bodies of at least Italy (UNI), Germany (DIN) and Spain (UNE) to be further submitted to CEN by the national representatives in CEN/TC256/SC1/WG40 (noise barriers for railways) and possibly in CEN/TC226/WG6 (road traffic noise reducing devices).

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## 2. IMPACT

### 2.1 Ambition of the impacts

#### Ambition of the impacts

*Identify and quantify the effects of the project (during the implementation and up to 5 years after its end).*

*Be specific and provide only information about impacts that are a result of your project. The impact of other projects should not be taken into account.*

*Wherever possible, use quantified indicators and targets.*

**Note:** *In addition to the description above, for stage 2 (full proposals) include quantified indicators in Part C of the application forms (both horizontal KPIs for the LIFE programme as well as any specific KPIs relevant to the proposal). Ensure correspondence between Part B and Part C.*

In this paragraph impacts are broken down into three sections, corresponding to the main objectives of the project, namely:

- Low noise pavements;
- Low-height noise barriers;
- Procedures for managing and implementing noise mitigation measures in complex environmental scenarios.

#### Low noise road pavements

- Impact on the acoustic performance: it is expected to achieve a noise reduction of 4 dB by acting on generation factors (dependence of noise on texture and gradation) and ancillary effects (e.g., the addition of crumb rubber). This would lead to a CPX level (average value) ≤



86±1 dB(A) at 50 km/h and CPX level ≤ 86±2 dB(A) in each measurement section. It is worth mentioning that the core criterion for low-noise pavement of the EU GPP Criteria for Road Design, Construction and Maintenance, 2016 EUGPPC, is LCPX<90 dB(A) at 50 km/h.

- Impact on durability: by acting on skeleton and additives (e.g., functionalized cellulose fibres), it is possible to increase the durability of the low noise pavement by 20% with respect to a baseline of 10 years under average boundary conditions (e.g., traffic).
- Impact on circular economy: the low noise pavement will integrate recycled materials, mainly crumb rubber and cellulose fibres from packaging waste. At least 16 tons of recycled material per km for a 10 m wide road are foreseen to be used (i.e., about 14 kg/km for CR and the remaining for functionalized fibres), corresponding to 205 m<sup>3</sup> of waste saved. Therefore, being the road stretch 22 m wide and 1,9 km long, 66,88 tons of recycled materials are foreseen to be used in the pilot area. This is possible by acting on the “glue” (binder and mastic). As for crumb rubber, it should be noted that in Italy a large number of end-of-life tyres are available (about 350 tons/year); the same can be stated about cellulose fibres, being 3.5 tons/year the amount of wastepaper gathered. Therefore, no shortage of recycled materials is expected.
- Impact on carbon footprint: by acting on the durability of the low noise pavement it is possible to reduce the carbon footprint by 17% (with respect to common frictions courses and under identical boundary conditions). This corresponds to a decrease of CO<sub>2</sub> per km and per year of about 420 kg.
- Impact on emissions: due to the use of functionalized cellulose fibres it is possible to reduce polycyclic aromatic compounds (PAC) and volatile organic compounds (VOC). In more detail, it is possible to reduce VOCs by 45% with respect to a baseline value of about 140 mg/m<sup>3</sup>, according to Cui et al, 2020 10.1016/j.jclepro.2019.118757, for baseline; Tursi et al, 208, 2019, 2020 (doi: 10.1016/j.chemosphere.2018.03.044; 10.1016/j.jhazmat.2019.04.022; 10.3390/w12113154)
- Impact on cost: by increasing the durability of the low noise pavement, the net present value of the pavement can be reduced. It is expected a cost decrease by 14% per effective year of life.

#### Low-height Noise Barriers (LHNB)

The impact of the newly developed LHNB will touch different aspects, as detailed in the following:

- Impact on environmental sustainability: recycled rubber will be used to build the acoustic elements of the new LHNB, thus contributing to feeding the virtuous path of the circular economy. A percentage of 85% of recycled materials on the total amount of an LHNB element is expected, corresponding to 205 kg/km.
- Impact on social acceptance: the reduced visual impact of LHNB compared to classical (high rise) noise barriers is a factor related to the social sustainability of noise mitigation measures. A social acceptance at least doubled with respect to traditional noise barriers can be easily reached.
- Impact on the acoustic performance: the new LHNB will be shaped according to the emerging acoustic metamaterial technology (see Section 1.1), to give an enhanced acoustic performance. The project ambition is to increase the single-number rating DL<sub>α</sub> (ref. rail noise spectrum as per EN 16272-3-2) of the internal surface (train side) of the LHNB by 3 dB, corresponding to halving the reflected sound energy, with respect to the standard Strail prototype (full reflecting surface). This will reduce the sound energy bouncing between the train and the barrier, which finally overcomes the barrier. Moreover, also considering the diffraction effect on the top edge an overall insertion loss of 5 dB can be reached with a barrier height not greater than 0,5 m. This means increasing the IL by 2 dB(A) compared to the baseline of the existing Strail prototype. This result can't be achieved by traditional noise barriers of the same height, which must be located far more distant from the railway tracks (at least 4 - 10 m). This implies that traditional noise barriers must be higher (4-7 m) and thus have strong foundations to withstand wind load, increasing costs and visual impact. It should be noted that the noise level reduction depends on the distance of receivers from the noise source. Consequently, it is not possible to attribute a single value of noise reduction to the LHNB. The effectiveness of the LHNB will be evaluated by comparing noise levels at a fixed distance, as explained in Section 1.1, as well as at selected receivers before and after its implementation (see WP 6)
- Impact on the LHNB durability: by implementing sound absorption properties with metamaterials, it is possible to prolong the lifetime of the noise barrier. Indeed, low-height noise barriers equipped with porous materials show a shorter lifetime due to a rapid deterioration of their acoustic properties caused by dirt and dust. Furthermore, the solutions developed and tested in laboratory at a prototypal stage will be implemented in a real test site (see WP5), located in a densely populated area, and regularly monitored for 3 years after the end of the project. A working life of at least 15 years is expected.

- Impact on acoustic test methodology: while for testing the acoustic performance of classical noise barriers two comprehensive sets of standards exist (EN 1793 for roads and EN 16272 for rails) no method exists for measuring the acoustic performance of an LHNB. The project ambition is to implement and apply a new test methodology, specifically developed for LHNB, relying on unpublished research by UNIBO (follow up of the SOPRANOISE project after its end). This methodology will be presented in a report and proposed to CEN for standardization at the end of the project.
- Impact on maintenance issues: the proposed new LHNB will be made of a few lightweight elements; with a suitable design the impediment to normal maintenance work can be minimized, e.g., studying a specific system for easy reclining or removing the LHNB when necessary, without the use of heavy equipment and in a short time. The project ambition is to exceed the installation speed of classical noise barriers by several times. It is expected to reach an installation speed of 10 LHNB meters/hour based on a team of 8 workers (excluding all ballast work and material transport to the site).
- Impact on safety issues: classical railway noise barriers are tested for resistance to fatigue due to repeated passages of trains, causing a pressure/suction shock wave, according to EN 16727-2-1. For LHNB such a testing standard does not exist. The project ambition is to adapt the same test procedure to LHNB and to pass the test with 4 Mil cycles at 2 Hz under a maximum load 2.5 kN/m<sup>2</sup>.
- Impact on the market of noise control technologies: WP7 involves the preparation of an action plan including competitive advantage considerations and market analysis, estimated return on investment, expected business models, competitiveness assessment. The new LHNB could be a breakthrough product, permitting reasonable noise abatements at reduced costs in sites where traditional noise barriers, 3-4 m high, cannot be installed due to lack of space, strong visual impact, opposition by the neighbour population. Considering that LHNB are cheaper than traditional noise barriers (lower height and no foundations) and benefits are higher, due to a more effective reduction of rolling noise, a higher benefit/cost ratio by at least 30% can be expected.
- Impact on circular economy: the LHNB will integrate recycled materials from dismissed tyres. At least 205 tons of recycled material per km for a 0,5 high LHNB are foreseen to be used, corresponding to 2.630 m<sup>3</sup> of waste saved. Therefore, as being the LHNB for the pilot area 200 m long, the estimated amount of recycled material is 41 tons. The rubber compound used to produce the LHNB is made of recycled part of natural rubber (NR) and synthetic rubber (styrene-butadiene rubber-SBR) added with virgin rubber to increase mechanical resistance of the outer surface of the product. Natural rubber is a natural material that is derived from the latex sap of rubber trees, while SBR is a synthetic rubber that is made by combining styrene and butadiene. Natural rubber is known for its excellent elasticity, resilience, and abrasion resistance. It is also highly flexible and has good tear strength. SBR is generally more resistant to chemicals than natural rubber. A minimum content of both NR and SBR is currently fixed in the production process. To check the amount of recycled rubber used, a sample of rubber compound is taken, and a gravimetric method is applied, which involves weighing the sample of rubber before and after burning it to determine the amount of carbon black present. This procedure is part of production quality checks according to DIN EN ISO 9001 standard. For product placed on the market a declaration is provided to state the product has undergone quality control.  
Furthermore, when purchasing the rubber compound the supplier will be asked to provide a statement on the percentage of recycled material present in the compound.

Procedures for managing and implementing noise mitigation measures in complex environmental scenarios.

The LIFE SILENT project involves the development of an operative methodology to support the coordination and implementation of noise mitigation measures of different nature and types, like those included in the project proposal (low noise pavements and low-height noise barriers) from a plurality of subjects, to ensure integration of the planned solutions and optimal results, both in terms of effectiveness and efficiency. This is to ensure the coordination of the action plans drawn up by the companies and bodies managing public transport services or related infrastructures with the action plans of the agglomerations. In this way, the authority concerned (Local authority or the Ministry for the Environment and the Energy Security on a case-by-case basis) verifies with a specific provision the coherence and possible synergies between the various types of actions and interventions on the territory and establishes the necessary prescriptions.

Therefore, to the newly developed procedures can be attributed a series of benefits, impacting on the following stakeholders and issues:



- Impact on stakeholders (regions, municipalities, infrastructures owners, NGOs, citizens): the procedures will provide a clear guideline to the implementation of the legislative requirements related to the preparation of Action Plans in complex environmental scenarios. This initiative might potentially affect 34 Italian agglomerations and on a larger scale, the whole bunch of European cities obliged to comply with the European Directive 2002/49/EC on Environmental Noise, i.e., 529 urban agglomerations. However, urban agglomerations are not the only environments where different transport infrastructures are contemporary presents. This situation often occurs even in suburban areas when the main roads and railways are built side by side or cross each other.
- Impact on transport infrastructures owners/managers: the availability of a clear guideline on the coordination and implementation of synergistic solutions in complex environmental scenarios will provide, useful support also to transport infrastructures owners and managers. Noise mitigation measures can be optimized, thus leading to costs reduction on several fronts: data input (cartography and general information), design, execution of works and maintenance. For transport infrastructures that are built side by side, this is expected to reach a cost reduction by at least 50%.
- Impact on citizens living in the pilot area of Muratella (Italy): in the pilot area of Muratella, about 159 dwellings (including two hospitals and two schools) with 19.769 receivers (including residents, students, hospital staff and patients) are exposed to Lden levels greater than 55 dB(A). Since the developed solutions (a low noise pavement 1,9 km long and a low-height noise barrier 200 m long) uniformly influence the impacted area, it is estimated that the whole receivers are expected to be positively affected by the implemented measures. Therefore, this will result in a reduction of the number of people exposed to Lden levels greater than 55 dB(A) by 12%, corresponding to 2.464 people.
- Impact on awareness-raising and solutions acceptance: citizens living in the pilot area will be invited to participate in the design phase of the planned mitigation measures (co-design). In this way, it is expected to reach greater acceptance of the proposed solutions by the resident population. Furthermore, the implementation of the Dynamap system will provide updated information on the noise impacts using easily understandable indicators (developed under the LIFE HARMONICA project and then adopted by the LIFE DYNAMAP project), before (to define the noise impact baseline), during (to monitor noise levels in the construction phase) and after the implementation of the proposed solutions (to check the achievement of the targeted noise values).

## 2.2 Credibility of the impacts

### Credibility of the impacts

*Show the steps of your calculations and base yourself on the activities mentioned in your work plan.*

*Justify and substantiate the baselines, benchmarks and assumptions you used, making reference to relevant publications, studies or statistics.*

*Try to use the same methodologies for calculating impacts (avoid using different methodologies for each partner, region or country).*

In this paragraph, as already done for the description of impacts, their credibility is broken down into three sections, corresponding to the main objectives of the project.

#### Low noise pavements

- *Impact on the acoustic performance:* the expected outcomes are based on calculations and supported by previous studies and projects linking material type, aggregate gradation, and surface texture to noise generation (Praticò et al., 2020, 2021, LIFE E-VIA, ISO10844).
- *Impact on durability:* the expected durability has been estimated considering the binder quality, the mixture modulus and fatigue cycles. These calculations are also supported by the experience gained within the IASNAF project with natural cellulose fibres.
- *Impact on circular economy:* the stated value is based on crumb rubber and cellulose fibres that has been estimated to be used to develop the new low noise pavement. This value is supported by the results achieved in the IASNAF project (for functionalized cellulose fibres, in the laboratory), and in the LIFE E-VIA project (for crumb rubber, in the laboratory and on site).
- *Impact on carbon footprint:* the calculated impact is indirectly linked to the expected lifetime of the low noise pavement and determined by taking into account the overall life cycle encompassing extraction and processing of the raw materials, manufacturing, distribution, use, recycling and final disposal. This calculation is also supported by literature data (Burati et al, Optimal procedures for quality assurance specifications).

- *Impact on emissions:* PAC and VOC reduction has been estimated by comparing their production during the laydown of the surface and their absorption due to the presence of cellulose fibres. Estimates are supported by literature and results achieved from the IASNAF project, where functionalised cellulose fibres were used. Indeed, recent studies [A] have shown that the quantity of VOCs measured during the on-site construction of hot mix asphalt, HMA, is about 140 mg/m<sup>3</sup>. If the quantity of VOCs emitted by the asphalt concrete is constant for at least two hours (laydown process and compaction prior to HMA cooling) and the air above the pavement (about two meters above the pavement) is replaced through natural ventilation every minute, the quantity of VOCs emitted (per square meter of pavement) is about 3x10<sup>4</sup> mg. On the other hand, based on [B] [C], the functionalized fibre can retain a quantity of VOCs of more than 50-200 mg per gram of fibre (based on boundary conditions). Given that the quantity of fibre contained in 1 m<sup>2</sup> of pavement is about 100 grams (thickness=0.03m), the quantity of VOCs that these fibres can absorb is about (0,5-2) x10<sup>4</sup> mg per square meter of pavement, that is to say, about 45% of the corresponding VOC emitted.

[A] Peng Cui, Gabriella Schito, Qingbin Cui, VOC emissions from asphalt pavement and health risks to construction workers, *Journal of Cleaner Production*, Volume 244, 2020, 118757, ISSN 0959-6526. <https://doi.org/10.1016/j.jclepro.2019.118757>.

[B] A. Tursi, A. Beneduci, F. Chidichimo, N. De Vietro, G. Chidichimo Remediation of hydrocarbons polluted water by hydrophobic functionalized cellulose (2018). *Chemosphere*, 201, 530-539, ISSN: 0045-6535, doi: 10.1016/j.chemosphere.2018.03.044.

[C] A. Tursi, F. Chidichimo, R. Bagetta, A. Beneduci. BTX Removal from Open Aqueous Systems by Modified Cellulose Fibers and Evaluation of Competitive Evaporation Kinetics (2020). *Water* 2020, 12(11), 3154; <https://doi.org/10.3390/w12113154>

- *Impact on cost:* the cost has been estimated by a rough LCC analysis based on the Net Present Value concept, considering the construction, operational and maintenance costs (Praticò et al, 2011, 10.1061/(ASCE)CO.1943-7862.0000264).

#### Low-height Noise Barriers (LHNB)

In order to evaluate the credibility of the impact of the newly developed LHNB, a classical noise barrier is assumed as a baseline. It needs foundations and is typically made of concrete panels covered with a fibrous absorbing layer or metal cassettes filled with fibrous material; the panels are inserted in metal posts (HEA or HEB). The typical height spans from 4 to 5 m. in some cases, the height of 7 m is reached.

- *Environmental sustainability:* based on the manufacturing experience of STRAIL, a minimum percentage of 85% of recycled materials on the total amount of an LHNB element is expected. The environmental sustainability of the new LHNB, made with recycled materials, will be assured by submitting it to a third-party certification process, namely the Environmental Product Declaration (EPD). In this way, the proof of the environmental performance credibility will be guaranteed by independent evaluators.
- *Social acceptance:* the social sustainability of LHNB can be assessed by questionnaires and dedicated meetings with the neighbouring populations. A social acceptance at least doubled with respect to traditional noise barriers can be easily reached.
- *Acoustic performance:* the new LHNB will be shaped according to the emerging acoustic metamaterial technology, to give an enhanced acoustic performance. The sound absorption coefficient ( $\alpha$ ) of the internal surface (train side) of the LHNB will be measured in the preliminary laboratory stage both for the base rubber and the rubber shaped according to the metamaterial models. The UNIBO research experience supports an expected increase of 3 dB overall (see also Cingolani et al. *Appl. Sci.*, 11(6), 2445 (2021)) with respect to a classical noise barrier made of concrete panels. Adding the diffraction effect on the top edge, which can be optimized too, an overall insertion loss of 5 dB can be achieved with a height not greater than 0,5 m and maybe overcome (see for example Jolibois et al. *Appl. Acoust.* 94 (2015); Nieuwenhuizen et al. in *Proc. Euronoise 2018*, Crete). The above-mentioned acoustic indicators are defined in chapter 3.5 "Impact monitoring and reporting".
- *LHNB durability:* it is sure that more knowledge on the durability of the proposed LHNB will be gained when the new LHNB will be implemented in a real test site (see WP5) and regularly monitored (on a 6 monthly basis) for 3 years after the end of the project. This will allow to determine the effectiveness of the implemented measures, including any deterioration of the acoustical performance over the project life span and after the end of the project. Many national authorities require a working life of noise barriers, according to EN 14389-2 or EN 16951-2, not smaller than 15 years under normal exposure conditions. Based on STRAIL experience with recycled rubber products, it is expected to reach and even surpass this target

with the new LHNB.

- *Acoustic test methodology*: a new methodology for testing the acoustic performance of LHNB will be implemented in the frame of the proposed project. This methodology will be presented in a report and proposed to CEN for standardization at the end of the project. The WP4 leader, UNIBO, has demonstrated experience in developing new measurement methods, as proved in the projects ADRIENNE, QUIESST and SOPRANOISE. Moreover, the head of the UNIBO team, prof. M. Garai, is the main drafter of the standards EN 1793 and EN 16272 and convenor of CEN/TC256/SC1/WG40.
- *Maintenance issues*: traditional noise barriers require periodic inspections and dedicated repair/maintenance contracts (see CEDR Technical Report 2017-02 State of the art in managing road traffic noise: noise barriers); cranes or other equipment are required to remove damaged elements when necessary. In practice, budget limitations may reduce repair/maintenance activities. Conversely, LHNBs can be installed and maintained within current track maintenance contracts, without heavy equipment, thus eliminating these costs and allowing a regular schedule of these activities. Based on STRAIL experience, it is expected to reach an installation speed of 10 LHNB meters/hour with a team of 8 workers (excluding all ballast work and material transport to the site), which is at least twice the average installation speed of classical noise barriers.
- *Safety issues*: the project ambition is to design a new LHNB robust to resistance to fatigue due to repeated passages of trains. The new LHNB will be checked not only at the design stage but also in the laboratory and on a real test site. In WP4 fatigue tests will be done by an independent laboratory, where the prototype LHNB will be submitted to repeated load cycles in order to check their structural integrity after thousands of cycles. Italian Railways require classical noise barriers to pass a fatigue test according to EN 16727-2-1 procedure C, for 4 Mil cycles at 2 Hz under a maximum load 2.5 kN/m<sup>2</sup>. The same resistance (flexural test) is planned for the new LHNB. Moreover, the LHNB installed in the pilot area will be periodically inspected to check its integrity.
- *Market of noise control technologies*: **a market breakthrough is expected not only because three national authorities (ANAS, RFI and ITALFERR) are involved in the project**, but also because during WP7 competitive advantage considerations and market analysis, estimated return on investment, expected business models, competitiveness assessment will be done. This will pave the way for the future implementation, replication and exploitation of the project results. Moreover, with the proof of performance credibility carried out in WP8 by independent evaluators, the proposed innovations can expect easier market access and/or a larger market share, with reduced technological risk for contracting authorities.
- *Impact on circular economy*: the stated value is based on the experience gained in the development of Mini Sound Walls (MsW) by STRAIL (Third Party), integrating a high percentage of recycled materials (85%).

#### **Procedures for managing and implementing noise mitigation measures in complex environmental scenarios.**

The credibility of the impact of the newly developed methods and procedures for setting up synergistic solutions in complex environmental scenarios is firmly based on the following facts.

- *Stakeholders' engagement*. The operative methodology proposed will support the coordination and implementation of noise mitigation measures of different nature and types, like those included in the project proposal (low noise pavements and low-height noise barriers) from a plurality of subjects, to ensure integration of the planned solutions and optimal results, both in terms of effectiveness and efficiency. The analysis of legislation and the specific lack of knowledge on the matter that needs further investigation will be carried out by ARPAT (BEN). ARPAT plays a relevant role in the National Network System for Environmental Protection in Italy, being also part of the EPON (Expert panel on noise) group of the European Environmental Protection Agency and of the Noise Working group of DG Environment.
- *Transport Infrastructure owners and managers engagement*. The definition of methods and procedures for setting up synergistic solutions in complex environmental scenarios will be tested in five different situations and locations in Italy using data already available from RFI and ANAS, managers of rail and road infrastructures at national level, with a strong experience on noise issues gained in 15 years of END action plans. The results will be validated by processing additional noise maps using common input data and tools (simulation software) for the same scenario and by checking the effectiveness and efficiency of the proposed solutions. This last step also involves the need for more in-depth investigations (further simulations) to check the possibility of optimizing (integrating) the planned solutions. To that end, UNIBO (BEN) will also undertake cost-benefit analysis to determine the relative efficiency of the

planned solutions with respect to the integrated solutions. Costs and benefits reported in RFI and ANAS Action Plans will form the baseline for the new estimates.

- *Impact on citizens.* Data on dwellings and inhabitants exposed to noise levels exceeding  $L_{den} = 55$  dB(A) have been extracted from RFI and ANAS reports on Strategic Noise Mapping issued in 2017, in compliance with the Environmental Noise Directive 2002/49/EC (see Special Annex B - Maps).
- *Awareness raising and solutions acceptance.* The expected outcomes can be linked to the experience gained in the LIFE HARMONICA project, where the effectiveness of communication and information to citizens using the Harmonica indicator was demonstrated, as well as on the experience gained in the LIFE HUSH project, where the co-design of solutions was successfully tested. Given the priority assigned to this city area, in the first place in the regional ranking list, a great interest among citizens is expected to be raised by this initiative.

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## 2.3 Sustainability of project results

### Sustainability of project results

*Describe your strategy to sustain the project's results after the EU funding ends. Consider the following aspects:*

- *How will the project impact be ensured and sustained? Which tasks will you carry out during the project to ensure that?*
- *Which parts of the project should be continued or maintained? How will this be achieved and which resources will be necessary?*

The LIFE SILENT project includes an Action Plan to support the maintenance and monitoring of the developed solutions (WP7). The Action Plan considers a maintenance programme aimed at keeping operative the SILENT solutions beyond the project duration and at monitoring their acoustic and non-acoustic performance by means of periodical measurement campaigns, to check for any decay of the expected performance.

Specifically, the decay of the acoustic performance of a road surface over time (acoustic ageing) is a very complex phenomenon related to mechanical, volumetric, and surface properties of the road pavement, as well as to the exposure to traffic loads and meteorological conditions. Therefore, additional measurements on rolling noise levels, traffic flows and meteorological conditions will be carried out by ANAS after the end of the project for three years, in order to achieve a more accurate estimate of the SILENT pavement durability.

These activities will be funded by ANAS within the framework of the research programme “Preserving the Environment”, meant to support innovation in the field of noise, air, water, soil and biodiversity. A team of skilled personnel from ANAS laboratories will be used to guarantee the reliability of test results. Test results will be also the subject of future publications.

Likewise, ex-post low-height noise barriers evaluations will be carried out, according to the method implemented under WP4, in order to measure the effectiveness of the LHNB over time. Periodic tests will be carried out by ITALFERR after the end of the project to check the LHNB durability. Visual inspections will be carried out by RFI as part of ordinary maintenance activities.

UNIBO will support data analysis and processing to check the LHNB behaviour over time and convey the results to the standardization bodies of Italy (UNI), Germany (DIN) and Spain (UNE), to be further submitted to CEN by the national representatives in CEN/TC256/SC1/WG40 (noise barriers for railways) and possibly in CEN/TC226/WG6 (road traffic noise reducing devices) (see WP8).

The methodology set up to support the coordination and implementation of noise mitigation measures in complex environments will be also promoted and disseminated after the end of the project to local authorities and transport infrastructures administrations by ARPAT, as a leading member of the National Network System for Environmental Protection in Italy. Furthermore, UNIBO, through its team leader prof. Massimo Garai, coordinator of the Acoustic and Vibration Committee for the Italian Standardization Body UNI, will promote the preparation of a standard for the management and implementation of noise mitigation measures in complex environments. ARPAT, as a member of the Noise Working group of DG Environment, will also convey the proposal to the Italian Ministry of the Environment and Energy Security and to the EC.

The Action Plan for future implementation of the developed solutions is part of the project deliverables (D7.2).

The sustainability of the developed solutions, in terms of environmental, social, and economic perspective is also the subject of WP7 (T.7.1 and T.7.2). Here, the technical aspects will be assessed



according to standardized methods and procedures: EN 1794-1/2 for the non-acoustic performance of road traffic noise reducing devices; EN 14389-2 for long term non-acoustic performance of road traffic noise reducing devices; EN 16727-1/2/3 for the non-acoustic performance of noise barriers and related devices acting on airborne sound propagation for railway track applications. The evaluation of environmental, social, and economic impacts throughout the life cycle of each technology will be made according to the Life Cycle Sustainability Assessment (LCSA), based on ISO EN 14040/14044, EN 15804 and the UNEP/SETAC Guidelines for Social Life Cycle Assessment of Products. The sustainability assessment will implement the Multi-Criteria Decision Making (MCDM) tools to benchmark the SILENT noise reduction solution against an Optimal Hypothetical Ideal Solution (OHIS) that will act as the baseline. The MCDM methodology will eventually lead to an Overall Sustainability Index (OSI) ranging from 0 to 1 that will allow measuring how the SILENT noise reduction solution is close to the OHIS (OSI=1).

Moreover, The LIFE SILENT project team will keep disseminating the project results after the end of the project. Dissemination activities will include participation in national and international conferences, as well as the preparation of papers on scientific journals and magazines. Furthermore, information on the developed solutions and the results achieved will be published on beneficiaries' websites and social media.

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## 2.4 Exploitation of project results

### Exploitation of project results *(n/a for concept note)*

*Do you foresee other ways of exploiting the project's results (e.g. utilisation in further research, in developing / creating / marketing a product or process, in creating / providing a service, in standardisation activities etc.)? Who are the targeted users?*

*For close-to-market projects: Describe the reference market: actual and potential market size, features of prospective customers and of their demand, competitors, market and regulatory barriers, etc. Explain the economic feasibility of the proposed solution comparing cost, price or other economic investment variables (e.g. payback period, net present value, etc.).*

**Note:** Don't forget to include the activities in the mandatory Work Package for Sustainability, replication, and exploitation of project results.

The LIFE SILENT project provides an exploitation strategy (see WP7) with the objective to maximise the benefits of the expected solutions beyond the end of the project. The consortium will work together to define a roadmap for the exploitation of the SILENT solutions and to pave the way for their commercialisation, through the study of potential regulatory barriers and constant monitoring of the market evolution.

In order to reach the market with a competitive advantage, the new products, developed at an advanced TRL stage (7-8), will be submitted to a third-party validation process, i.e., the Environmental Product Declaration (EPD) in WP8. With such credible proof of performance ensured, innovations can expect easier market access and/or a larger market share, with reduced technological risk for potential buyers.

The exploitation plan also includes a periodical update of the targeted economic sectors, the design of suitable business strategies for marketable SILENT outputs, the promotion of market awareness, the understanding, acceptance and, whenever possible, investment in exploitable results, through contacts with end-users, institutions or associations related to the project activities. By the end of the project, the consortium will have gathered enough experience with the SILENT solutions such that several exploitation strategies will be devised to support the SILENT solutions after the official end of the project. A final exploitation plan will be released by ANAS based on the inputs achieved from the consortium partners.

Further research activities are also part of the exploitation plan, with the aim to enhance the developed product features and fine-tune the manufacturing process (industrialization process), installation and maintenance procedures. More specifically, periodic measurements on the performance of the products will be carried out for three years after the end of the project, to track the trend and possible decay of structural, mechanical, and acoustic properties over time. Visual inspections for structural and mechanical performance will be carried out at first, followed by more detailed experimental assessments in case of critical response. Besides, noise measurements, according to the newly developed method for LHNB and using the CPX method for low noise pavements, will be periodically accomplished. During testing and maintenance activities, special attention will be paid to safety issues in accessing the test site to identify possible criticalities, refine the procedures and mitigate risks. These activities will require a joint effort by academics, manufacturers, and infrastructure managers.

In addition, standardization for both noise measurements and interoperability regulations of the newly

developed LHNb will be promoted, starting from the outcomes of WP8, where a proposal to the national standardization bodies of Italy (UNI), Germany (DIN) and Spain (UNE) will be submitted. This proposal will be further put forward to CEN by national representatives in CEN/TC256/SC1/WG40 (noise barriers for railways) and possibly to CEN/TC226/WG6 (road traffic noise reducing devices), for their wider acceptance at the European level.

Finally, in order to facilitate the future implementation of the developed solutions, UNIBO, through its team leader prof. Massimo Garai, coordinator of the Acoustics and Vibration Committee of the Italian Standardization Body UNI, will promote the preparation of a technical standard related to the management and implementation of noise mitigation measures in complex environments to exploit the results achieved in WP2. Likewise, ARPAT, as a member of the Noise Working group of DG Environment, will also convey the proposal to the Ministry of the Environment and Energy Security and to the EC.

## 2.5 Catalytic potential: Replication and upscaling

### Catalytic potential: Replication and upscaling *(n/a for concept note)*

*Describe the potential for the results to be replicated in the same or other sectors or places. Which factors might favour or limit the replication?*

*Describe the potential for the results to be up-scaled by public/private actors or through mobilising larger investments or financial resources. What is the coverage and size of the market? Who are the potential users of the results?*

*Describe the strategy and tasks to multiply the impact of the project (during implementation or afterwards). How will its main actions and results be replicated elsewhere?*

**Note:** Don't forget to include the activities in the mandatory Work Package for Sustainability, replication, and exploitation of project results.

### Geographical and financial catalytic potential

SILENT aims at developing innovative noise reduction technologies with high mass deployment potential for the EU transport sector. The key elements to achieve this ambition lie in:

1. modularity and flexibility of design, manufacturing, installation and maintenance of both noise reduction technologies, i.e. low noise pavements and low-height noise barriers;
2. compliance to EN standards, including green certification of the developed solutions, thanks to the Environmental Product Declaration (EPD), as well as the alignment to EU environmental initiatives such as the Circular Economy Action Plan of the Green Deal;
3. evidence-based impacts to society of the results generated during the project;
4. presence of economies of scale to ramp-up production at low manufacturing costs;
5. stakeholders' engagement and support from public institutions and policy.

This holistic approach is crucial to ensure benefits in the long term since each of the aforementioned factors favours the exploitation of the project results, but without synergy with the other aspects, might also hinder the overall deployment. For instance, design and test procedures aligned to Italian regulations rather than EN standards would, de facto, might limit the replication potential to only one Member State.

The replication potential of the LIFE SILENT project is enormous since the proposed technologies will provide an attractive solution to a general problem that is not single country related. In fact, at EU level it has been estimated that 113 million people are affected by long-term day-evening-night traffic noise levels of at least 55 dB(A). According to the World Health Organization, health impacts are likely to occur at this level. Moreover, in most European countries, more than 50 % of inhabitants within urban areas are exposed to road noise levels of 55 dB(A) or higher during the day-evening-night period (EEA report 'Noise in Europe', 2020). In turn, these EU-wide concerns can be translated into a significant demand that the market is currently unable to fill with conventional solutions. The main target of LHNb includes all urban areas where track noise is an issue and there is a need for a solution that has a minimal visual impact on the surroundings. **A market potential for LHNb of more than 7.5 billion euros has been estimated, corresponding to 23% of the total European mapped railways (45.609 km, source Eionet.eu). These figures further confirm the industrial interest behind noise reduction, including the market of materials, noise barriers producers, installation and maintenance services and logistics. In this context, RFI plays a major role, as manager of the Italian railway network.**

The LIFE SILENT project will also contribute to boosting the market of low noise pavements made with recycled material, dispelling any doubts about their safety and non-toxicity. Specifically, the market for low noise pavements could be exploited by improving their durability. Longer duration means lower



costs, thus making low noise surfaces competitive with ordinary road pavements. This would lead to an extensive application of low noise pavements and to a reduction of more expensive noise mitigation measures solutions, such as traditional noise barriers. Indeed, KPMG (J. Klooster, "Cost-effectiveness of road traffic noise measures", The Hague: KPMG, 2005) indicates that low-noise asphalts can reduce investments in noise abatement measures by up to 80% compared to high noise barriers. **Based on this assumption the potential market for low noise pavements is huge, covering in principle the range of major roads with traffic flow of more than 3 Mil/year (see European Directive on Environmental Noise 2002/49/EC), equal to 154.593 km (source Eionet.eu), corresponding to a potential European market of more than 10 billion euros. In this market area, the main stakeholders are road owners and managers, as well as the industrial sector linked to materials and pavement construction. Among them, ANAS, the Italian Road Network Administration, is expected to pave 4.145 km with low noise surfaces in the next 20 years, resulting in an estimated market of about € 684 M ANAS. As such, ANAS is the largest contracting authority in Italy and a reference point for regional and local road administrations, thus opening the market to a wider stakeholder's plateau. At the European level, ANAS is also a member of CEDR, the Conference of European Directors of Roads, and PIARC, where noise problems are constantly at the heart of technical committees and where strategies and solutions are shared, and demonstration projects are funded to consolidate their large-scale implementation.**

Nonetheless, besides technology manufacturers and public/private organisations that have an interest in upscaling and mobilising large investments to deploy noise reduction solutions, the ultimate and actual beneficiaries of the project results will be the EU society and economy. In fact, benefits related to noise reduction largely outweigh the mass deployment costs. For instance, it has been estimated that a 2 dB reduction in traffic noise would result in cumulative benefits (health, amenity, and abatement savings) over 20 years equal to € 326 billion, which is equivalent to increasing EU GDP by 0.1% (TNO, 2012).

The uptake of the SILENT solutions will be supported by a go-to-market strategy and estimated return on investment, which will be based on competitive advantage considerations and market analysis, competitiveness assessment and expected business models. The market analysis will focus on updating the initial analysis of the reference market and related segmentation (including geography, budget profile, habits, and preferences, etc.), constantly updating the competitor landscape (players, products, positioning, distribution, pricing), identifying strategies to launch the product/solution on the market with a roadmap, indicating the penetration strategies, sales channels, etc. This will lead to a business plan with the expected investments, operating costs, and revenues.

To thoroughly evaluate and validate the applicability of the LIFE SILENT solutions in the global market, 'Replication Sites' will be conceived during the project lifetime (WP2) to consolidate the project results not only from a technical perspective (WP6), but also in terms of socio-economic and environmental impacts (WP7), as well as to further test the applicability of the procedures developed under task WP2 related to the management of noise mitigation measures in complex environments. Replication Sites results will be considered as the baseline where "early adoption" of the LIFE SILENT solutions will be demonstrated.

**Replication sites will be implemented after the end of the project in additional five complex scenarios, as part of ANAS and RFI Action Plans (Road and Rail managers), to refine the developed technologies and their production process. The replication sites will be chosen among the critical sites emerged from the last cycle of the END (2024), with the highest priority, among a plethora of critical sites, for a total of 7.980 km. In the following table a preliminary selection of possible replication sites and their year of implementation is reported. Confirmation of the replication sites will be given only following the results of the last END cycle and the approval of the next business plan from RFI and ANAS.**

Country	Municipality	Road Name	Length (m)	People exposed Lden>55 dB(A)	Implementation Year
ITALY	BARI	SS16 ADRIATICA	4.517	42.732	2029
ITALY	SERAVEZZA	SS1 - AURELIA	4.014	23.046	2029
ITALY	CATANIA	SS 121 CATANESE	1.943	13.827	2029
ITALY	CETRARO	SS18 TIRRENA INF.	1.758	4.724	2029
ITALY	NOGARA (VR)	SS12 dell'Abetone e del Brennero	1.462	8.910	2029

An exploitation strategy will be finally set up for the project outcomes to maximise the benefits of the expected solutions. The consortium will work together to define a road map for the exploitation of the LIFE SILENT solutions and to pave the way for their commercialisation, through the study of potential regulatory barriers and constant monitoring of the market evolution. This will include dissemination activities (participation in conferences, articles, workshops, and visits to the experimental and replication sites) with the involvement of the main stakeholders, the support for standardisation in National and European Standard Bodies, the inclusion of the new products in the price list and GPP tools as

alternative to traditional noise mitigation measures.

**Societal catalytic potential**

The LIFE SILENT project also includes the development of a general methodology, applicable at European level, to address the management and implementation of noise mitigation measures in complex environments. This methodology will help local authorities and transport infrastructure owners/managers to coordinate and harmonize the implementation of noise mitigation measures in urban environments, where usually diverse noise sources of different nature and types coexist.

Currently, specific indications or prescriptions on such scenarios are not provided in the legislation. Therefore, the methodology developed in the project will at least establish a new national model of cooperation among local authorities and infrastructure owners/managers, which will be proposed for standardization after the end of the project.

Furthermore, ARPAT, as a leading member of the National Network System for Environmental Protection in Italy will bring the methodology to the attention of EPA, the network of the European Environmental Protection Agencies, as well as to the Noise Working group of DG Environment and the Italian Ministry of the Environment and Energy Security to promote its adoption at European level. Hopefully, this would lead to an upgrade of the current environmental noise legislation.

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**3. IMPLEMENTATION**

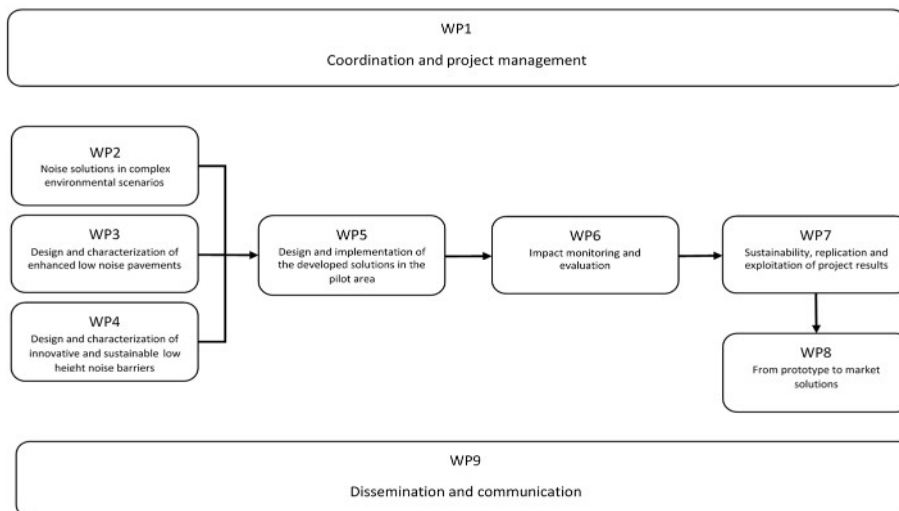
**3.1 Work plan**

**Work plan**

*Provide a brief description of the overall structure of the work plan (list of work packages or graphical presentation (Pert chart or similar)).*

The project is broken down into 9 work packages, covering methodological actions, in-lab tests, on-site implementation, validations, sustainability assessments and close to market initiatives:

- WP1. Coordination and Project management;
- WP2. Noise solutions in complex environmental scenarios;
- WP3. Design and characterization of enhanced low noise pavements;
- WP4. Design and characterization of innovative and sustainable low-height noise barriers;
- WP5. Design and implementation of the developed solutions in the pilot area;
- WP6. Impact monitoring and evaluations;
- WP7. Sustainability, replication and exploitation of projects results;
- WP8. From prototypes to market solutions;
- WP9. Communication and Dissemination.



**Timetable**

ACTIVITY	MONTHS																							
	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WP1 - ...																								
Task 1.1 - ...																								
Task 1.2 - ...																								
Task ...																								

**Timetable (projects up to 2 years)** (n/a for concept note)

Fill in cells in beige to show the duration of activities. Repeat lines/columns as necessary.

Note: Use the project month numbers instead of calendar months. Month 1 always marks the start of the project. In the timeline you should indicate the timing of each activity per WP.

ACTIVITY	YEAR 1			YEAR 2			YEAR 3			YEAR 4			YEAR 5											
	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M									
	1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46	49	52	55	58				
WP1 – COORDINATION AND PROJECT MANAGEMENT																								
Task 1.1 - Preliminary activities																								
Task 1.2 - Tracking project and project controls																								
Task 1.3 - Project communication and information																								

ACTIVITY	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				
	M 1	M 4	M 7	M 10	M 13	M 16	M 19	M 22	M 25	M 28	M 31	M 34	M 37	M 40	M 43	M 46	M 49	M 52	M 55	M 58	
WP2 – NOISE SOLUTIONS IN COMPLEX ENVIRONMENTAL SCENARIOS																					
Task 2.1 - Analysis of legislative requirements related to the preparation of action plans in complex environmental scenarios																					
Task 2.2 - Definition of methods and procedures for setting up synergistic solutions in complex environmental scenarios																					
Task 2.3 - Implementation of the developed methods and procedures in the pilot area																					
WP3 – DESIGN AND CHARACTERIZATION OF ENHANCED LOW NOISE PAVEMENTS																					
Task 3.1 - State of the art on highly sustainable and low-noise pavements																					
Task 3.2 - Development of procedures to recycle waste materials in low noise pavements																					
Task 3.3 - Design and test of sustainable long life formulations for low noise pavements																					
Task 3.4 - Preliminary sustainability																					

ACTIVITY	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5			
	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
assessment of the proposed formulation	1	4	7	10																
<b>WP4 - DESIGN AND CHARACTERIZATION OF INNOVATIVE AND SUSTAINABLE LOW HEIGHT NOISE BARRIERS</b>																				
Task 4.1 - State of the art on low-height noise barriers																				
Task 4.2 - Selection of waste materials to be recycled in low-height noise barriers and preliminary sustainability assessment																				
Task 4.3 - Design of low-height noise barriers with acoustic metamaterials for enhanced performance																				
Task 4.4 - Implementation of the low-height noise barrier prototype																				
Task 4.5 - Implementation of a new method for testing low-height noise barriers																				
<b>WP5 – DESIGN AND IMPLEMENTATION OF THE DEVELOPED SOLUTIONS IN THE PILOT AREA</b>																				
Task 5.1 - Assessment of the initial acoustic scenario and setting up of the																				

ACTIVITY	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5			
	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
mitigation strategies	1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46	49	52	55	58
Task 5.2 - Design of the mitigation measures																				
Task 5.3 - Implementation of the developed solutions in the pilot area																				
WP6 – IMPACT MONITORING AND EVALUATIONS																				
Task 6.1 - Testing and monitoring the acoustic and structural response of low noise pavements																				
Task 6.2 - Testing and monitoring the acoustic and structural response of low noise barriers																				
Task 6.3 - Ex-post monitoring of noise impacts at receivers																				
Task 6.4 - Analysis and optimization of the procedure developed in WP2 for managing noise mitigation in complex environment																				
WP7 – SUSTAINABILITY, REPLICATION AND EXPLOITATION OF PROJECT'S RESULTS																				
Task 7.1 - Identification of methods and indicators for sustainability analysis																				



ACTIVITY	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5			
	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	
Task 7.2 - Final sustainability assessment: ex-post evaluation of technical, environmental, social and economic issues	1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46	49	52	55	58
Task 7.3 - Action plan for future implementation, replication and exploitation of the developed solutions																				
WP8 – FROM PROTOTYPES TO MARKET SOLUTIONS																				
Task 8.1 - Environmental Product Declaration (EPD) for the new low noise pavement																				
Task 8.2 - Product Declaration (EPD) for the new LHNH																				
Task 8.3 - Proposal for the preparation of a standard for low-height noise barriers characterization																				
WP9 – COMMUNICATION AND DISSEMINATION																				
Task 9.1 - Participant's websites, newsletters and social media																				
Task 9.2 - Dissemination and Networking events																				

ACTIVITY	YEAR 1			YEAR 2			YEAR 3			YEAR 4			YEAR 5							
	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M					
Task 9.3 - Publications on journal and magazines	1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46	49	52	55	58

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For clarity, the detailed timetable per months, with milestones and deliverables, is reported in Annex C.

### 3.2 Stakeholder engagement

#### Stakeholders engagement

*Identify any key stakeholders outside the consortium that are required to ensure the success of the project. How will you mobilise them to contribute to your project activities or participate in these?*

*Annex Letters of support to demonstrate the type and level of commitment already secured (if any). (n/a for concept note)*

*For Nature and Biodiversity: If your project (or a part of it) depends on support of the competent authority or stakeholders, provide letters of support to show their commitment to the project (needed for full proposal, n/a for concept note)*

The project will mobilise the following stakeholders: Road and Rail Administrations, Local and National Authorities, Ministry of the Environment and Energy Security, Ministry of Infrastructure and Transport, Providers, Road and Rail Organizations, Universities and Research Centres.

The above-mentioned stakeholders will be invited to webinars and networking events arranged under WP 9, during which their active participation in the project issues will be solicited. Furthermore, structured sessions at the main international conferences will be organized, in order to attract their attention and consolidate their interest in the project.

Moreover, the city of *Rome* will actively participate in the project, by hosting meetings and events addressed to spread information about the project to local residents. As a matter of fact, the project involves the participation of the population resident in the pilot area during the design phase of the on-site demonstrators. Before and after the design of the noise mitigation measures, two meetings will be arranged with local citizens to share the design approach and gather their feedback. This meeting will serve to inform people about the developed solutions, whilst the second one to show them the designed measures. A third meeting will be arranged to inform about the results achieved. These events will be advertised on the project web pages, on social media and via press releases.

The LIFE SILENT project will involve at least the following main target groups:

#### Road and Rail Administrations

The main road and rail owners and managers will be involved as potential users and replicators of the solutions developed in the project. These include: the Italian Association of Motorway and Tunnel Concessionaires (AISCAT), CEDR (The conference of European Director of Roads), CER (the voice of European Railways), PIARC (World Road Association).

#### Local and National Authorities

Municipalities, Regions, Provinces, Transport and Environmental Councillors of Municipalities will be involved at a technical level, as the main subjects responsible for the activity of road and rail management and as policymakers, responsible for sustainable mobility strategies and environmental impacts control.

Specifically, local authorities, responsible for the preparation of Noise Maps and Action Plans for urban agglomerations with more than 100.000 inhabitants, will be invited to join dissemination initiatives and to replicate the developed solutions.

To spread information about the project as much as possible, ANCI, the Italian Association of Municipalities, will be directly involved as a main stakeholder. ANCI participation in the project is crucial not only to link and have access to all municipalities, but also to achieve technical and strategic support to boost the developed solutions.

The involvement of municipalities will be extended at the European level by inviting representatives of EUROCIITIES, the network of European cities, to join the initiative, as well as participating in meetings of the WG NOISE to present the project results. The involvement of EUROCIITIES is rather relevant, as being an entity potentially able to define technical and strategic recommendations on noise mitigation solutions. Invitations to disseminate the project results have been already sent by the WG NOISE chairs.

Among national authorities, the following entities will be invited:

1. Ministry of the Environment and Energy Security;
2. ISPRA, the Research branch of the Ministry of the Environment and Energy Security;
3. The Ministry of Infrastructure and Transport.

#### Companies

The project provides the involvement of companies active in the bitumen and road pavement with recycled materials and, more generally, in the recycling of waste materials. The topic of circular economy is one of the main leitmotifs of this project. Therefore, their involvement is very important not

only for dissemination activities, but also to achieve information on the market potential of the developed solutions (WP 7).

#### **Road and Rail Organizations**

Road and rail associations will be included in the stakeholders list in order to share knowledge on roads and rail transport and encourage discussion on a global scale.

#### **Universities and Research Centres**

In order to boost the discussion about the developed solutions, representatives of the academic world will be invited to technical dissemination events, to achieve suggestions, critical observations and recommendations.

#### **Coordinating beneficiary and beneficiaries of EU funded project on similar topics**

Since the beginning of the project, a networking activity will be promoted with other noise-related projects, such as LIFE NEREIDE, LIFE C-LOW-N, LIFE E-VIA, LIFE SNEAK, LIFE SustainEuroRoad, etc.

Project coordinators will be involved in LIFE SILENT activities and dissemination events in different ways according to their own interest in the project topics. Contacts will be kept over and beyond the lifetime of the project.

#### **List of support letters**

Some of the cited stakeholders have enthusiastically shown their interest in the project proposal by signing letters of support (see Annex A):

- The city of Rome through its Agency for the Mobility “Roma Servizi per la Mobilità (RSM)”;
- The Ministry of Infrastructure and Transport;
- Transport Infrastructure Ireland;
- ATECO Polymers;
- MENESTRINA bitumen provider;
- UNI Italian Standardization Body;
- PIARC, the World Road Association;
- ECOPNEUS, non-profit company for the tracing, collection, treatment and recovery of End of Life Tires (ELTs);
- AISCAT – Italian Association of Motorway and Tunnel Concessionaires.

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### **3.3 Impact monitoring and reporting**

#### **Impact monitoring, evaluation and reporting strategy** *(n/a for concept note)*

*Describe your overall approach to monitor and evaluate the impact indicators during your project. Ensure that you include specific tasks to monitor, evaluate and report impacts in the work plan (section 2 of this template).*

In the LIFE SILENT project actions will be progressively checked in order to verify their accordance with the originally defined project objectives and expected results. According to the MGA specifications, LIFE performance indicators (see WP1) will be evaluated and reported in the LIFE KPIs web-tool at the beginning and at the end of the project to assess the overall impact of the initiative. Regular updates on the status of the project will be provided through the Continuous Reporting Module, where progress in achieving milestones, deliverables, outputs/outcomes, critical risks, indicators, publications, communication activities, etc. will be tracked. Two official Progress Reports will be delivered at M18, and M48.

In addition, in WP6 a series of monitoring activities will be carried out to validate the project results and the impact of the developed solutions. Projects results will be validated by testing and monitoring the performance of the low noise pavement and LHNB built in the pilot area (see WP6), before and after their implementation. Ex-ante evaluations will be made on the existing road surface and at receivers to fix the baseline against which to assess the overall performance of the solutions. Ex-post evaluations will periodically reiterate the same type of assessment to determine the overall impact of the mitigation strategy and the effectiveness of the implemented measures, including any deterioration of the acoustical performance over the project life span and after the end of the project for three years to estimate their durability.

The impact of the developed solutions will be evaluated from two different perspectives:

- The physical impact, in terms of noise levels reduction;
- The sustainability impact, in terms of environmental, economic, and social impacts as a whole.

The physical impact will be assessed by measuring noise levels at receivers before and after the implementation of the developed solutions (see Task 6.3). Noise levels will be also compared to limit values imposed by the Italian legislation for roads and rails. Task 6.3 also provides for a social survey to assess the psychological and physiological response of local residents to noise, mostly in terms of annoyance and acceptance of the new solutions, by linking noise measurements to the subjective response of the inhabitants. Information related to the social acceptance of the solutions implemented in the pilot area will be collated by means of interviews and surveys. The related data will be analysed with quantitative and qualitative methods to identify potential social impediments to their deployment.

People responses will be also used to assess the social sustainability of the developed solutions in WP7.

Here the evaluation of environmental, social, and economic positive and negative impacts over the life cycle of each solution will be carried out according to the Life Cycle Sustainability Assessment (LCSA), by combining the environmental Life Cycle Assessment (LCA), with the Social Life Cycle Assessment (S-LCA) and the Life Cycle Costing (LCC). The identification of specific KPIs to properly evaluate the sustainability of the proposed solutions is part of WP7 (Task 7.1).

Based on the above-mentioned activities and assumptions, the project impacts will be evaluated with the use of the following key performance indicators, clustered into four main categories:

- Environmental indicators;
- Social indicators;
- Economic indicators;
- Communication and Information indicators.

The target values of the Key Performance Indicators are summarized in table 3.5.1.

#### *Environmental indicators*

- **L<sub>DEN</sub>/L<sub>night</sub>**: noise level indicators prescribed by the directive 2002/49/CE. L<sub>DEN</sub> is a descriptor of noise level based on energy equivalent noise level (Leq) over a whole day with a penalty of 10 dB(A) for night-time noise (23.00-7.00) and an additional penalty of 5 dB(A) for evening noise (i.e. 19.00-23.00). Likewise, L<sub>night</sub> is an indicator measuring the night-time level. The estimate of noise levels at receivers living in the pilot area will be evaluated in Task 6.3. An average noise reduction over the exposed receivers ranging from 3 to 5 dB(A) is expected to be reached at the end of the project after the implementation of the developed solutions. This will shift many receivers to a lower exposure class.
- **L<sub>AeqD</sub>/L<sub>AeqN</sub>**: L<sub>AeqD</sub> and L<sub>AeqN</sub> are the day and night noise equivalent levels used by the Italian legislation to check the compliance of roads and railway sound pressure levels to national noise limits. The target value is a noise reduction ranging from 3 to 5 dB(A) at the end of the project.
- **CPX level**: this is an indicator for evaluating different road surfaces with respect to their influence on traffic noise, under conditions when tyre/road noise dominates. In Task 6.1 CPX levels will be measured in the pilot area after three, six, twelve and eighteen months from the laying of the low noise pavement to test for any deterioration of the acoustical performance. The same measurements will be carried out after the end of the project to estimate the durability of the acoustic properties. The assessment of the durability of the acoustic performance will be carried out both in absolute and relative terms (attenuation). *Target value*: CPX level (average value)  $\leq 86 \pm 1$  dB(A) at 50 km/h and CPX  $\leq 86 \pm 2$  dB(A) in each measurement section. Differential target compared to the current noise level emissions ( $\Delta$ ) = 4 dB.
- **Insertion loss (IL)**: This parameter measures the attenuation provided by noise barriers, as difference between the noise levels observed before and after their installation in the same measurement points and in the same boundary conditions (air temperature, wind velocity, etc.). The target value is an improvement in IL of 2 dB over the baseline of the existing Strail prototype on the same site at 7,5 m from the track axis, at a height of 1,2 m above the top of the rail, as usual in many specifications for railways (see ISO 3095). Moreover, a new measurement method specifically tailored to LHNb qualification will be developed in WP4, taking advantage of some research results by UNIBO not yet published. This will allow the comparison of different products without installing them on the same site.
- **Sound absorption coefficient ( $\alpha$ )**: this parameter quantifies the sound energy that is not reflected by the surface under test and is measured according to ISO standard 10534-2 for normal sound incidence (impedance tube method) and ISO 354 for random sound incidence (reverberation room method); the latter standard is fine-tuned for noise barriers in EN 1793-1 (roads) and EN 16272-1 (rails). The  $\alpha$ -value is strongly frequency-dependent and for this reason a single-number rating, DL $_{\alpha}$  in dB, is defined on the basis of a prescribed traffic/rail noise spectrum (given in EN 16272-3-2). The  $\alpha$ -value will be measured in WP4 for the internal (train side) surface on the new LHNb and the corresponding single-number ratings (roads and

rails) will be evaluated. The target value is an improvement of 3 dB in the single-number ratings (3 dB meaning the halving of sound energy) over the baseline of the existing Strail prototype.

- **CO<sub>2</sub> emissions:** estimate of the reduction of CO<sub>2</sub> emissions due to the use of recycled materials (crumb rubber and cellulose fibres from waste materials: cardboards, textiles and old tyres) instead of virgin materials. *Target value:* 17% (WP 3 and WP 4).
- **PAC and VOC emissions:** estimate of polycyclic aromatic compounds (POC) and volatile organic compounds (VOC) emissions reduction. Baseline: 140 mg/m<sup>3</sup>. *Target value:* 45%
- **Waste management:** 1) Reduction of landfill disposal of old tyres (crumb rubber in low-noise surface and low-height noise barriers). 2) Reduction of landfill disposal of reclaimed asphalt pavement (RAP), at the end of LNP life, due to the increased expected life. 3) Reduction of landfill disposal due to waste cellulose + RAP + crumb rubber (pavement). This figure was derived through a time dependent LCA analysis based on both CR/cellulose use and increased expected life (which, in turn, implies that RAP disposal over time decreases). Overall estimated target value (1+2+3): at least 310 m<sup>3</sup>/km/year. This figure refers to 1km of track & road treated as per this proposal and complies with the numbers stated in 2.2 for the proposed noise mitigation solutions.
- **Recycled materials:** Percentage of recycled materials used with respect to the total amount of material. For LHNB this value can reach 85%, corresponding to 205 tons/km, whilst in low noise pavements (LNP) the amount of recycled materials is typically around 16 tons/km.

#### *Social indicators*

- **Number of people affected by the implemented measures.** *Target value:* 19.769
- **Reduction of highly annoyed residents close to the infrastructures.** *Target value:* 12%.

#### *Economic indicators*

- **Durability:** parameter estimating the lifetime of low noise pavements and LHNB. The durability of LHNB is measured in years and can reach at least 15 years. As for low noise pavements, it is only possible to estimate the increment in durability as a percentage with respect to low noise pavements of the same type without functionalised cellulose fibres, since the durability depends on traffic load and other boundary conditions. The estimated increment is 20%.
- **Life cycle cost:** descriptor assessing the total cost of an asset over its life cycle including initial capital costs, maintenance costs, operating costs, and the asset's residual value at the end of its life.
- **Benefit/Cost ratio (BCR):** indicator that attempts to summarize the overall value for money of a project or proposal. It is given by the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. Costs and benefits of the new low noise pavement and of the LHNB will be compared to traditional solutions under WP7 to evaluate their efficiency. The new low noise pavement is expected to reach a higher BCR (approximately 16%), due to its lower cost (-14%). Furthermore, taking into account that LHNB are cheaper than traditional noise barriers (lower height and no foundations) and benefits are higher, due to a more effective reduction of rolling noise, a Benefit/Cost Ratio increase ranging from 30% to 70% is expected as a function of the material used for noise barriers.

#### *Communication and information indicators*

- **Number of participants in project's events:** this indicator is used to measure awareness raising. *Target value:* 50 attendees for each webinar; 100 participants for each event (special sessions at conferences and dedicated events) (see WP 9);
- **Number of publications:** this indicator is used to measure the dissemination impact. *Target value:* at least 10 articles on peer-reviewed scientific journals, 4 publications on magazines addressed to the main stakeholders, 3 press articles;
- **Average number of views (impressions) for content published on social channels:** these are the indicators used to evaluate the effectiveness of websites and social networks content and to measure the interest shown by the general public in the project. *Target value:* 20.000.

In Table 3.14 Key Performance Indicators and related target values are summarized.



Table 3.14 – Key Performance Indicators and related target values. Normalized data referred to a road surface 10 m wide and 1 km long. Yearly figures based on life cycle analysis.

KEY PERFORMANCE INDICATORS			
Category	Description	Indicator	Target value
Environment	Noise levels reduction at receivers (European indicators)	$L_{DEN}/L_{night}$ difference before and after the implementation of the developed solutions	3-5 dB on average within 150 m from infrastructure
	Noise levels reduction at receivers (Italian indicators)	$L_{AeqD}/L_{AeqN}$ difference before and after the implementation of the developed solutions	3-5 dB on average within 150 m from infrastructure
	Rolling Noise Level (LNP)	CPX (average level @ 50km/h) $\Delta L$ (attenuation)	86±1 dB(A) 4 dB
	Insertion Loss (LHNB) Baseline: Current STRAIL prototype Measurement method: UNI standard 11022: 2003 "Measurement of the Insertion Loss of traffic noise reducing devices installed outdoors" at 7,5 m from the track axis and at a height of 1,2 m above the top of the rail (ISO standard 3095:2013).	$\Delta IL$	2 dB
	Sound absorption coefficient (LHNB) Baseline: Current STRAIL prototype	$\Delta DL\alpha$ (Single-Number Rating of sound absorption coefficient $\alpha$ )	3 dB
	CO <sub>2</sub> emission reduction (LNP)	Mass of CO <sub>2</sub> saved per km of road per year	420 kg/km/y
	VOC emissions reduction (LNP)	% (with respect to 140 mg/m <sup>3</sup> )	45%
	Waste management (LNP and LHNB)	Volume/km of landfill saved per year	310 m <sup>3</sup> /km/year
	Amount of recycled materials used (crumb rubber, packaging and textiles)	LNP - mass/km LHNB - mass/km	16 tons/km 205 tons/km
	Waste saved per km of LNP	Volume in cubic meters	205 m <sup>3</sup>
Waste saved per km of LHNB	Volume in cubic meters	2.630 m <sup>3</sup>	
Society	Number of people affected by the implemented measures (site specific)	Amount	19.769
	Reduction of annoyed population referred to $L_{den} \geq 55$ dB(A) (P%)	%A reduction	12%
Economy	Life cycle cost reduction of LNP	Percentage (with respect to a cost of €10/m <sup>2</sup> )	14%
	Durability of low noise pavements (LNP) Durability of low height noise barriers (LHNB)	LNP- Life time increment (with respect to 10years - per given traffic conditions*). LNHB – Life time in years	+20% ≥15 years
	Benefit/Cost ratio increment	$\Delta BRC$ (%)	LNP: 16% LHNB: ≥ 30%
Communication & Information	Number of participants in project events	Number of participants at webinar Number of participants at conferences	50 100
	Number of publications	Scientific journals Magazine	10 4
	Social media: average number of views (impressions) for content published on social channels	Number of impressions	20.000

### 3.4 Communication, dissemination and visibility

#### Communication, dissemination and visibility of funding *(n/a for concept note)*

*Define your target audience(s). Describe the planned communication and dissemination activities to promote the action and its results and maximise the impact (to whom, which format, how many copies, etc.). Clarify how you intend to reach each target audience, and explain the choice of the dissemination channels. Describe the methods and indicators (quantitative and qualitative) to monitor and evaluate the outreach and coverage of the communication and dissemination activities and results.*

*Describe how the visibility of EU funding will be ensured.*

**Audience:** Road and Rail Administrations, Local and National Authorities, Ministry of the Environment and Energy Security, Ministry of Infrastructure and Transport, Bitumen Providers, Universities and Research Centres.

**The communication and dissemination plan** mainly involve three main tools:

1. **Participant’s websites, newsletters and social media.** Dedicated pages on beneficiaries’ websites will be created. The pages will be regularly updated (monthly) and maintained for 5 years after the end of the project. Information about the projects will be also delivered to the general public through the main social networks (LinkedIn, Youtube, Twitter and Facebook) and quarterly newsletters will be prepared and sent to the main stakeholders. Google Analytics, Socialbakers and insights on single social pages will be used to monitor the effectiveness of communication.
2. **Dissemination and Networking events.** Dissemination activities include beneficiaries’ participation in public conferences to spread the results achieved and to promote the project. National and International conferences on the project’s matters will be attended at regular time intervals. During conferences 2 special sessions and 1 event will be organized to attract the interest of the attendees. These special sessions will also act as networking events to link the LIFE SILENT project with other projects dealing with similar topics, such as LIFE SNEAK, LIFE EVIA, SILENT TRACK, etc. Furthermore, 3 webinars dedicated to sector specialists will be arranged, focused on low noise pavements, low-height noise barriers and methods to manage and implement noise mitigation measures in complex environments. The main purpose of these events is to inform groups of potential users about the projects and solicit their interest in the developed solutions. Events will be addressed to the main stakeholders; about 100 attendees are expected at each conference special session; 50 participants in webinars. The organization and participation in planned events include the drafting and editing of presentations, the production of informative material (at least 100 leaflets, brochures for each event), secretary service, linguistic revision, and interpreting (only for the Final Conference), catering and logistics. Signed participants lists or registrations, in case of webinars, will be collected to quantify stakeholders’ engagement in the project.
3. **Publications on journals and magazines.** Several publications in scientific journals and magazines are planned in order to inform about the project progress and the results achieved. At least 3 scientific articles addressed to scientists will be published in peer-reviewed scientific journal; 4 articles addressed to the main stakeholders will be published in magazines, such as “Strade e Autostrade”, “Le Strade dell’Informazione” (ANAS Magazine), to attract the attention of the general public. Finally, the proceedings of the final event will be published in a peer-reviewed scientific journal as a special issue (Applied Sciences). 7 peer-review scientific articles are expected to be drafted for this special issue.

Details on the Communication and Dissemination plan are available in WP9.

The visibility of the EU funding will be guaranteed by displaying in a visible way the EU flag and reporting the funding statement in all communication and dissemination activities (live events, electronic and paper articles, websites)

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## 4. RESOURCES

### 4.1 Consortium set-up

#### Consortium cooperation and division of roles (if applicable)

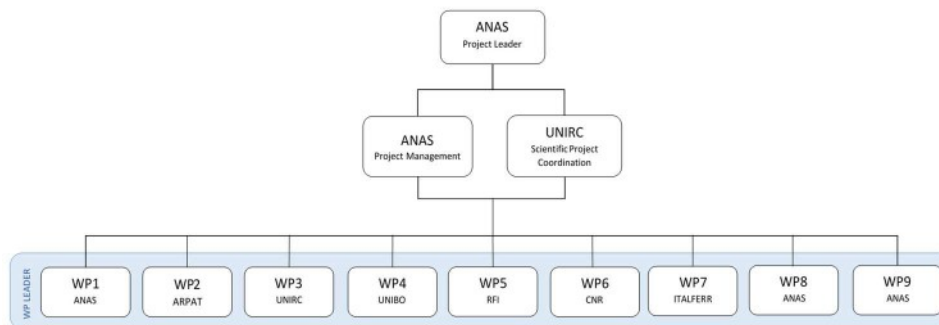
*Describe the consortium composition. How will all the partners together bring the necessary expertise?*

*In what way does each of the participants contribute to the project? Show that each has a valid role and adequate*

resources to fulfil that role.  
 For stage 2 (full proposal), fill out the Participant information (annex) with more details on the participants and their project teams (key staff).

The consortium involves 8 partners, with diverse expertise in the matters dealt by the project, that complement each other in the fulfilment of the project objectives:

1. ANAS, the Italian Road Administration, with expertise on road pavements, noise, project management and dissemination. ANAS has been also leader of several European projects. In the LIFE SILENT project ANAS will act as Project Manager.
2. ARPAT, the Regional Environmental Protection Agency for Tuscany, with expertise on European and Italian legislation on environmental noise, methods and standard specifications on Noise Mapping and Action plan complying with the EU Directive 2002/49/EC. ARPAT boasts a lot of experience in European projects.
3. ITALFERR, a company of the Italian State Railways Group, with expertise in design and implementation of noise mitigation measures for rails and sustainability assessment; ITALFERR has also broad experience on European projects.
4. MOPI, a small company with skills in chemistry and recycled materials. The company has gained experience on low noise pavement CPX measurements. MOPI is also a member of the LIFE SNEAK project.
5. RFI, a company of the Italian State Railways Group, with expertise in the management of the railway network. RFI is responsible for noise mapping activities and the implementation of the related Action Plan.
6. TEBAID, Consortium for the Research and Technological Applications in the field of Chemistry, Physics and Biomedicine, with expertise in chemical treatments and bitumen modifications.
7. UNIBO, University of Bologna “Alma Mater Studiorum”, with skills in noise barriers performance measurement systems (inventor of the Adrienne Method) and standardisation (ISO, CEN and UNI member). Great experience in key European projects, like ADRIENNE, QUIESST and SOPRANOISE.
8. UNIRC, “Università Mediterranea” of Reggio Calabria, with expertise on low noise pavements and their mechanical and acoustic characterization. UNIRC boasts a lot of experience in European projects.



The contribution of each partner to the project is shown in the Resource Assignment Matrix (Table 4.1.1). In this table, WP leaders are depicted with a blue circle, Task leaders with a smaller green circle and minor participants with an even smaller yellow circle. WP leaders act also as task leaders for some activities. Roles have been assigned taking into account beneficiaries specific skills and experience.

Table 4.1 – Resource Assignment Matrix (RAM).

BENEFICIARY	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9
ANAS	WP Leader	Task Leader	Participant		Task Leader	Participant	Task Leader	WP Leader	WP Leader
ARPAT	Participant	WP Leader				Task Leader			Participant
UNIRC	Participant		WP Leader		Participant	Participant	Participant	Participant	Participant
UNIBO	Participant	Participant		WP Leader		Participant	Participant	Task Leader	Task Leader
RFI	Participant	Participant		Participant	WP Leader	Participant	Participant		Participant
CNR	Participant			Participant	Participant	WP Leader			Participant
ITALFERR	Participant		Participant	Participant	Task Leader	Task Leader	WP Leader		Participant
TEBAID	Participant		Task Leader					Participant	Participant
MOPI	Participant		Participant	Task Leader	Participant	Participant	Participant	Participant	Participant

WP Leader    Task Leader    Participant

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## 4.2 Project management

### Project management, quality assurance and monitoring of progress *(n/a for concept note)*

Describe the management structures and decision-making mechanisms within the consortium. Explain how decisions will be taken and how regular and effective communication will be ensured.

Describe the measures and methods planned to ensure good quality, monitoring, planning and control of project implementation.

The Project Management tasks will be carried out by ANAS management team, led by a certified Project Manager (Patrizia Bellucci, ISIPM 12115), performing specific management, supervision, and reporting activities, according to the Continuous Reporting Module, with the support of WP leaders. The Project Management’s Team will ensure the correct administration of the entire project and secure the achievement of the project objectives within budget restraints, quality, and time schedule.

The Project’s Management Team is mainly composed of two working units with complementary and synergistic skills:

- The technical unit, made up of experienced staff in tracking project and project control, reporting, communication and information.
- The administrative unit, composed of skilled personnel in monitoring and checking financial expenditure, auditing procedures and payments.

The management structure also includes:

- The **Team Coordinators (TC)** in charge of coordinating beneficiaries team members (one for each beneficiary).
- The **Work Package leaders (WPL)** in charge of the coordination of Work Packages;
- The **Task Leaders (TL)**, appointed by the corresponding WP Leader. The Task Leader shall be responsible for co-ordinating the work of the partners involved in the task.

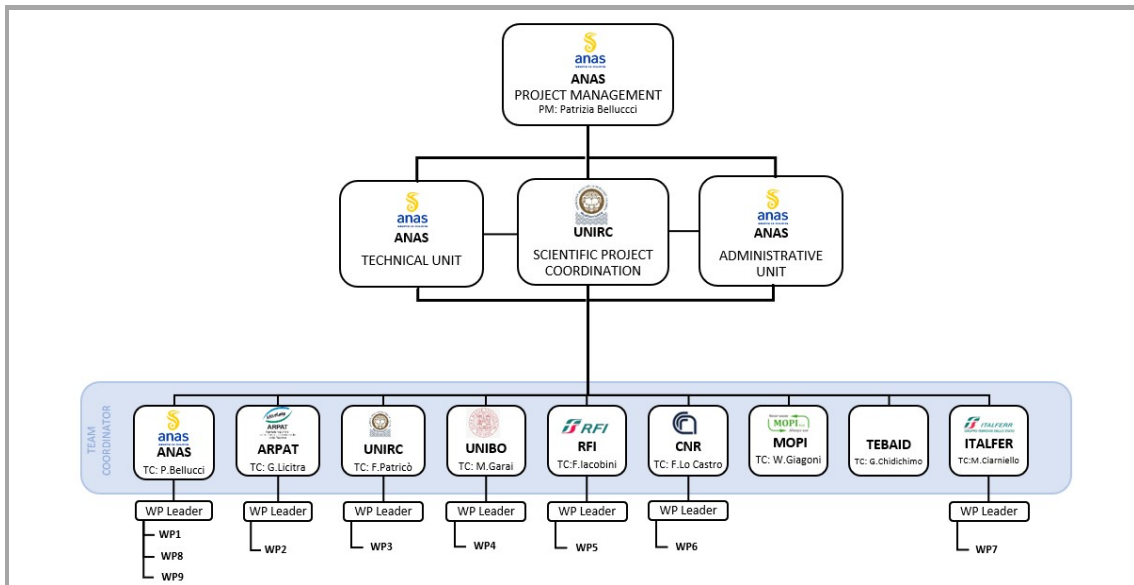


Fig. 4.2: Project Management Structure.

Project Management activities will be performed under WP1, which includes three main tasks:

- *Preliminary activities.* This task is addressed to coordinate and strengthen the project plans, launch the project, define the details of the management structure, share with the consortium all the rules provided in the Grant Agreement, estimate and report the initial values of key performance indicators.
- *Tracking project and project control.* This task is addressed to monitor and assess technical and financial progress. The technical progress will be checked through the fulfilment of specific milestones and performance indicators, tailored to the expected results from single tasks and WPs. The Project Management’s Team will collect information coming from beneficiaries and will compare actual and foreseen performance fixed in the work plan for the period, identify possible problems, formulate, and adopt corrective actions if necessary. Likewise, information on financial expenditures will be regularly gathered by the Project Management Team to verify their accordance with the project plan and determine how to address any possible deviation.
- *Communication and information.* This task includes continuous and periodic reporting to the EC, as well as communication and information to beneficiaries by means of quarterly meetings and internal reports. Quick communications will be carried out by e-mail and phone.

The internal rules, including the decision-making process, will be drafted in the *Quality Manual*, whose delivery is planned by the first quarter from the signature of the Grant Agreement. Decisions will be made collegially during meetings, according to the majority rule, or by online surveys when quick resolutions are requested, possibly supported by ad hoc web meetings, in case in-depth discussion is necessary.

Furthermore, the *Quality Manual* will describe and regulate in detail the management structure, partners details and functions in the project, norming (standard and operating guidelines that govern partners behavior), management of documents to be produced in the project (format, distribution, approval), calendar (meetings, frequency of meetings, meeting agenda, minutes).

More details about the project management activities are available in WP1.

### 4.3 Green management (n/a for concept note)

#### Green management (n/a for concept note)

Describe the measures proposed to reduce the environmental impact of your project, for example through the use of green procurement, environmental management systems, etc.



The LIFE SILENT project is per se a green project. In fact, in addition to the noise reduction challenge, the development of the innovative low-noise pavements and low-height noise barriers will be carried out through a holistic sustainability approach. As for environmental sustainability, the consortium will carefully look after materials and processes involved in the whole life cycle of the noise reduction solutions to minimize their impact to the environment. Life cycle assessments compliant with ISO 14040/44 standards will be carried out at the project onset to support the selection of environmentally friendly pavement formulations and noise barriers. The environmental impacts will be assessed from multiple perspectives, such as loss of land (footprint), overall waste production, materials used for energy recovery at the end of its life, recyclability potential, re-use potential, carbon footprint (global warming potential), water footprint, embodied energy content (use of primary energy resources/consumption), etc. Furthermore, circular economy best practices will be applied to promote the use of secondary materials as well as to enhance the recyclability of both SILENT solutions. Noise pavements, as well as low-height noise barriers, will be implemented with recycled waste materials from the rubber and packaging sectors (see tasks T.3.2 and T.4.2). Additional sustainability assessments will be performed ex-post in the pilot area. These assessments will include environmental, social, economic, and technical aspects (task T7.2).

To fulfil these ambitious goals, the consortium can leverage a broad range of expertise and a pioneering track record in sustainability and green management practices. For instance, ITALFERR and RFI have an integrated management system compliant with ISO 9001 (quality), ISO 14001 (environment) and ISO 45001 (safety) standards. MOPI has embedded a waste management system in their quality management system related to bituminous mixtures containing coal tar, packaging containing residues of other materials or contaminated by hazardous substances, hazardous components removed from discarded equipment, waste plastic. **ARPAT, UNIBO, UNIRC and CNR have voluntarily adopted the guidelines on Green Public Procurement compliant to the Italian Law 221/2015 on Environmental provisions to promote green economy measures and to limit the excessive use of natural resources. This law enforces public administrations and infrastructure management bodies to provide criteria for evaluating offers for works, services and supplies, compliant with GPP criteria, with reward scores for products containing post-consumer materials or materials deriving from the recovery of waste and the disassembly of complex products, when tendering the construction of road pavements and noise barriers. Strict rules will be defined in the Quality Manual (as part of the Consortium agreement) in order to drive all partners (including private companies) to engage in environmentally conscious behaviour and to adopt GPP criteria when purchasing goods and services.**

As for project-related management activities, meetings have been mostly planned via web and face to face meetings have been reduced to once a year over the project span, in order to avoid travels from one city to another and limit energy consumption from fossil fuels. Besides, during face-to-face meetings, only eco-labelled products for catering will be used. In addition, the use of public transport or carpooling with the other team members when moving for project-related reasons. Likewise, all the reports will be prepared only in electronic format, thus contributing to saving virgin material (cellulose from trees).

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#### 4.4 Budget

##### Estimated budget — Resources *(n/a for concept note)*

The budget of the project is 2.650.026,20 €.

The main cost item is personnel (1.932.334,00 €), followed by cost for other goods, works and services (300.480,00 €) and equipment (176.000,00 €). The latter include the costs for materials necessary for the prototypes, the construction and installation of the developed solutions, the construction of the new measurement system, specialist software for noise mapping and sustainability assessment, devices for monitoring the implemented solutions, EPD certifications and costs for administering the social survey.

It is worth noting that the cost for the low noise pavement is included in ANAS Action Plan and it will not be charged in the budget of the project. Furthermore, costs for special events and sessions during conferences are meant to be included in the conference fee, except for dissemination materials, such as brochures or gadgets.

Other costs include “Travel and Subsistence” for face-to-face meetings (once a year) and for events (conferences and on-site visits), as well as costs for open access publications and further dissemination items (video, brochure, leaflet).

See detailed budget table (Annex 2).

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## 5. OTHER

### 5.1 Ethics

<b>Ethics</b>
Not applicable

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### 5.2 Security

<b>Security</b>
Not applicable

#§SEC-URI-SU\$# #@DEC-LAR-DL@#

## 6. DECLARATIONS

<b>Higher funding rate</b> <i>(for Nature and Biodiversity; n/a for concept note)</i>	<b>YES/NO</b>
Do you fulfil the conditions set out in the Call document for a higher funding rate (75% or 67%)? If YES, explain and provide details.	<b>NO</b>
Insert text	

<b>Double funding</b> <i>(n/a for concept note)</i>	
<b>Information concerning other EU grants for this project</b>  Please note that there is a strict prohibition of double funding from the EU budget (except under EU Synergies actions).	<b>YES/NO</b>
We confirm that to our best knowledge neither the project as a whole nor any parts of it have benefitted from any other EU grant <i>(including EU funding managed by authorities in EU Member States or other funding bodies, e.g. EU Regional Funds, EU Agricultural Funds, etc.)</i> . If NO, explain and provide details.	<b>YES</b>
We confirm that to our best knowledge neither the project as a whole nor any parts of it are (nor will be) submitted for any other EU grant <i>(including EU funding managed by authorities in EU Member States or other funding bodies, e.g. EU Regional Funds, EU Agricultural Funds, etc.)</i> . If NO, explain and provide details.	<b>YES</b>

<b>Financial support to third parties (if applicable)</b> <i>(n/a for concept note)</i> <i>If in your project the maximum amount per third party will be more than the threshold amount set in the Call document, justify and explain why the higher amount is necessary in order to fulfil your project's objectives.</i>
Not applicable



**Seal of Excellence (if applicable)** *(n/a for concept note)*

*If provided in the Call document, proposals that pass the evaluation but are below the budget threshold (i.e. pass the minimum thresholds but are not ranked high enough to receive funding) will be awarded a Seal of Excellence. In this context we may be asked to share information about your proposal with other EU or national funding bodies.*

Do you agree that your proposal (including proposal data and documentation) is shared with other EU and national funding bodies to find funding under other schemes?

YES

#§DEC-LAR-DL§#

## ANNEXES

### LIST OF ANNEXES

#### Standard

Detailed budget table/Calculator (annex 1 to Part B) — *mandatory (n/a for concept note)*

Annual activity reports (annex 3 to Part B) — *mandatory, if required in the Call document (n/a for concept note)*

#### Special

Other annexes (annex X to Part B) — *mandatory, if required in the Call document (n/a for concept note)*

- Letters of support (Special Annex A)
- Road noise maps (Special Annex B)
- Detailed Timetable (Special Annex C)
- Notification of STRAIL withdrawal (Special Annex D)

HISTORY OF CHANGES		
VERSION	PUBLICATION DATE	CHANGE
1.0	04.10.2022	Initial version.
2.0	21.04.2023	<p>Final version</p> <ul style="list-style-type: none"> <li>• The starting date has been fixed at 01/09/2023 and justified.</li> <li>• In Section 1.1 additional information has been added about the material used to implement the LHNB and the degree of novelty proposed in the LIFE SILENT project.</li> <li>• In Section 2.1 further information and details have been included to clarify the indicator and the methodology used to quantify the noise reduction achieved with the LHNB.</li> <li>• A clear monitoring methodology for recycling the estimated amount of crumb rubber used for LHNB has been added in Section 2.1.</li> <li>• Inconsistencies between the KPI table and the environmental benefits reported in the description of actions have been removed.</li> <li>• WP1 has been amended to clarify how the implementation of green management principles will be pursued and an additional deliverable on the achievements of Green Project Management has been included.</li> <li>• IN WP1 The deliverables and Milestones related to the Midterm and Final Report have been deleted. Two official Progress Reports have been added at M18 and M48.</li> <li>• In WP8 the ETV certification has been replaced by the Environmental Product Declaration (EPD).</li> <li>• Section 4.5 on risk management has been updated reporting additional measures to adopt for reducing the risk of recycled materials shortage and free of charge provision of the low height noise barriers.</li> <li>• On 18/04/2023, the beneficiary Kraiburg STRAIL communicated its intention to leave the project for internal restructuring and reorientation of the part of the group's management and for lack of qualified workers in the German labour market. Nonetheless, STRAIL also officially notified their commitment to keep supporting the project as a "Third-Party with in-kind contribution (non-eligible)" by providing free of charge the LHNB's components for the testing and implementation phase, including onsite technical assistance for installation. Therefore, the project's tasks previously assigned to STRAIL have been redistributed to UNIBO, ITALFERR and ARPAT.</li> <li>• Following the withdrawal of STRAIL and the new assignments, the detailed budget table has been updated. The withdrawal of STRAIL also entailed an overall budget reduction of 10%, corresponding to 294.999,00 €. Some adjustment to RFI's monthly rate has been made to align their cost to EU average costs.</li> </ul>

ANAS SpA  
Direzione Ingegneria e Verifiche  
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00185 Roma

Dáta | Date

Ár dTag | Our Ref.

Bhur dTag | Your Ref.

19 November 2021

## Letter of support for proposal SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies”

To whom it may concern

I am writing on behalf of Transport Infrastructure Ireland (TII) to confirm our support for the above project which is being submitted by ANAS SpA, together with Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, the Regional Agency for the environmental protection in Tuscany (ARPAT), the National Research Council (CNR), the University of Bologna (UNIBO), the University of Reggio Calabria (UNIRC), the KRAIBURG STRAIL GmbH & Co. KG (STRAIL), the MOPI srl and the TEBAID Consortium, in response to the LIFE 2021 Call for proposals organised by the European Commission.

The proposed research aims to develop innovative long-lasting and sustainable solutions to mitigate the noise emissions produced by road and rail traffic in urban environments in situations where the installation of noise barriers is impractical. Specifically, the research aims to develop low noise pavements and low height noise barriers with recycled and non-toxic materials from the packaging and tire chains. It will also provide for the preparation of procedures for the harmonization and management of Action Plans in urban agglomerations, where the simultaneous presence of a plurality of sound sources makes their implementation difficult.

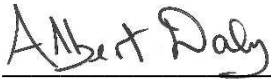
As the state agency responsible for the construction, maintenance and operation of the national road and light rail networks in Ireland, we have specific interest in this research in as much as it relates to our national transport networks and we would like to express our interest in participating in the project as a public sector stakeholder. We believe that the outputs of the research will contribute significantly to the implementation of the obligations introduced by the European Directive on Environmental Noise 2002/49 / EC, allowing the accomplishment of mitigation interventions suitable for urban contexts. It will also help to facilitate the implementation of Action Plans in urban agglomerations where multiple noise sources coexist and will ease the management and harmonisation of the designed solutions.

For these reasons, we support the development of the LIFE SILENT project by ANAS and the above consortium members and confirm our willingness to cooperate as an external stakeholder with the beneficiaries of the project. Our contact for this project is Dr Vincent O'Malley who is Head of the TII Environment Section as well as being chair of CEDR's Working Group Environment: please contact Vincent directly for any additional information required.



We very much look forward to cooperating with the research team on this project and disseminating and implementing the outcomes within our organisation. We ask the European Commission consider the proposed project and express our hope that the proposal will be accepted for inclusion in the forthcoming work programme.

Is mise le meas



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Albert Daly  
Head of Standards and Research  
Transport Infrastructure Ireland





Roma, 24 Novembre 2021

FDG/mp/MS  
prot. 3403/21

Gent.ma Sig.ra  
Ing. Patrizia Bellucci  
ANAS SpA  
Direzione Ingegneria e Verifiche  
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**OGGETTO: Progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” - Participation in the LIFE 2021 Call for proposals – Letter of interest**

We herewith express our support to the LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” project that Anas SpA together with Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, the Regional Agency for the environmental protection in Tuscany (ARPAT), the National Research Council (CNR), the University of Bologna (UNIBO), the University of Reggio Calabria (UNIRC), the KRAIBURG STRAIL GmbH & Co. KG (STRAIL), the MOPI srl and the TEBAID Consortium, is preparing applying to the European Commission for a co-funding, in response to the LIFE Call for proposals 2021.

The project aims to develop innovative long-lasting and sustainable solutions to mitigate the noise emissions produced by road and rail traffic in urban environments, where the installation of noise barriers is impractical. Specifically, the project aims to develop low noise pavements and low height noise barriers with recycled and non-toxic materials from the packaging and tire chains. The project also provides for the preparation of procedures for the

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harmonization and management of Action Plan  in urban agglomerations, whose  - 11/05/2023  
simultaneous presence of a plurality of sound sources makes their implementation difficult.

In particular, the writer as Italian Association of Toll Motorways believes that the realization of the project in question can bring a significant contribution to the implementation of the obligations introduced by the European Directive on Environmental Noise 2002/49 / EC, allowing the accomplishment of mitigation interventions suitable for urban contexts.

For these reasons, we express:

- great interest in the development of the LIFE SILENT project by the beneficiaries;
- our willingness to cooperate as an external stakeholder with the beneficiaries of the project.

Therefore, it is hoped that the European Commission will fully accept the request for funding to benefit from the results of this project initiative.

Il Direttore Generale  
(dr. ing. Massimo Schintu)





FDG/mp/MS  
prot. 3403/21

Roma, 24 novembre 2021

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Ing. Patrizia Bellucci  
ANAS SpA  
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**OGGETTO: Progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” - Partecipazione alla Call for proposals LIFE 2021 – Espressione di interesse**

Con la presente si esprime il pieno supporto al progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” che ANAS SpA ha in corso di predisposizione insieme a Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, l’Agenzia Regionale per la Protezione Ambientale della Toscana (ARPAT), il Consiglio Nazionale delle Ricerche (CNR), l’Università di Bologna (UNIBO), l’Università Mediterranea di Reggio Calabria (UNIRC), la KRAIBURG STRAIL GmbH & Co. KG (STRAIL), la MOPI srl ed il Consorzio TEBAID, ai fini della presentazione alla Commissione Europea, nell’ambito della Call for proposals CEF 2021, ai fini della richiesta di un cofinanziamento europeo.

Il progetto ha come obiettivo lo sviluppo di soluzioni innovative di lunga durata e sostenibili per mitigare le immissioni sonore prodotte dal traffico stradale e ferroviario. Nello specifico, il progetto si propone di realizzare pavimentazioni antirumore con materiali riciclati e atossici, provenienti dalle filiere della carta e dei pneumatici esausti, e barriere antirumore basse per contenere le emissioni sonore delle traffico ferroviario. Il progetto prevede, inoltre, la predisposizione di procedure per l’armonizzazione e la gestione dei Piani di Azione in

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ambienti complessi, dove la contemporanea presenza di una pluralità di sorgenti sonore ne rende difficile l'attuazione.  Associated with document Ref. Ares(2023)3293175 - 11/05/2023

In particolare, la scrivente in qualità di Associazione delle Concessionarie autostradali ritiene che la realizzazione del progetto in questione possa apportare un significativo contributo nell'attuazione degli obblighi introdotti dalla Direttiva Europea sul Rumore Ambientale 2002/49/CE, consentendo l'implementazione di interventi di mitigazione idonei ai contesti urbani.

Per tali ragioni, si esprime:

- il grande interesse a che i beneficiari realizzino il progetto in questione;
- la disponibilità a cooperare in qualità di stakeholder esterno con i beneficiari del progetto

Si auspica, pertanto, in un pieno accoglimento da parte della Commissione Europea della richiesta di finanziamento al fine di poter beneficiare dei risultati di questa iniziativa progettuale.

Il Direttore Generale  
(dr. ing. Massimo Schintu)





Spett.le  
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Vogogna 18/Novembre/2021

**OGGETTO: Progetto LIFE SILENT "*Sustainable Innovations for Longlife Environmental Noise Technologies*" - Partecipazione alla Call for proposals LIFE 2021 – Espressione di interesse**

Con la presente si esprime il pieno supporto al progetto LIFE SILENT "*Sustainable Innovations for Longlife Environmental Noise Technologies*" che ANASSpA ha in corso di predisposizione insieme a Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, l'Agenzia Regionale per la Protezione Ambientale della Toscana (ARPAT), il Consiglio Nazionale delle Ricerche (CNR), l'Università di Bologna (UNIBO), l'Università Mediterranea di Reggio Calabria (UNIRC), la KRAIBURG STRAIL GmbH & Co. KG (STRAIL), la MOPI srl ed il Consorzio TEBAID, ai fini della presentazione alla Commissione Europea, nell'ambito della Call for proposals LIFE 2021, ai fini della richiesta di un cofinanziamento europeo.

Il progetto ha come obiettivo lo sviluppo di soluzioni innovative di lunga durata e sostenibili per mitigare le immissioni sonore prodotte dal traffico stradale e ferroviario in ambienti urbani, dove l'apposizione di barriere antirumore è impraticabile. Nello specifico, il progetto si propone di realizzare pavimentazioni antirumore con materiali riciclati e atossici, provenienti dalle filiere della carta e dei pneumatici esausti, e barriere antirumore basse per contenere le emissioni sonore del traffico ferroviario. Il progetto prevede, inoltre, la predisposizione di procedure per l'armonizzazione e la gestione dei Piani di Azione negli agglomerati urbani, dove la contemporanea presenza di una pluralità di sorgenti sonore ne rende difficile l'attuazione.

In particolare, la scrivente in qualità di operatore nel settore del recupero e valorizzazione degli scarti plastici realizza materia prima rigenerata e alcuni manufatti in plastica riciclata che confermano che la realizzazione del progetto in questione possa apportare un significativo contributo nell'attuazione degli obblighi introdotti dalla Direttiva Europea sul Rumore Ambientale 2002/49/CE, consentendo l'implementazione di interventi di mitigazione idonei ai contesti urbani.

L'intervento, a nostro modo di vedere, si inserisce a pieno in quelli che sono i nuovi obiettivi di uno sviluppo dell'economia circolare, infatti le materie prime impiegate daranno nuova vita a materiali destinati all'abbandono ma soprattutto consentiranno nel momento in cui essi stessi arriveranno a fine vita di poterli nuovamente riutilizzare con opportuni procedimenti di riciclo, per tali ragioni,

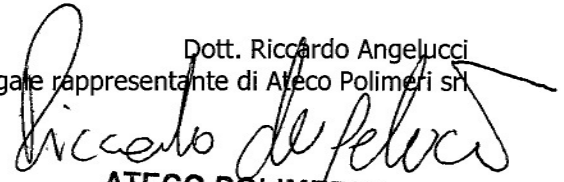
*www.atecosrl.com*

si esprime:

- il grande interesse a che i beneficiari realizzino il progetto in questione;
- la disponibilità a cooperare in qualità di stakeholder esterno con i beneficiari del progetto

Si auspica, pertanto, in un pieno accoglimento da parte della Commissione Europea della richiesta di finanziamento al fine di poter beneficiare dei risultati di questa iniziativa progettuale.

Dott. Riccardo Angelucci  
Legale rappresentante di Ateco Polimeri srl



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**OGGETTO: Progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies”  
- Partecipazione alla Call for proposals LIFE 2021 – Espressione di interesse**

Con la presente si esprime il pieno supporto al progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” che ANAS SpA ha in corso di predisposizione insieme a Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, l’Agenzia Regionale per la Protezione Ambientale della Toscana (ARPAT), il Consiglio Nazionale delle Ricerche (CNR), l’Università di Bologna (UNIBO), l’Università Mediterranea di Reggio Calabria (UNIRC), la KRAIBURG STRAIL GmbH & Co. KG (STRAIL), la MOPI srl ed il Consorzio TEBAID, ai fini della presentazione alla Commissione Europea, nell’ambito della Call for proposals LIFE 2021, ai fini della richiesta di un cofinanziamento europeo.

Il progetto ha come obiettivo lo sviluppo di soluzioni innovative di lunga durata e sostenibili per mitigare le immissioni sonore prodotte dal traffico stradale e ferroviario in ambienti urbani, dove l’apposizione di barriere antirumore è impraticabile. Nello specifico, il progetto si propone di realizzare pavimentazioni antirumore con materiali riciclati e atossici, provenienti dalle filiere della carta e dei pneumatici fuori uso, e barriere antirumore basse per contenere le emissioni sonore delle traffico ferroviario. Il progetto prevede, inoltre, la predisposizione di procedure per l’armonizzazione e la gestione dei Piani di Azione negli agglomerati urbani, dove la contemporanea presenza di una pluralità di sorgenti sonore ne rende difficile l’attuazione.

In particolare, la scrivente in qualità di società consortile senza scopo di lucro per la gestione degli Pneumatici Fuori Uso (PFU) in Italia ritiene che la realizzazione del progetto in questione possa apportare un significativo contributo nell’attuazione degli obblighi introdotti dalla Direttiva Europea sul Rumore Ambientale 2002/49/CE, consentendo l’implementazione di interventi di mitigazione idonei ai contesti urbani.

Ecopneus è inoltre fortemente impegnata nella promozione delle applicazioni della gomma riciclata, nonché in iniziative di informazione e sensibilizzazione per la creazione di modelli di economia circolare.

Per tali ragioni, si esprime:

- il grande interesse a che i beneficiari realizzino il progetto in questione;
- la disponibilità a cooperare in qualità di stakeholder esterno con i beneficiari del progetto

Si auspica, pertanto, in un pieno accoglimento da parte della Commissione Europea della richiesta di finanziamento al fine di poter beneficiare dei risultati di questa iniziativa progettuale.

Milano, 23/11/2021

Daniele Fornai  
Responsabile operazioni



**Ecopneus scpa**  
Via Messina 38  
20154 Milano  
ECOPNEUS CF/P.IVA 06516590962

ANAS SpA  
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ANAS SpA  
Direzione Amministrazione, Finanza,  
Pianificazione e Controllo  
Finanza/Finanza Agevolata  
Via Monzambano, 10  
00185 Roma

**OGGETTO: Progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies”  
- Participation in the LIFE 2021 Call for proposals – Letter of interest**

We herewith express our support to the LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” project that Anas SpA together with Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, the Regional Agency for the environmental protection in Tuscany (ARPAT), the National Research Council (CNR), the University of Bologna (UNIBO), the University of Reggio Calabria (UNIRC), the KRAIBURG STRAIL GmbH & Co. KG (STRAIL), the MOPI srl and the TEBAID Consortium, is preparing applying to the European Commission for a co-funding, in response to the LIFE Call for proposals 2021.

The project aims to develop innovative long-lasting and sustainable solutions to mitigate the noise emissions produced by road and rail traffic in urban environments, where the installation of noise barriers is impractical. Specifically, the project aims to develop low noise pavements and low height noise barriers with recycled and non-toxic materials from the packaging and tyre chains. The project also provides for the preparation of procedures for the harmonization and management of Action Plans in urban agglomerations, where the simultaneous presence of a plurality of sound sources makes their implementation difficult.

Ecopneus is a non-profit company for the collection and treatment of end-of-life tyres (ELTs) created by the major tyre manufacturers operating in Italy. In particular, the writer believes that the realization of the project can bring a significant contribution to the implementation of the obligations introduced by the European Directive on Environmental Noise 2002/49 / EC, allowing the accomplishment of mitigation interventions suitable for urban contexts.

Ecopneus is strongly committed to promote the applications for recycled rubber, as well as initiatives of information and awareness raising for the creation of circular economy models.

For these reasons, we express:

- great interest in the development of the LIFE SILENT project by the beneficiaries;
- our willingness to cooperate as an external stakeholder with the beneficiaries of the project.

Therefore, it is hoped that the European Commission will fully accept the request for funding to benefit from the results of this project initiative.

23 November 2021

Daniele Fornai

Operations manager



ecopneus scpa  
Via Messina 38  
20154 Milano  
ecopneus CF/P.IVA 06516590962



Trento, il 23/11/2021

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Finanza/Finanza Agevolata  
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00185  
Roma

**OGGETTO: Progetto LIFE SILENT "Sustainable Innovations for Longlife Environmental Noise Technologies" - Partecipazione alla Call for proposals LIFE 2021 - Espressione di interesse**

Con la presente si esprime il pieno supporto al progetto LIFE SILENT "Sustainable Innovations for Longlife Environmental Noise Technologies" che ANAS SpA ha in corso di predisposizione insieme a Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, l'Agenzia Regionale per la Protezione Ambientale della Toscana (ARPAT), il Consiglio Nazionale delle Ricerche (CNR), l'Università di Bologna (UNIBO), l'Università Mediterranea di Reggio Calabria (UNIRC), la KRAIBURG STRAIL GmbH & Co. KG (STRAIL), la MOPI srl ed il Consorzio TEBRID, ai fini della presentazione alla Commissione Europea, nell'ambito della Call for proposals LIFE 2021, ai fini della richiesta di un cofinanziamento europeo.

Il progetto ha come obiettivo lo sviluppo di soluzioni innovative di lunga durata e sostenibili per mitigare le immissioni sonore prodotte dal traffico stradale e ferroviario in ambienti urbani, dove l'apposizione di barriere antirumore è impraticabile. Nello specifico, il progetto si propone di realizzare pavimentazioni antirumore con materiali riciclati e atossici, provenienti dalle filiere della carta e dei pneumatici esausti, e barriere antirumore basse per contenere le emissioni sonore delle traffico ferroviario. Il progetto prevede, inoltre, la predisposizione di procedure per l'armonizzazione e la gestione dei Piani di Azione negli agglomerati urbani, dove la contemporanea presenza di una pluralità di sorgenti sonore ne rende difficile l'attuazione.

In particolare, la scrivente in qualità di attore primario nel settore delle trasformazioni industriali del bitume e delle tecnologie a questo collegate, ritiene che la realizzazione del progetto in questione possa apportare un significativo contributo nell'attuazione degli obblighi introdotti dalla Direttiva Europea sul Rumore Ambientale 2002/49/CE, consentendo l'implementazione di interventi di mitigazione idonei ai contesti urbani.

L'intervento, infatti, contribuisce radicalmente a risolvere le cause alla base della problematica in esame, da una parte evitando di sovraccaricare l'ambiente urbano con ulteriori strutture e sovrastrutture, e dall'altra prevedendo il riutilizzo virtuoso di materiali esausti o a fine vita e perseguendo, quindi, il raggiungimento del risultato attraverso il minimo possibile utilizzo di risorse materiali ed ambientali.

Per tali ragioni, si esprime:

- il grande interesse a che i beneficiari realizzino il progetto in questione;
- la disponibilità a cooperare in qualità di stakeholder esterno con i beneficiari del progetto

Si auspica, pertanto, in un pieno accoglimento da parte della Commissione Europea della richiesta di finanziamento al fine di poter beneficiare dei risultati di questa iniziativa progettuale.

DATA-FIRMA LEGALE RAPPRESENTANTE / INCARICATO-TIMBRO

23/11/2021

**MENESTRINA S.R.L.**  
(L'Amministratore Unico)

BOLLEA



Trento, il 23/11/2021

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00185 Roma

**OGGETTO: Progetto LIFE SILENT "Sustainable Innovations for Longlife Environmental Noise Technologies" - Participation in the LIFE 2021 Call for proposals - Letter of interest**

We herewith express our support to the LIFE SILENT "*Sustainable Innovations for Longlife Environmental Noise Technologies*" project that Anas SpA together with Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, the Regional Agency for the environmental protection in Tuscany (ARPAT), the National Research Council (CNR), the University of Bologna (UNIBO), the University of Reggio Calabria (UNIRC), the KRAIBURG STRAIL GmbH & Co. KG (STRAIL), the MOPI srl and the TEBAlD Consortium, is preparing applying to the European Commission for a co-funding, in response to the LIFE Call for proposals 2021.

The project aims to develop innovative long-lasting and sustainable solutions to mitigate the noise emissions produced by road and rail traffic in urban environments, where the installation of noise barriers is impractical. Specifically, the project aims to develop low noise pavements and low height noise foreseeing barriers with recycled and non-toxic materials from the packaging and tire chains. The project also provides for the preparation of procedures for the harmonization and management of Action Plans in urban agglomerations, where the simultaneous presence of a plurality of sound sources makes their implementation difficult.

In particular, the writer as a primary player in the sector of industrial transformation of bitumen and related technologies believes that the realization of the project in question can bring a significant contribution to the implementation of the obligations introduced by the European Directive on Environmental Noise 2002/49 / EC, allowing the accomplishment of mitigation interventions suitable for urban contexts.

As a matter of fact, the project radically contributes to resolve the underlying causes of the problem under consideration, on the one hand avoiding overloading the urban environment with additional structures and superstructures, and on the other hand foreseeing the virtuous reuse of exhausted or

end-of-life materials and pursuing, therefore, the achievement of the result through the minimum possible use of virgin material and environmental resources.

For these reasons, we express:

- great interest in the development of the LIFE SILENT project by the beneficiaries;
- our willingness to cooperate as an external stakeholder with the beneficiaries of the project.

Therefore, it is hoped that the European Commission will fully accept the request for funding to benefit from the results of this project initiative.

Date - Signature of a legal representative / stamp

23/11/2021

**MENESTRINA S.R.L.**  
(L'Amministratore Unico)

BOLZA

*Il Presidente*

Prot. n. 32/P/2021

ANAS SpA  
Direzione Ingegneria e Verifiche  
Ricerca e Innovazione  
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ANAS SpA  
Direzione Amministrazione, Finanza,  
Pianificazione e Controllo  
Finanza/Finanza Agevolata  
Via Monzambano, 10  
00185 Roma

OGGETTO: Progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” - Partecipazione alla Call for proposals LIFE 2021 – Espressione di interesse

Con la presente si esprime il pieno supporto al progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” che ANAS SpA ha in corso di predisposizione insieme a Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, l’Agenzia Regionale per la Protezione Ambientale della Toscana (ARPAT), il Consiglio Nazionale delle Ricerche (CNR), l’Università di Bologna (UNIBO), l’Università Mediterranea di Reggio Calabria (UNIRC), la KRAIBURG STRAIL GmbH & Co. KG (STRAIL), la MOPI srl ed il Consorzio TEBALD, ai fini della presentazione alla Commissione Europea, nell’ambito della Call for proposals CEF 2021, ai fini della richiesta di un cofinanziamento europeo.

Si prende atto che il progetto ha come obiettivo lo sviluppo di soluzioni innovative di lunga durata e sostenibili per mitigare le immissioni sonore prodotte dal traffico stradale e ferroviario. Nello specifico, il progetto si propone di realizzare pavimentazioni antirumore con materiali riciclati e atossici, provenienti dalle filiere della carta e dei pneumatici esausti, e barriere antirumore basse per contenere le emissioni sonore delle traffico ferroviario. Il progetto prevede, inoltre, la predisposizione di procedure per l’armonizzazione e la gestione dei Piani di Azione in ambienti complessi, dove la contemporanea presenza di una pluralità di sorgenti sonore ne rende difficile l’attuazione.

In particolare, la scrivente PIARC Italia in qualità di espressione Italiana della PIARC WORLD ROAD ASSOCIATION - che ha per sua finalità la promozione e la diffusione delle conoscenze in campo stradale - ritiene che la realizzazione del progetto in questione possa apportare un significativo contributo nell’attuazione degli obblighi introdotti dalla Direttiva Europea sul Rumore Ambientale 2002/49/CE.





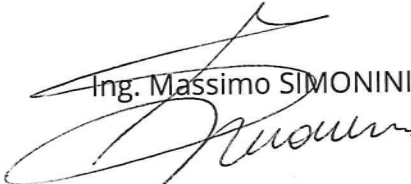
L'attuazione del progetto in argomento potrà consentire l'implementazione di interventi di mitigazione del rumore stradale in contesti urbani, che rivestono un particolare interesse per alcuni dei Comitati Tecnici attualmente in attività nell'ambito del ciclo PIARC Italia nel quadriennio 2020-2023.

Per tali ragioni, si esprime:

- il grande interesse a che i beneficiari realizzino il progetto in questione;
- la disponibilità a cooperare in qualità di stakeholder esterno con i beneficiari del progetto

Si auspica, pertanto, in un pieno accoglimento da parte della Commissione Europea della richiesta di finanziamento al fine di poter beneficiare dei risultati di questa iniziativa progettuale.

Roma, 16.11.2021

Ing. Massimo SIMONINI  




Il Presidente e Amministratore Delegato

RM\_SERVMOB  
Roma Servizi per la Mobilità s.r.l.  
USCITA - 12/11/2021 - 0071026



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ANAS SpA  
Direzione Amministrazione, Finanza,  
Pianificazione e Controllo  
Finanza/Finanza Agevolata  
Via Monzambano, 10  
00185 Roma

**Oggetto Progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” - Partecipazione alla Call for proposals LIFE 2021 – Espressione di interesse.**

Con la presente si esprime il pieno supporto al progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” che ANAS SpA ha in corso di predisposizione insieme a Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, l’Agenzia Regionale per la Protezione Ambientale della Toscana (ARPAT), il Consiglio Nazionale delle Ricerche (CNR), l’Università di Bologna (UNIBO), l’Università Mediterranea di Reggio Calabria (UNIRC), la KRAIBURG STRAIL GmbH & Co. KG (STRAIL), la MOPI srl ed il Consorzio TEBAID, ai fini della presentazione alla Commissione Europea, nell’ambito della Call LIFE 2021, ai fini della richiesta di un cofinanziamento europeo.

Il progetto ha come obiettivo lo sviluppo di soluzioni innovative di lunga durata e sostenibili per mitigare le immissioni sonore prodotte dal traffico stradale e ferroviario in ambienti urbani, dove l’apposizione di barriere antirumore è impraticabile. Nello specifico, il progetto si propone di realizzare pavimentazioni antirumore con materiali riciclati e atossici, provenienti dalle filiere della carta e degli pneumatici esausti, e barriere antirumore basse per contenere le emissioni sonore del traffico ferroviario. Il progetto prevede, inoltre, la predisposizione di procedure per l’armonizzazione e la gestione dei Piani di Azione negli agglomerati urbani, dove la contemporanea presenza di una pluralità di sorgenti sonore ne rende difficile l’attuazione.

In particolare, la scrivente in qualità di Agenzia per la Mobilità del Comune di Roma, quale supporto tecnico del Dipartimento Mobilità e Trasporti anche nella predisposizione del PUMS, nell’ottica del contenimento degli impatti della mobilità nello specifico dal punto di vista acustico, possa fornire strumenti per un significativo contributo nell’attuazione degli obblighi introdotti dalla Direttiva Europea sul Rumore Ambientale 2002/49/CE, consentendo l’implementazione di interventi di mitigazione idonei ai contesti urbani. L’intervento, infatti, potrà migliorare l’impatto acustico della mobilità e potrà essere utile nelle fasi di progettazione e attuazione delle nuove linee di trasporto pubblico di massa previste dal PUMS.

Roma servizi per la mobilità S.r.l.

via di Vigna Murata, 60 00143 Roma (ingresso pedonale via L. Gaurico, 9) T +39 06 46952271 -2272 F +39 06 46952017 www.romamobilita.it  
Società con socio unico soggetta alla direzione e coordinamento di Roma Capitale

Partita IVA e N. Iscrizione 10735431008 del 31/12/2009 Capitale Sociale Euro 10.000.000,00 REA 1253419



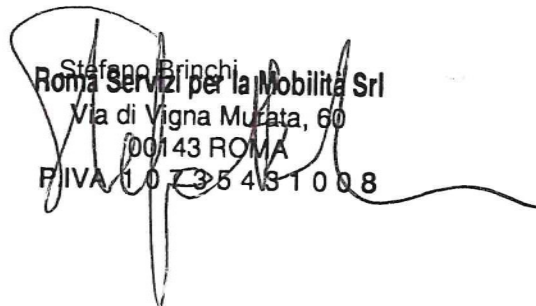


Per tali ragioni, si esprime:

- il grande interesse a che i beneficiari realizzino il progetto in questione;
- la disponibilità a cooperare in qualità di stakeholder esterno con i beneficiari del progetto

Si auspica, pertanto, in un pieno accoglimento da parte della Commissione Europea della richiesta di finanziamento al fine di poter beneficiare dei risultati di questa iniziativa progettuale.

Distinti saluti.

  
Stefano Brinchi  
Roma Servizi per la Mobilità Srl  
Via di Vigna Murata, 60  
00143 ROMA  
P.IVA 10735431008





Il Presidente e Amministratore Delegato

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Direzione Amministrazione, Finanza,  
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Via Monzambano, 10  
00185 Roma

**Subject: LIFE SILENT Project “Sustainable Innovations for Longlife Environmental Noise Technologies” – Participation to the Call for proposals LIFE 2021 – Expression of Interest.**

We herewith express our support to the LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” project that Anas SpA together with Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, the Regional Agency for the environmental protection in Tuscany (ARPAT), the National Research Council (CNR), the University of Bologna (UNIBO), the University of Reggio Calabria (UNIRC), the KRAIBURG STRAIL GmbH & Co. KG (STRAIL), the MOPI srl and the TEBAID Consortium, is preparing applying to the European Commission for a co-funding, in response to the LIFE Call for proposals 2021.

The project aims to develop innovative long-lasting and sustainable solutions to mitigate the noise emissions produced by road and rail traffic in urban environments, where the installation of noise barriers is impractical. Specifically, the project aims to develop low noise pavements and low height noise barriers with recycled and non-toxic materials from the packaging and tire chains. The project also provides for the preparation of procedures for the harmonization and management of Action Plans in urban agglomerations, where the simultaneous presence of a plurality of sound sources makes their implementation difficult.

In particular, the writer as the Mobility Agency of the Municipality of Rome, being the technical support of the Mobility and Transport Department also in the preparation of the Rome SUMP, with a view to limiting the impacts of mobility specifically from the acoustic point of view, agrees that the proposed action can provide tools for a significant contribution in the implementation of the obligations introduced by the European Directive on Environmental Noise 2002/49 / EC, allowing the implementation of mitigation interventions suitable for urban contexts.

The action, in fact, will improve the acoustic impact of mobility and may be useful in the design and implementation phases of the new mass public transport lines provided for by the SUMP.

Roma servizi per la mobilità S.r.l.

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Società con socio unico soggetta alla direzione e coordinamento di Roma Capitale

Partita IVA e N. Iscrizione 10735431006 del 31/12/2009 - Capitale Sociale Euro 10.000.000,00 - REA 1253419





For these reasons, we express:

- great interest in the development of the LIFE SILENT project by the beneficiaries;
- our willingness to cooperate as an external stakeholder with the beneficiaries of the project

Therefore, it is hoped that the European Commission will fully accept the request for funding to benefit from the results of this project initiative.

Best regards.

Stefano Brinchi  
~~Roma Servizi per la Mobilit  Srl~~  
Via di Vigna Murata, 60  
00143 ROMA  
P.IVA 10735431008

A large, stylized handwritten signature in black ink, which appears to be "Stefano Brinchi". The signature is written over the printed text of the contact information.

*Il Direttore*

Milano, 23 novembre 2021

**Oggetto: Progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” - Participation in the LIFE 2021 Call for proposals – Letter of interest**

We herewith express our support to the LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” project that Anas SpA together with Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, the Regional Agency for the environmental protection in Tuscany (ARPAT), the National Research Council (CNR), the University of Bologna (UNIBO), the University of Reggio Calabria (UNIRC), the KRAIBURG STRAIL GmbH & Co. KG (STRAIL), the MOPI srl and the TEBAID Consortium, is preparing applying to the European Commission for a co-funding, in response to the LIFE Call for proposals 2021.

The project aims to develop innovative long-lasting and sustainable solutions to mitigate the noise emissions produced by road and rail traffic in urban environments, where the installation of noise barriers is impractical. Specifically, the project aims to develop low noise pavements and low height noise barriers with recycled and non-toxic materials from the packaging and tire chains. The project also provides for the preparation of procedures for the harmonization and management of Action Plans in urban agglomerations, where the simultaneous presence of a plurality of sound sources makes their implementation difficult.

In particular, UNI, the Italian Standardization Body, is a private non-profit association which develops, publishes and disseminates technical standards to support economic growth, social progress, environmental protection, quality improvement and the enhancement of innovation. UNI is a participatory and democratic multi-stakeholder platform available to the country, businesses, institutions, associations and citizens. In all areas of our life, it produces a wealth of knowledge and values that are both useful, practical and ethical. UNI believes that the realization of the project in question can bring a significant contribution to the implementation of the obligations introduced by the European Directive on Environmental Noise 2002/49 / EC, allowing the accomplishment of mitigation interventions suitable for urban contexts.

UNI Ente Italiano di Normazione  
Membro italiano CEN e ISO

Via Sannio, 2 - 20137 Milano - Tel. 02700241 uni@uni.com (sede legale)  
Via del Collegio Capranica, 4 - 00186 - Roma - Tel. 0669923074 uni.roma@uni.com  
P.IVA 06786300159 - CF 80037830157  
www.uni.com



As a matter of fact the project aims to develop sustainable and eco-compatible solutions to mitigate noise in complex urban environments, where multiple and different sources of noise, mainly roads and railways, coexist in densely populated areas. In this proposal, innovative and sustainable low-noise flooring and low-height noise barriers will be developed and demonstrated at real test sites, to provide transport infrastructure managers with reliable information to support their widespread use. To this end, the proposal also provides for the preparation of specific procedures to manage their implementation in complex urban scenarios.

For these reasons, we express:

- great interest in the development of the LIFE SILENT project by the beneficiaries;
- our willingness to cooperate as an external stakeholder with the beneficiaries of the project.

Therefore, it is hoped that the European Commission will fully accept the request for funding to benefit from the results of this project initiative

Ruggero Lensi



-----  
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*Ministero delle Infrastrutture e della Mobilità Sostenibile*

DIPARTIMENTO PER LA PROGRAMMAZIONE STRATEGICA, I SISTEMI  
INFRASTRUTTURALI, DI TRASPORTO A RETE, INFORMATIVI E STATISTICI

Direzione Generale per le strade e le autostrade, l'alta sorveglianza sulle infrastrutture stradali e  
la vigilanza sui contratti concessori autostradali

[dg.strade@pec.mit.gov.it](mailto:dg.strade@pec.mit.gov.it)

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[anas@postacert.stradeanas.it](mailto:anas@postacert.stradeanas.it)

**OGGETTO: Progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” - Partecipazione alla Call for proposals LIFE 2021 – Espressione di interesse**

Con la presente si esprime il pieno supporto al progetto LIFE SILENT “Sustainable Innovations for Longlife Environmental Noise Technologies” che ANAS SpA ha in corso di predisposizione insieme a Rete Ferroviaria Italiana SpA (RFI), ITALFERR SpA, l’Agenzia Regionale per la Protezione Ambientale della Toscana (ARPAT), il Consiglio Nazionale delle Ricerche (CNR), l’Università di Bologna (UNIBO), l’Università Mediterranea di Reggio Calabria (UNIRC), la KRAIBURG STRAIL GmbH & Co. KG (STRAIL), la MOPI srl ed il Consorzio TEBAID, ai fini della presentazione alla Commissione Europea, nell’ambito della Call for proposals CEF 2021, ai fini della richiesta di un cofinanziamento europeo.

Il progetto ha come obiettivo lo sviluppo di soluzioni innovative di lunga durata e sostenibili per mitigare le immissioni sonore prodotte dal traffico stradale e ferroviario. Nello specifico, il progetto si propone di realizzare pavimentazioni antirumore con materiali riciclati e atossici, provenienti dalle filiere della carta e dei pneumatici esausti, e barriere antirumore basse per contenere le

emissioni sonore delle traffico ferroviario. Il progetto prevede, inoltre, la predisposizione di procedure per l'armonizzazione e la gestione dei Piani di Azione in ambienti complessi, dove la contemporanea presenza di una pluralità di sorgenti sonore ne rende difficile l'attuazione.

In particolare, la scrivente Direzione in qualità di Concedente della rete stradale ritiene che la realizzazione del progetto in questione possa apportare un significativo contributo nell'attuazione degli obblighi introdotti dalla Direttiva Europea sul Rumore Ambientale 2002/49/CE, consentendo l'implementazione di interventi di mitigazione idonei ai contesti urbani.

L'intervento infatti tende a sviluppare nuove soluzioni per la mitigazione delle emissioni sonore su strada, in un'ottica di sostenibilità e riduzione dell'impatto ambientale, anche con l'ausilio di materiali riciclati, e trova pertanto il pieno appoggio da parte di questo Ministero.

Per tali ragioni, si esprime:

- il grande interesse a che i beneficiari realizzino il progetto in questione;
- la disponibilità a cooperare in qualità di stakeholder esterno con i beneficiari del progetto

Si auspica, pertanto, in un pieno accoglimento da parte della Commissione Europea della richiesta di finanziamento al fine di poter beneficiare dei risultati di questa iniziativa progettuale.

**IL DIRIGENTE**  
**Ing. Andrea Capuani**

Firmato digitalmente da

**Andrea Capuani**

CN = Andrea Capuani  
O = Ministero delle  
Infrastrutture e dei Trasporti  
C = IT





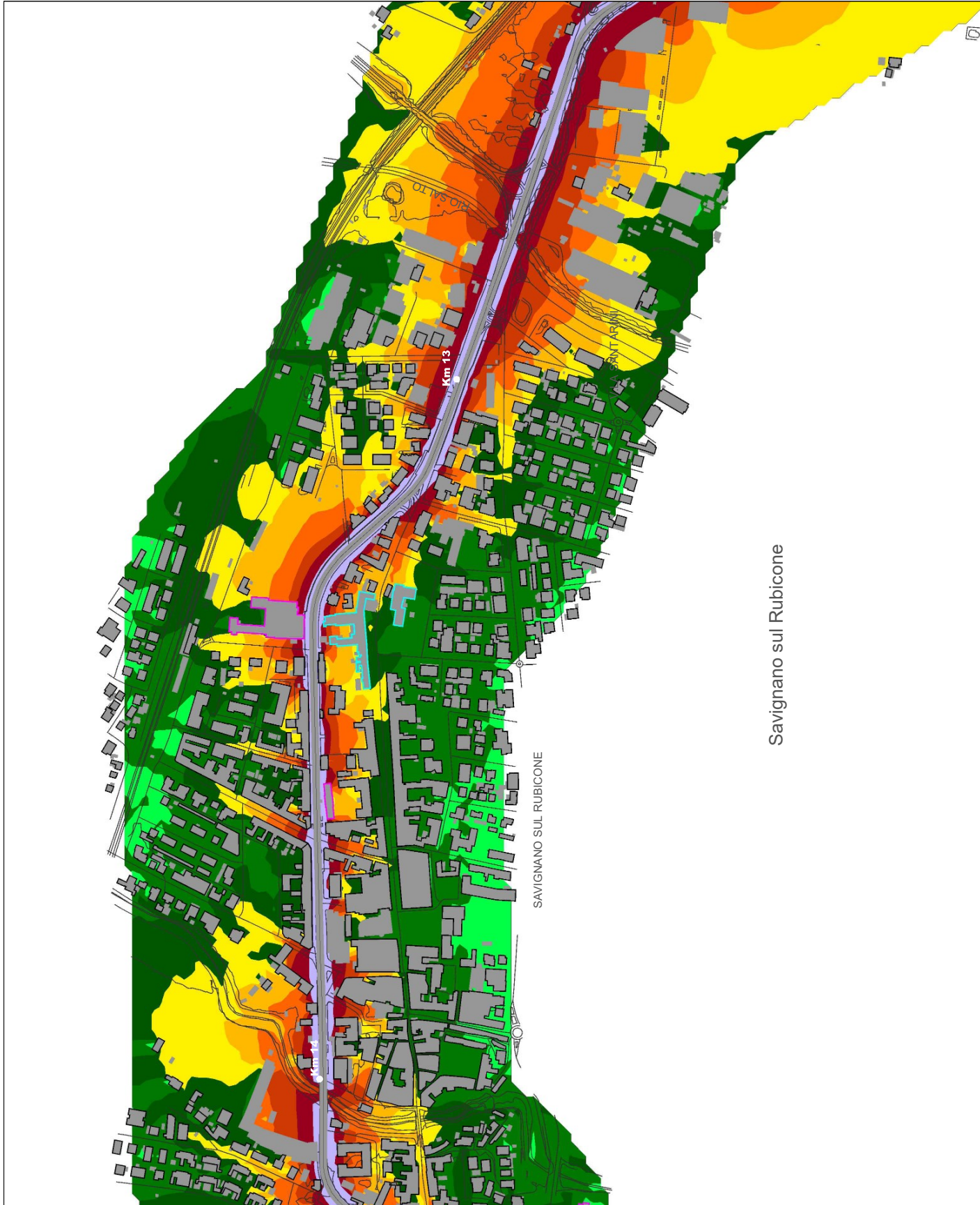
## **SPECIAL ANNEX B**

### **SAVIGNANO SUL RUBICONE PILOT AREA**

#### **ROAD NOISE MAPS**


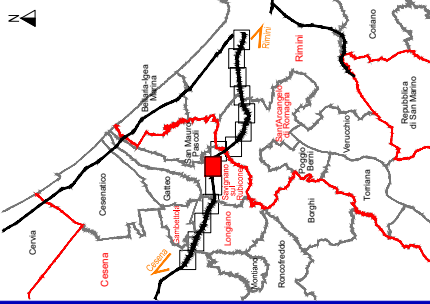
##### **LIST OF DOCUMENTS**

- Maps according to the Directive 2002/49/EC on Environmental Noise:
  - Lden
  - Lnight
  
- Maps according to the Italian Decree DM 11/29/2000:
  - Area framework
  - LAeq day
  - LAeq night
  - Conflicts day
  - Conflicts night
  - Planned noise mitigation measures
  - Critical area technical sheet



Savignano sul Rubicone

REGIONE: Emilia Romagna	REV: 1	DATA: Giugno 2012
TAVOLA: 9		

**LEGENDA**

**TIPOLOGIA RICETTORI**

- Edifici abitativi
- Edifici non abitativi o di pertinenza ANAS
- Edifici scolastici (sensibili)
- Edifici ospedalieri (sensibili)

**SIMBOLOGIA**

- Intervento esistente


**CROMATICITA' LIVELLI**

<math>< 35</math>
35-40
40-45
45-50
50-55
55-60
60-65
65-70
70-75
75-80
80-85

Propagazione dei livelli a 4 m dal suolo (dB(A))

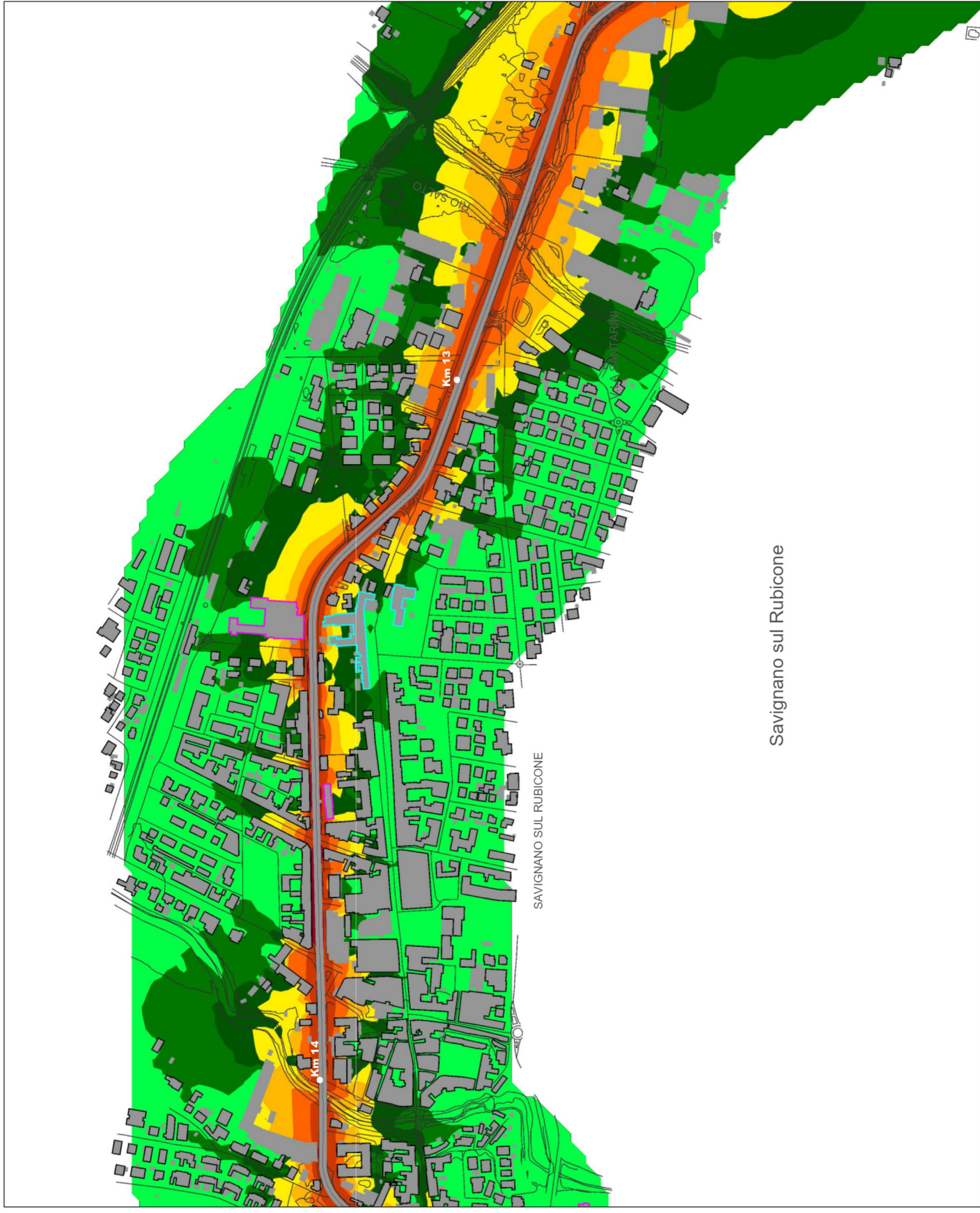
- Confine Comunale
- Confine Provinciale

scala 1:5000



**e-geos** **TECNIC** **SIT**  
PIA SOCIETA' AUTONOMA Consulting Engineers





Savignano sul Rubicone

REGIONE: Emilia Romagna	REV: 1	DATA: Giugno 2012
TAVOLA: <b>9</b>		

**LEGENDA**

**TIPOLOGIA RICETTORI**

- Edifici abitativi
- Edifici non abitativi o di pertinenza ANAS
- Edifici scolastici (sensibili)
- Edifici ospedalieri (sensibili)

**SIMBOLOGIA**

- Intervento esistente

**CROMATICITA' LIVELLI**

	<35
	35-40
	40-45
	45-50
	50-55
	55-60
	60-65
	65-70
	70-75
	75-80
	80-85

Propagazione dei livelli a 4 m dal suolo (dB(A))

- Confine Comunale
- Confine Provinciale

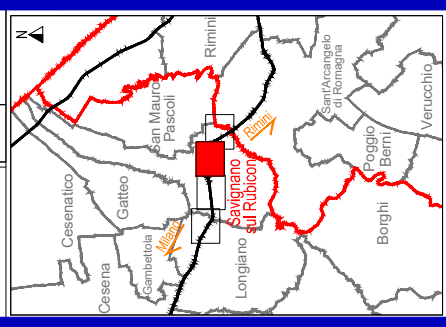
scala **1:50000**





Savignano sul Rubicone

REGIONE: Emilia Romagna	REV: 1	DATA: Settembre 2012
TAVOLA: 2		



**LEGENDA**

**TIPOLOGIA RICETTORI**

- Edifici abitativi
- Edifici non abitativi o di pertinenza ANAS
- Edifici scolastici (sensibili)
- Edifici ospedalieri (sensibili)

**INFRASTRUTTURE**

**Sorgente principale ANAS**

**Sorgenti concorsuali**

- A - Autostrade
- B - Extraurbane principali
- C - Extraurbane secondarie
- D - Urbane di scorrimento
- Ferrovie

**INFRASTRUTTURE**

FASCE DI RISPETTO	FASCE A	FASCE B
Infrastruttura principale ANAS	-----	-----
Infrastrutture concorsuali	-----	-----

**Infrastrutture concorsuali**

- A - Autostrade
- B - Extraurbane principali
- C - Extraurbane secondarie
- D - Urbane di scorrimento
- Ferrovie

**INTERVENTI ESISTENTI**

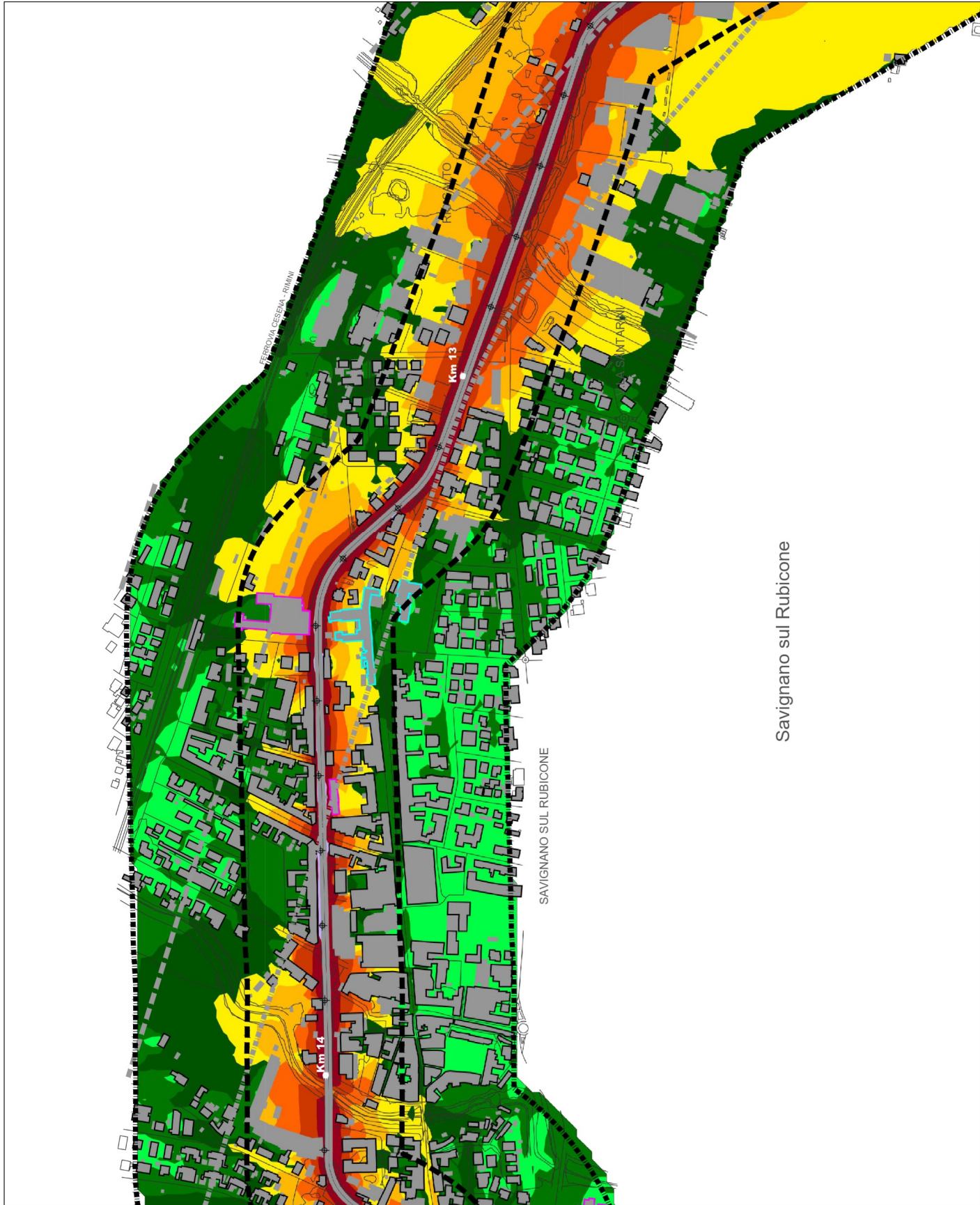
- Barriera esistente
- Confine Comunale
- Confine Provinciale

scala 1:5000

0 50 100 150 250m

**e-geos** **TECNIC** **SIT**  
UNA SOCIETA' AUTONOMA





Savignano sul Rubicone

REGIONE: Emilia Romagna	REV: 1	DATA: Settembre 2012
TAVOLA: 2		

**LEGENDA**

**TIPOLOGIA RICETTORI**

- Edifici abitativi
- Edifici non abitativi o di pertinenza ANAS
- Edifici scolastici (sensibili)
- Edifici ospedalieri (sensibili)

**SIMBOLOGIA**

- Intervento esistente

**CROMATICITA' LIVELLI**

<math>< 35</math>
35-40
40-45
45-50
50-55
55-60
60-65
65-70
70-75
75-80
80-85

Propagazione dei livelli a 4 m dal suolo (dB(A))

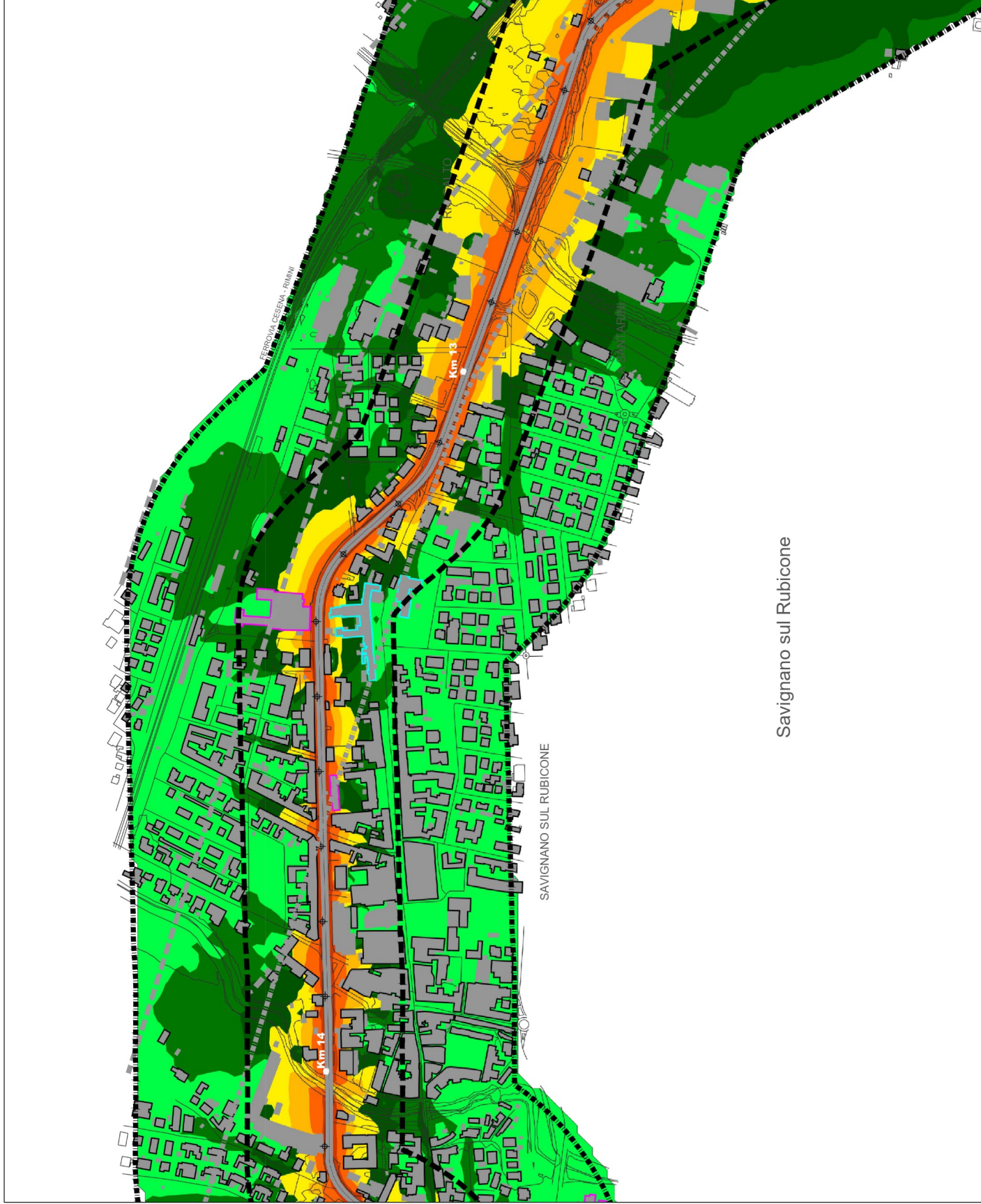
**INFRASTRUTTURE**

- Infrastruttura principale
- Infrastrutture concorsuali

••••• Confine Comunale  
••••• Confine Provinciale

scala 1:5000  
0 50 100 150 250m





Savignano sul Rubicone

REGIONE: Emilia Romagna	REV: 1	DATA: Settembre 2012
TAVOLA: 2		

**LEGENDA**

**TIPOLOGIA RICETTORI**

- Edifici abitativi
- Edifici non abitativi o di pertinenza ANAS
- Edifici scolastici (sensibili)
- Edifici ospedalieri (sensibili)

**SIMBOLOGIA**

- Intervento esistente

**CROMATICITA' LIVELLI**

< 35
35-40
40-45
45-50
50-55
55-60
60-65
65-70
70-75
75-80
80-85

Propagazione dei livelli a 4 m dal suolo [dB(A)]

**INFRASTRUTTURE**

- Infrastruttura principale
- Infrastrutture concorsuali

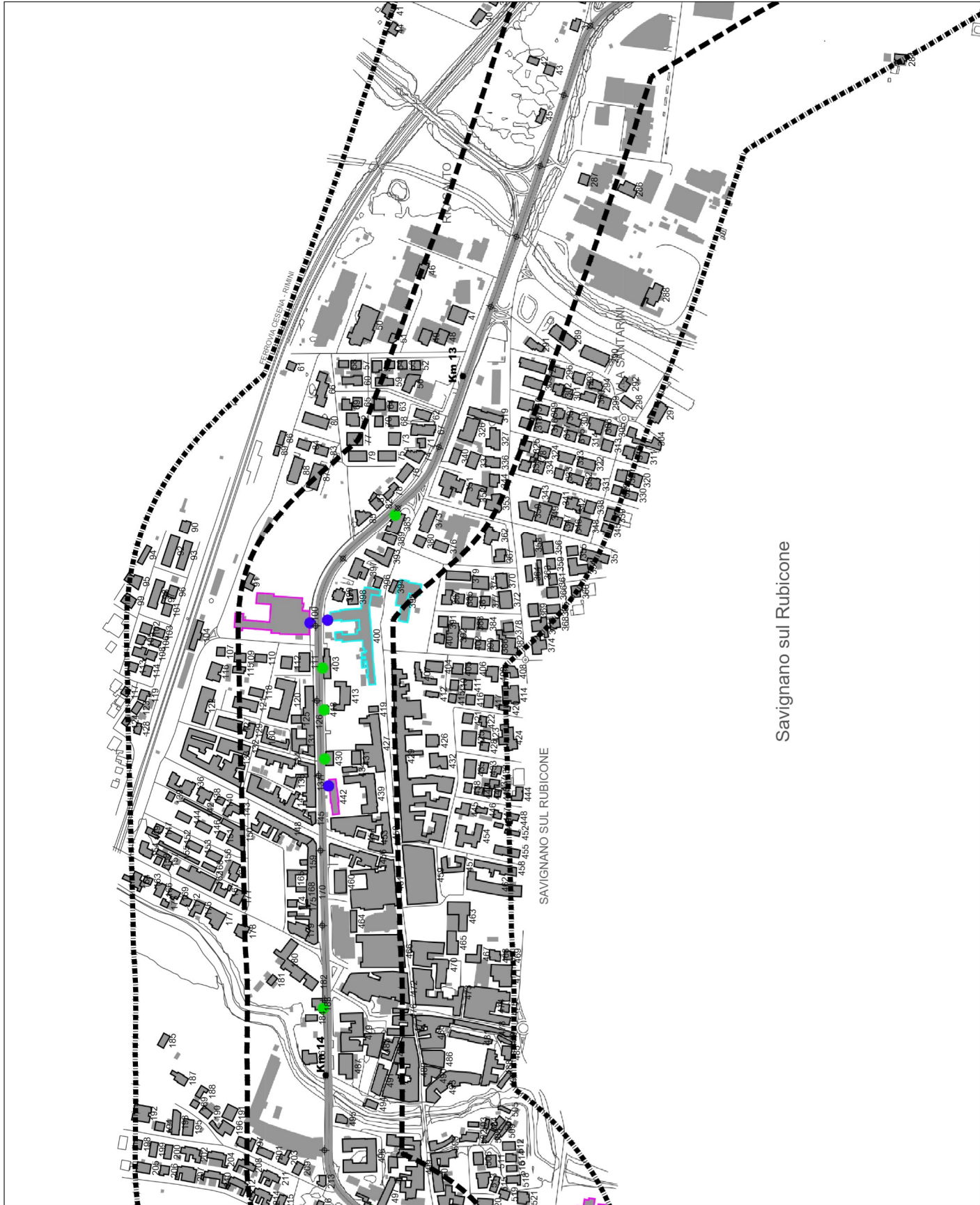
**Simboli**

- Confine Comunale
- Confine Provinciale

scala 1:5000

**e-geos** **TECNIC** **SIT**  
INGEGNERIA AMBIENTALE Consulting Engineers





Savignano sul Rubicone

REGIONE Emilia Romagna	REV. 1	DATA Settembre 2012
TAVOLA: 2		

**LEGENDA**

**TIPOLOGIA RICETTORI**

- Edifici abitativi
- Edifici non abitativi o di pertinenza ANAS
- Edifici scolastici (sensibili)
- Edifici ospedalieri (sensibili)
- n° Codifica ricettori

**SIMBOLOGIA**

- Barriera esistente
- Area di intersezione

**ENTITA' DEGLI IMPATTI dB(A)**

- ≤ 3 Basso
- 3 < ≤ 6 Medio
- 6 < ≤ 9 Medio Alto
- 9 < ≤ 12 Alto
- 12 < Molto Alto

**INFRASTRUTTURE**

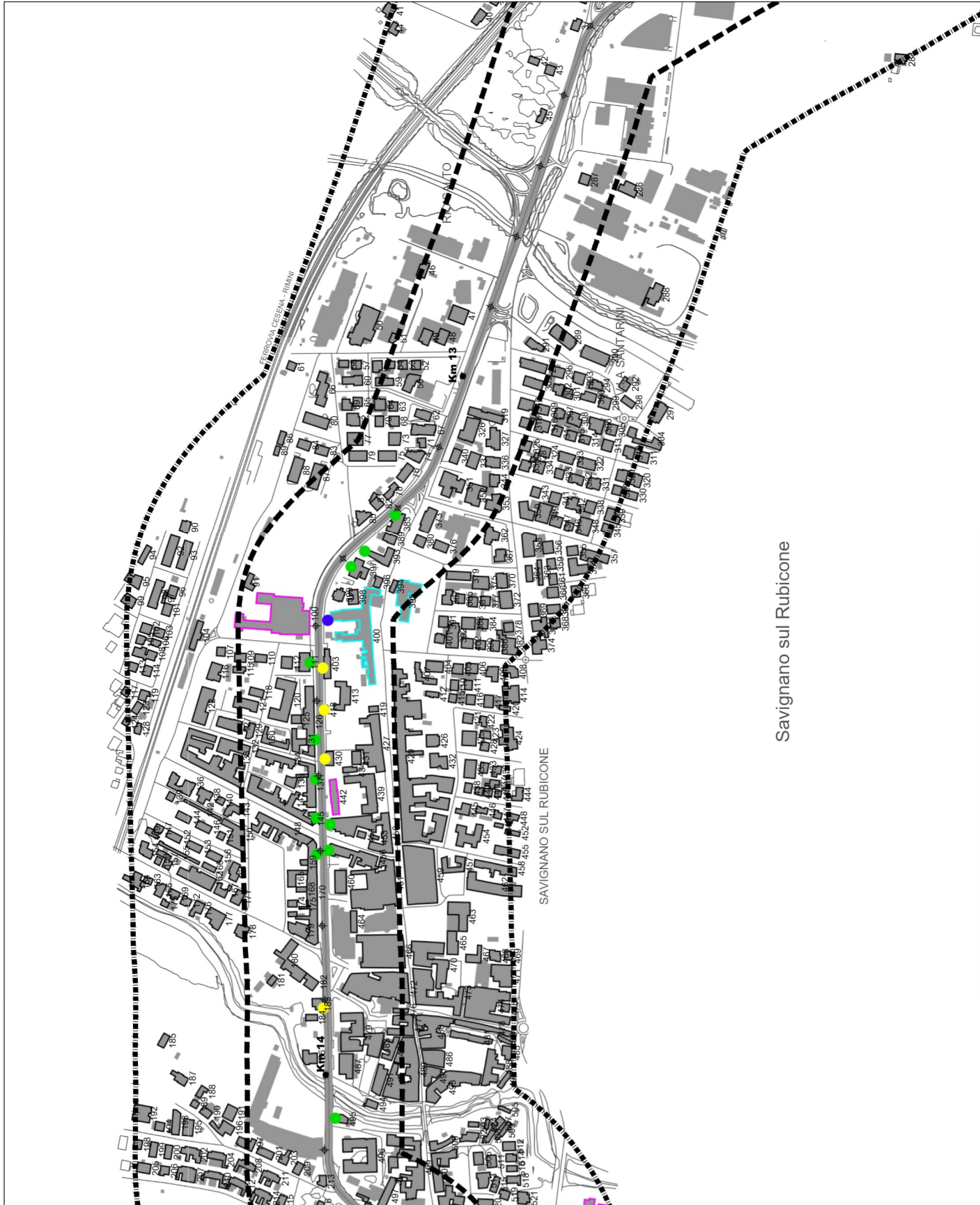
Infrastruttura principale

- Confine Comunale
- Confine Provinciale

scala 1:5000

0 50 100 150 250m

**e-geos** **TECNIC** **SIT**  
INGEGNERIA AMBIENTALE CONSULTING ENGINEERS



Savignano sul Rubicone

REGIONE Emilia Romagna	REV. 1	DATA Settembre 2012
TAVOLA: 2		

**LEGENDA**

**TIPOLOGIA RICETTORI**

- Edifici abitativi
- Edifici non abitativi o di pertinenza ANAS
- Edifici scolastici (sensibili)
- Edifici ospedalieri (sensibili)

n° Codifica ricettori

**SIMBOLOGIA**

- Barriera esistente
- Area di intersezione

**ENTITA' DEGLI IMPATTI dB(A)**

- ≤ 3 Basso
- 3 < ≤ 6 Medio
- 6 < ≤ 9 Medio Alto
- 9 < ≤ 12 Alto
- 12 < Molto Alto

**INFRASTRUTTURE**

Infrastruttura principale

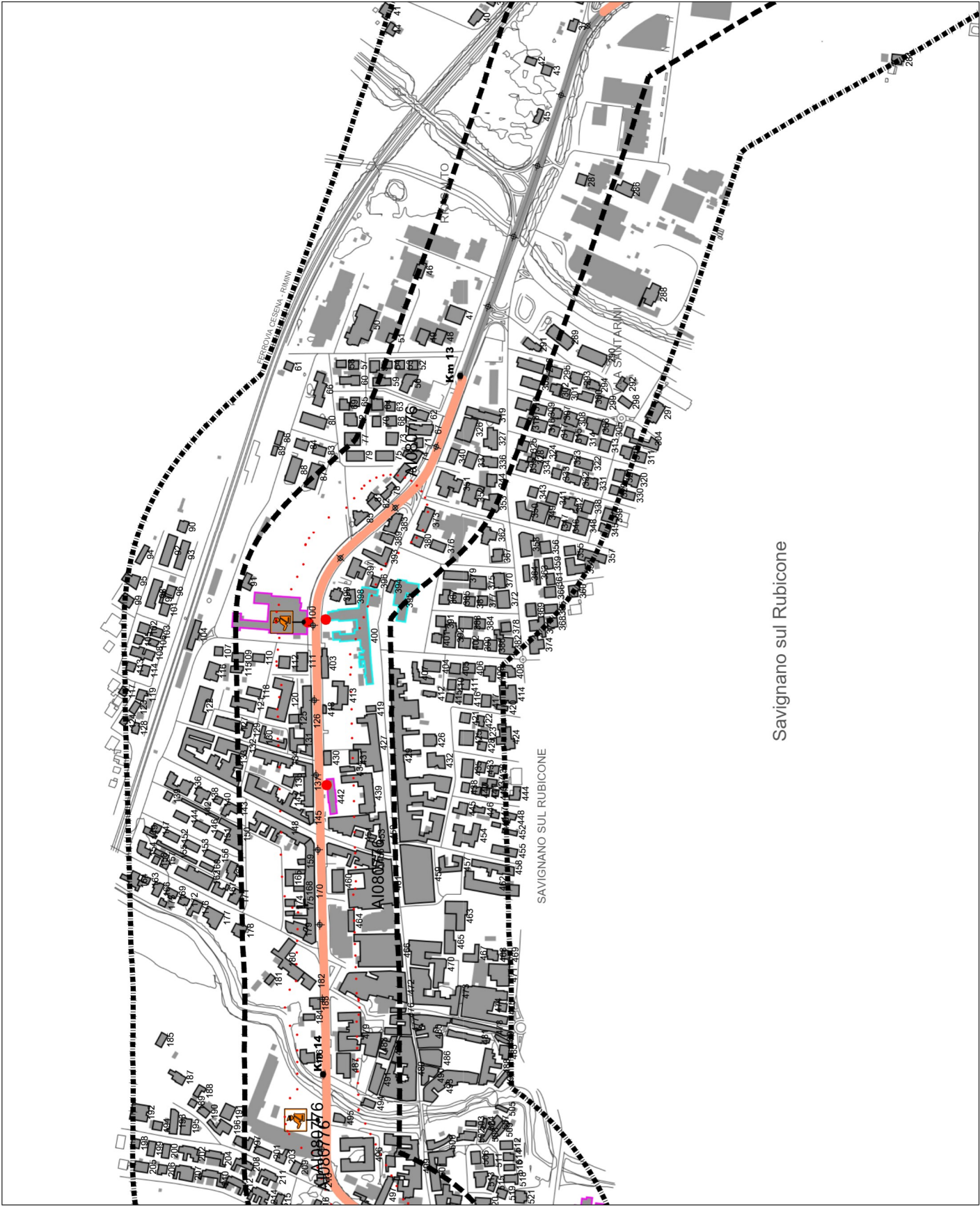
- Contine Comunale
- Contine Provinciale

scala 1:5000

0 50 100 150 250m

**e-geos** **TECNIC** **SIT**  
INGEGNERIA AMBIENTALE Consulting Engineers





Savignano sul Rubicone

REGIONE: Emilia Romagna	REV: 1	DATA: Novembre 2012
TAVOLA: 2		

**LEGENDA**

**TIPOLOGIA RICETTORI**

- Edifici abitativi
- Edifici non abitativi o di pertinenza ANAS
- Edifici scolastici (sensibili)
- Edifici ospedalieri (sensibili)
- n° Codifica ricettori

**INFRASTRUTTURE**

- Sorgente principale ANAS
- Barriera esistente

**INTERVENTI ESISTENTI**

- Barriera h=2
- Barriera h=3
- Barriera h=4
- Barriera h=5
- Barriera h>5

**INTERVENTI DI PROGETTO**

- Interventi diretti
- Pavimentazione CDF
- Tunnel
- Autoveloce

**SIMBOLOGIA**

- Area di intersezione
- Area di intervento

**INFRASTRUTTURE**

Infrastruttura principale

- Confine Comunale
- Confine Provinciale

scala 1:5000

0 50 100 150 250m

**e-geos** **TECNIC** **SIT**  
INGEGNERIA CONSULTING ENGINEERS



**AREA DI INTERVENTO AI080776**  
**Scheda tecnica di sintesi**

Comune **Savignano sul Rubicone**

**INFRASTRUTTURA DI RIFERIMENTO**

Strada **SS9** Corsie **2**  
 Denominazione **VIA EMILIA**

**DATI AREA INTERVENTO**

**INDICE DI PRIORITA'** **59408,80** **COSTO TOTALE (€)** **566.624,48**  
 posiz. grad. Nazion. **18**  
 posiz. grad. Region. **1** Anno di piano **1**

**UBICAZIONE**

Regione **Emilia-Romagna**  
 Progr. Iniziale (km) **13+075** Progr. Finale (km) **14+076**  
 Comune 1 **Savignano sul Rubicone** Provincia 1 **ForlÀ-Cesena**  
 Comune 2 **Savignano sul Rubicone** Provincia 2 **Savignano sul Rubicone**  
 Barriere esistenti **NO**

**PAVIMENTAZIONE FONDOASSORBENTE / BASSOEMISSIVA**

Progressivo	Tipo	Progr. Iniziale (km)	Progr. Finale (km)	lunghezza (m)	costo (Euro)
1	bassoemissiva	12+925	14+226	1.301,00	78.060,00
<b>TOTALE</b>					<b>78.060,00</b>

**BARRIERE ANTIRUMORE**

Progressivo	lato	Progr. Iniziale (km)	Progr. Finale (km)	lunghezza (m)	altezza (m)	costo (Euro)
<b>TOTALE</b>						<b>-</b>

**AUTOVELOX**

Progressivo	Progressiva (km)	costo (Euro)
2	13+316	75.000,00
3	13+991	75.000,00
<b>TOTALE</b>		<b>150.000,00</b>

**INTERVENTI DIRETTI**

Progressivo	codice edificio	stima finestre (mq)	costo (Euro)
4	040045GJ00442	22,33	26.790,89
5	040045GJ00400	166,11	199.327,98
6	040045GJ00100	93,70	112.445,60
<b>TOTALE</b>			<b>338.564,48</b>







KRAIBURG STRAIL GmbH & Co. KG / Göllstraße 8 / D-84529 Tittmoning

ANAS SPA  
Via Monzambano 10  
  
00185 Roma

Tittmoning, 18.04.2023

## LIFE SILENT – Sustainable Innovations for Long-life Environmental Noise Technologies

Dear Coordinator,

We are very sorry to inform you that due to various circumstances we have to withdraw from the LIFE SILENT project.

Due to internal restructuring and a reorientation on the part of the group's management, we do not see ourselves in a position to participate.

Another reason for our withdrawal is the difficult personnel situation, caused by the lack of qualified workers in the labour market, triggered by the pandemic, as well as the global situation.

The initial situation and the objectives for our company have changed drastically compared when we agreed to participate.

Unfortunately, this development was not foreseeable at the time we agreed to participate.

However, we do commit to give our support to the project by providing free of charge a few samples for testing phase (40 linear meters of mSW version „reflecting“ + 20 linear meters of mSW version „absorbing“), as well as 150 linear meters of mSW version „reflecting“ + 50 linear meters of mSW version „absorbing“ for the implementation of the LHNB in the pilot site, including onsite technical assistance for installation.

Therefore, we propose to consider our company for taking a role of a „third party providing in-kind contributions“.

We hope for your understanding, ask you to inform the whole Consortium and formally apologise for having to take this step.

Best regards

  
Günther Wagner  
CEO  
Kraiburg STRAIL GmbH & CO KG



KRAIBURG STRAIL GmbH & Co. KG  
Göllstraße 8  
D-84529 Tittmoning  
E-Mail: info@strail.de  
www.strail.com

Tel.: +49/8683/701-0  
Fax: +49/8683/701-126  
Sitz der Gesellschaft: Tittmoning  
Registergericht: Traunstein HRA Nr. 11345  
Geschäftsführer: Günther Wagner

Bank: UniCredit Bank AG  
BLZ: 7112 2183 | BLZ: 374 7014 28  
IBAN: DE09 7112 2183 0374 7014 28  
BIC: HYVEDEMM457  
VAT: DE 290329859

P.h.G.: KRAIBURG STRAIL Verw. GmbH  
Sitz der Gesellschaft: Tittmoning  
Registergericht: Traunstein HRB Nr. 22780  
Geschäftsführer: Günther Wagner

Detailed Budget Table										
<b>LIFE SILENT</b>										
<b>Important:</b> You may add rows but no additional tabs. This may result in your proposal being considered inadmissible. Please ensure that the file can be printed on a format of 1 page wide (number of pages depending on the number of participants). Please make sure that the figures in this table are consistent with the total budget provided in part A section 3 of the application. In case of inconsistencies, part A will prevail.										
<b>Staff effort allocation</b> Fill in the effort per work package and Beneficiary/Affiliated Entity. Please indicate the number of person-months over the whole duration of the planned work. Adapt the columns to the number of work packages in your proposal. Identify the work-package leader for each work package by showing the relevant person-month figure in bold.										
Participant Number/Short Name	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	Total
1. ANAS	38	3	2	0	3,5	3,5	1,8	4	10	<b>65,8</b>
2. RFI	3	1	0	2,5	17,25	4	3	0	2	<b>32,75</b>
3. ITALFERR	3	0	2	2	7	4	22,5	3,5	1	<b>45</b>
4. ARPAT	2	35	0	0	0	4	3	0	4,5	<b>48,5</b>
5. CNR	4	4	0	8	14	17	0	0	9	<b>56</b>
6. UNIBO	3	1	0	30,5	0	6	5	4	10,5	<b>60</b>
7. UNIRC	4,5	0	25	0	6	6	4	2	7	<b>54,5</b>
9. MOPI	3	0	14	16	4	12	0	4	3	<b>56</b>
<b>Total person-months</b>	<b>60,5</b>	<b>44</b>	<b>43</b>	<b>59</b>	<b>51,75</b>	<b>56,5</b>	<b>39,3</b>	<b>17,5</b>	<b>47</b>	<b>418,55</b>
<b>Personnel costs</b> Present your estimated "Personnel costs" split into 3 categories as per the table below. If you do not have any personnel costs falling under "A.4 SME owners and natural person beneficiaries" or "A.5 Volunteers", all personnel costs should be budgeted under "A1. Employees (or equivalent); A2. Natural persons under direct contract and A3. Seconded Persons". For A.4 SME owners and natural person beneficiaries: please note that as per Annex 2a of the LIFE General Model Grant Agreement (MGA), a unit cost is applied to this cost category. The units are the days spent working on the action (rounded up to the nearest half-day) and the amount per unit (daily rate) is calculated according to the following formula: (EUR 5 080 / 18 days = EUR 282.22 per day) multiplied by (country-specific correction coefficient of the country where the beneficiary is established) Note that the country specific correction coefficient to use is the one applied for the Marie Skłodowska-Curie Actions (MSCA). Yearly rates are published in the Horizon Europe Work Programme – Marie Skłodowska-Curie Actions under the funding and tender portal Reference Documents (work programme and call documents section), available at <a href="https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/reference-documents;programCode=HORIZON">https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/reference-documents;programCode=HORIZON</a> . For A.5 Volunteer Costs: a unit cost is also applied to this cost category. The units are the days spent working on the action (rounded up to the nearest half-day) and the amount per unit (daily rate) is a country specific rate of the beneficiary established. Country specific rates can be found in the LIFE MGA at page 83.8.4.										
Participant Number/Short Name	Country	Number of person months (staff effort per beneficiary)	Average monthly salary rate	A1. Employees (or equivalent); A2. Natural persons under direct contract and A3. Seconded Persons (costs)	A.4 SME owners and natural person (sole trader) beneficiaries (Unit costs in €)	Subtotal personnel costs without volunteers (A1+A2+A3+A4) - must be the same as in part A section 3	A.5 Volunteers (Unit costs) must be the same as in part A section 3	Total Personnel costs		
1. ANAS	IT	65,80	6,000 €	394.800		394.800 €		394.800 €		
2. RFI	IT	32,75	4,980 €	163.094		163.094 €		163.094 €		
3. ITALFERR	IT	45,00	5,158 €	232.110		232.110 €		232.110 €		
4. ARPAT	IT	48,50	4,847 €	235.080		235.080 €		235.080 €		
5. CNR	IT	56,00	2,964 €	165.984		165.984 €		165.984 €		
6. UNIBO	IT	60,00	4,879 €	292.740		292.740 €		292.740 €		
7. UNIRC	IT	54,50	4,764 €	259.638		259.638 €		259.638 €		
9. MOPI	IT	56,00	3,373 €	188.888		188.888 €		188.888 €		
<b>Total</b>		<b>419</b>		<b>1.932.334 €</b>	<b>0 €</b>	<b>1.932.334 €</b>	<b>0 €</b>	<b>1.932.334 €</b>		
<b>Subcontracting</b> Give details on subcontracted action tasks (if any) and explain the reasons why (as opposed to direct implementation by the participants). Subcontracting — Subcontracting means the implementation of action tasks, i.e. specific tasks which are part of the action and are described in Annex 1 of the Grant Agreement. Note: Subcontracting concerns the outsourcing of a part of the action to a party outside the Consortium. It is not simply about purchasing goods or services. We normally expect the participants to have sufficient operational capacity to implement the project activities themselves. Sub-contracting should therefore be exceptional. Include only subcontracts that comply with the rules (i.e. best value for money and no conflict of interest; coordinator tasks can normally not be subcontracted).										
Participant Number/Short Name	Subcontract Description	Cost (€)	WP	Justification (Why is subcontracting necessary?)						
	<b>Total estimated costs</b>	<b>0 €</b>								
If subcontracting for the entire project goes beyond 30% of the total eligible costs, give specific reasons.		Insert text								
<b>Other direct costs</b> Please complete the table below for each participant. If required add further tables at the end of this work sheet (one per participant). Please ensure that sufficient details are provided in part B. For major cost items add lines below, in order to provide a detailed breakdown within one cost category. For major items listed in the justification column, indicate the work package to which they belong. For equipment and infrastructure, please explain if the cost represents the full cost or the depreciation.										
Participant Number / ANAS	Cost (€)	Justification								
Travel & subsistence	9.216 €	Participation in the LIFE SILENT starting event and Special sessions organized in the framework of European conferences. Participation in the AIA Conference 2024 and to the PIARC2025.								
Equipment (incl. infrastructure)	20.000 €	Dynamap system (sensors and platform)								
	7.000 €	Dynamap system installation								
	20.000 €	EPD for the low noise pavement								
	6.000 €	Graphics and print for informative materials								
	3.000 €	Project logo								
Other goods, works and services	7.000 €	Final conference room with interpreting								
	2.000 €	Proceeding open access								
	9.200 €	Catering								
	6.000 €	Video								

	5.200 €	Fees for conference participations, consumables. Special events are arranged in the framework of the conferences, thus the fee includes also the catering for participants.
Financial support to third parties		
Land purchase		
<b>Total</b>	<b>94.616</b>	
<b>Participant Number 2 /RFI</b>	<b>Cost (€)</b>	<b>Justification</b>
Travel & subsistence	6.710 €	Travel costs for participation in conferences and events
Equipment (incl. infrastructure)		
Other goods, works and services	92.100 €	Dissemination materials, open access publication and installation of the LHNB
Financial support to third parties		
Land purchase		
<b>Total</b>	<b>98.810</b>	
<b>Participant Number 3 /ITALFERR</b>	<b>Cost (€)</b>	<b>Justification</b>
Travel & subsistence	6.300 €	Travel costs for participation in conferences and events
Equipment (incl. infrastructure)	30.000 €	Train speed measurement system; software for noise mapping and reporting; EPD certification.
Other goods, works and services	18.300 €	Fee for conferences and LCA database with construction materials
Financial support to third parties		
Land purchase		
<b>Total</b>	<b>54.600</b>	
<b>Participant Number 4 /ARPAT</b>	<b>Cost (€)</b>	<b>Justification</b>
Travel & subsistence	12.360 €	Travel costs for participation in conferences, meetings and events.
Equipment (incl. infrastructure)		
Other goods, works and services	46.400 €	Fee for conferences. Technical support for acoustic modeling. Administrative support for reporting activities
Financial support to third parties		
Land purchase		
<b>Total</b>	<b>58.760</b>	
<b>Participant Number 5 /CNR</b>	<b>Cost (€)</b>	<b>Justification</b>
Travel & subsistence	8.200 €	Travels for Measurement campaigns in SELECTED SITE; Participation to LIFE SILENT meeting, conferences and events.
Equipment (incl. infrastructure)		
Other goods, works and services	35.000 €	Costs for Social survey- questionnaires delivering and collecting and fees for participation to events
Financial support to third parties		
Land purchase		
<b>Total</b>	<b>43.200</b>	
<b>Participant Number 6 /UNIBO</b>	<b>Cost (€)</b>	<b>Justification</b>
Travel & subsistence	11.940 €	Travels for Measurement campaigns in SELECTED SITE; Participation to LIFE SILENT meeting, conferences and events.
Equipment (incl. infrastructure)	55.000 €	Super-directive loudspeaker made following custom specifications for acoustic measurements on low-height noise barriers and Material for provisional laboratory prototypes; proptotype supply.
Other goods, works and services	28.000 €	High precision additive manufacturing (3D printing) services for metamaterial prototypes, Open access publication on scientific journals and fees for participation to events
Financial support to third parties		
Land purchase		
<b>Total</b>	<b>94.940</b>	
<b>Participant Number 7 /UNIRC</b>	<b>Cost (€)</b>	<b>Justification</b>
Travel & subsistence	7.520 €	Travels for Measurement campaigns in SELECTED SITE; Participation to LIFE SILENT meeting, conferences and events.
Equipment (incl. infrastructure)	60.000 €	Dynamic Shear Rheometer, LCA software and Renting of devices to measure surface texture in WP3 and in WP5
Other goods, works and services	7.580 €	Fee for conferences.
Financial support to third parties		
Land purchase		
<b>Total</b>	<b>75.100</b>	
<b>Participant Number 9 /MOPI</b>	<b>Cost (€)</b>	<b>Justification</b>
Travel & subsistence	5.600 €	Participation to LIFE SILENT meeting, conferences and events.
Equipment (incl. infrastructure)	11.000 €	High shear mixer for Bitumen copound
Other goods, works and services	7.700 €	Rubber material aproduction on semindustrial scale, Polymer material production on semindustrial scale, fees for publications and participation in conferences and events
Financial support to third parties		
Land purchase		
<b>Total</b>	<b>24.300</b>	

**Proposal Info**

 Associated with document Ref. Ares(2023)3295175 - 11/05/2023

**Proposal ID**  
SEP-210899625

**Call for Proposal**  
LIFE-2022-SAP-ENV

**Topic**  
LIFE-2022-SAP-ENV-  
ENVIRONMENT

**Type of Action**  
LIFE-PJG

## LIFE Programme – Application Forms (Part C – KPI)

**Horizontal KPIs for all LIFE applicants (Mandatory to report on all the KPIs of this section).**

<p><b>Innovation</b></p> <p>Is your project proposal developing, demonstrating and promoting innovative techniques and approaches?</p> <p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p><b>Governance</b></p> <p>Is your project proposal improving governance through enhancing capacities of public and private actors and the involvement of civil society?</p> <p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p><b>Plans &amp; strategies</b></p> <p>Is your project proposal implementing key plans or strategies?</p> <p><input type="radio"/> Yes <input checked="" type="radio"/> No</p>
<p><b>Catalytic effect - Financial</b></p> <p>Will your project trigger additional investments?</p> <p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p><b>Catalytic effect - Spatial</b></p> <p>Will the results of your project be replicated beyond its intended geographical scope?</p> <p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p><b>Catalytic effect - Thematic</b></p> <p>Will the results of your project be replicated (transferred) beyond its intended thematic scope?</p> <p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>
<p><b>Catalytic effect - Societal</b></p> <p>Will your project :</p> <p>a) Contribute to the development of new or existing national legislation, policies, regulations, incentives and voluntary commitments?</p> <p>b) Achieve a step-change in more effective compliance with and enforcement of Union environmental and climate legislation and/or in policy implementation?</p> <p>c) Achieve a step-change in awareness and support of environmental and climate matters?</p> <p>d) Establish a new macroregional or national model of cooperation (networking)?</p> <p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p><b>Rio markers for climate, biodiversity and air quality</b></p> <p>Please indicate if your proposal:</p> <ul style="list-style-type: none"> <li>• Has climate change/ biodiversity/ air quality as their primary objective</li> <li>• Has climate change/ biodiversity/ air quality as their secondary objective and provide substantial contributions to these objectives</li> <li>• Does not contribute significantly to climate change/ biodiversity/ air quality</li> </ul> <p><b>Climate change</b> Not contributing</p> <p><b>Biodiversity</b> Not contributing</p> <p><b>Air quality</b> Not contributing</p>	

**LIFE Programme - Context selection**

Please select the EU Member State(s) or/and Associated Countries (if any) or/and potential Associated Countries (if any) that best describe the geographical context of your project proposal, i.e. the area(s) of work or/and area(s) of impact.

Please select the type of country you wish to add

EU Member States



- Associated Countries
- To Be Associated Countries

Germany(DE)

Please select the EU Member State(s) or/and Associated Countries (if any) or/and potential Associated Countries (if any) that best describe the geographical context of your project proposal, i.e. the area(s) of work or/and area(s) of impact.

Please select the type of country you wish to add

- EU Member States
- Associated Countries
- To Be Associated Countries

Italy(IT)

Please select the EU Member State(s) or/and Associated Countries (if any) or/and potential Associated Countries (if any) that best describe the geographical context of your project proposal, i.e. the area(s) of work or/and area(s) of impact.

Please select the type of country you wish to add

- EU Member States
- Associated Countries
- To Be Associated Countries

**LIFE Programme - Annex II - Section 2 - Specific KPIs - (Please report on KPIs you consider relevant).**

Please select the relevant indicators for your project. For each selected indicator please provide any required values and comments. Please note that if you deselect an indicator, all values entered will be lost.

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Air quality                            | <input type="checkbox"/> Biodiversity (Invasive Alien Species) | <input type="checkbox"/> Biodiversity (habitats)        |
| <input type="checkbox"/> Biodiversity (number of Species)       | <input type="checkbox"/> C2M projects                          | <input type="checkbox"/> Chemicals (environment)        |
| <input type="checkbox"/> Chemicals (humans)                     | <input type="checkbox"/> Climate area vulnerability reduction  | <input type="checkbox"/> Climate vulnerability (humans) |
| <input type="checkbox"/> Employment                             | <input type="checkbox"/> Energy savings                        | <input type="checkbox"/> GHG emissions                  |
| <input type="checkbox"/> GHG sequestration                      | <input type="checkbox"/> Investments and Financing             | <input checked="" type="checkbox"/> Noise               |
| <input checked="" type="checkbox"/> Other project specific KPIs | <input type="checkbox"/> Renewable energy                      | <input type="checkbox"/> Resource efficiency            |
| <input type="checkbox"/> Soil quality                           | <input type="checkbox"/> Waste management                      | <input type="checkbox"/> Water efficiency               |
| <input type="checkbox"/> Water quality                          |  |   |

**Noise**

Number of people living in areas with reduced noise pollution

The start-value is pre-set to 0. In the end-value please provide your estimated number of residents living in areas with reduced noise pollution due to your project, at project-end. The end-value is expected to be higher than the start-value, demonstrating an increase in the number of residents living in areas with reduced noise pollution, due to the project actions. Please also provide the estimated number, 3/5 years after the project-end, to demonstrate if further number of people will be positively affected. Please also provide relevant comments.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
0	2372	28078	Number of people

Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.

The estimated figures report the reduction of the annoyed population, compared to the reference value Lden >=55 dB(A). The implementation of the proposed solutions, acting on the noise source, allows reducing noise impacts by at least 3 dB in a homogeneous way, but in order to clearly report the beneficial effects of the solutions, we have decided to adopt as KPI only the number of people that are not annoyed by road and railway noise anymore, that is to say, only the number of people shifted below 55 dB(A) due to the implementation of the proposed solutions.

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
0	66.88	318	tn

Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please

**also ensure alignment with the main proposal text.**

Amount of recycled materials used (crumb rubber, cardboard and textiles) for LNP. The recycled material used for a 10 m wide road is 16 tn/km. The A91 road is 22 m wide and 1.9 km long. Therefore the amount of recycled materials used is  $16 \times 2.2 \times 1.9 = 66.88$  tn. Replication sites are about 13.5 km long in total with widths ranging from 10 m to 22 m, therefore the amount of crumb rubber needed is 318 tn.

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
0	41	574	tn

**Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.**

Amount of recycled materials (crumb rubber) used for LHNB. The amount of crumb rubber used for a LHNB 0,5 m high is 205 tn/km. For replication sites, the estimated length of the noise barriers is 2.8 km, corresponding to  $205 \times 2.8 = 574$

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
89.8	81.9	74.1	tn

**Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.**

Reduction of CO2 emissions. The improvement is estimated by calculating the CO2 emissions saved due to the use of recycled materials (crumb rubber and cellulose fibres from waste materials (cardboard, textiles and old tyres) instead of virgin materials. Mass of CO2 saved per km of road: 420 tn/km. Replication sites are about 13.5 km long in total with widths ranging from 10 m to 22 m, therefore the estimated amount of CO2 saved after 5 years is 41.77 tn, starting from 477.40 tn.

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
374000	352183.33	330366.7	€

**Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.**

Cost reduction of LNP. Descriptor assessing the total cost reduction of an asset over its life cycle including initial capital costs, maintenance costs, operating costs and the asset's residual value at the end of its life. The reference cost is 10 €/m2. The estimated cost reduction is 14%. Replication sites are about 13.5 km long in total with widths ranging from 10 m to 22 m, therefore the estimated cost reduction is 278,482 €, starting from a cost of 1,710,678.00 €.

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
0	2404	11442	m3

**Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.**

Waste saved per km of LNP (205 m3 for a 10 m wide road) and LHNB (2630 m3). LHNB length 200 m. LNP length 1.9 km; width 22 m.

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
53.5	50.5	50.5	dB

Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.

Reduction of the noise level at receivers. The baseline is related to a reference point located in front of the Hospital San Giovanni Battista (east side facade). This is described in terms of LAeqN. The noise level at 3/5 years refers to the same site.

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
0	4	4	dB

Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.

Improvement of the acoustic characteristics of the LNP compared to the existing road pavement, in terms of CPX level (rolling noise reduction).

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
0	2	2	dB

Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.

Improvement in the Insertion Loss Parameter, measuring the attenuation of the LHNB, compared to the current STRAIL prototype. Measures made at 7.5 m from the track axis and at a height of 1.2 m above the top of the rail.

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
0	3	3	dB

Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.

Improvement in the sound absorption coefficient due to metamaterials in the LHNB compared to the current STRAIL prototype.

**Other project specific KPIs**

Please enter your project's specific KPI title and provide clarifications in the comment box.

Please specify any other KPIs you wish to present that you consider relevant and not included in the existing KPI list.

Project-Start Value (Baseline)	Project-End Value	3/5 years beyond Project-End Value	Unit
10	12	12	anni

Please provide stand-alone information to further clarify your input and briefly explain any assumptions/calculations. Please also ensure alignment with the main proposal text.

Improvement in the durability of the LNP. Average durability 10 years. Expected increment: 20%.

## ESTIMATED BUDGET FOR THE ACTION

Forms of funding	Estimated eligible <sup>1</sup> costs (per budget category)											Estimated EU contribution <sup>2</sup>					
	Direct costs						Indirect costs					Total costs			EU contribution to eligible costs		
	A. Personnel costs		B. Subcontracting costs		C. Purchase costs		D. Other cost categories		E. Indirect costs <sup>3</sup>			Funding rate % <sup>4</sup>	Maximum EU contribution <sup>5</sup>	Requested EU contribution	Maximum grant amount <sup>6</sup>		
A.1 Employees (or equivalent)	A.2 Natural persons under direct contract	A.3 Seconded persons	A.4 SME owners and natural person beneficiaries	A.5 Volunteers	B. Subcontracting	C.1 Travel and subsistence	C.2 Equipment	C.3 Other goods, works and services	D.1 Financial support to third parties	D.2 Land purchase	E. Indirect costs					Funding rate % <sup>4</sup>	Maximum EU contribution <sup>5</sup>
Actual costs	Unit costs <sup>7</sup>	Unit costs <sup>7</sup>	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	Actual costs	
a1	a3	a4	b	c1	c2	c3	d1a	d2	e	e = flat-rate * (a1 + a3 + b + c1 + c2 + c3 + d1a)	f = a + b + c + d + e	g = f * U%	h	m			
1 - ANAS	394 800,00	0,00	0,00	9 216,00	20 000,00	65 400,00	0,00	0,00	34 259,12	523 675,12	314 205,07	314 205,07	314 205,07	314 205,07	314 205,07		
2 - RFI	163 094,00	0,00	0,00	6 710,00	0,00	92 100,00	0,00	0,00	18 333,28	280 237,28	168 142,37	168 142,37	168 142,37	168 142,37			
3 - ITALFERR	232 110,00	0,00	0,00	6 300,00	30 000,00	18 300,00	0,00	0,00	20 069,70	306 779,70	184 067,82	184 067,82	184 067,82	184 067,82			
4 - ARPAT	235 080,00	0,00	0,00	12 360,00	0,00	46 400,00	0,00	0,00	20 568,80	314 408,80	188 645,28	188 645,28	188 645,28	188 645,28			
5 - CNR	165 984,00	0,00	0,00	8 200,00	0,00	35 000,00	0,00	0,00	14 642,88	223 826,88	134 296,13	134 296,13	134 296,13	134 296,13			
6 - UNIBO	292 740,00	0,00	0,00	11 940,00	55 000,00	28 000,00	0,00	0,00	27 137,60	414 817,60	248 890,56	248 890,56	248 890,56	248 890,56			
7 - UNIRC	259 638,00	0,00	0,00	7 520,00	60 000,00	7 580,00	0,00	0,00	23 431,66	358 696,66	214 901,80	214 901,80	214 901,80	214 901,80			
8 - MOPI	188 888,00	0,00	0,00	5 600,00	11 000,00	7 700,00	0,00	0,00	14 923,16	228 111,16	136 866,70	136 866,70	136 866,70	136 866,70			
9 - TEBALD																	
<b>Σ consortium</b>	<b>1 932 334,00</b>	<b>0,00</b>	<b>0,00</b>	<b>67 846,00</b>	<b>176 000,00</b>	<b>300 480,00</b>	<b>0,00</b>	<b>0,00</b>	<b>173 366,20</b>	<b>2 650 026,20</b>	<b>1 590 015,73</b>	<b>1 590 015,73</b>	<b>1 590 015,73</b>	<b>1 590 015,73</b>			

<sup>1</sup> See Article 6 for the eligibility conditions. All amounts must be expressed in EUR (see Article 21 for the conversion rules).

<sup>2</sup> The consortium remains free to decide on a different internal distribution of the EU funding (via the consortium agreement; see Article 7).

<sup>3</sup> Indirect costs already covered by an operating grant (received under any EU funding programme) are ineligible (see Article 6.3). Therefore, a beneficiary/affiliated entity that receives an operating grant during the action duration cannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant, unless they can demonstrate that the operating grant does not cover any costs of the action. This requires specific accounting tools. Please immediately contact us via the EU Funding & Tenders Portal for details.

<sup>4</sup> See Data Sheet for the funding rate(s).

<sup>5</sup> This is the theoretical amount of the EU contribution to costs, if the reimbursement rate is applied to all the budgeted costs. This theoretical amount is then capped by the 'maximum grant amount'.

<sup>6</sup> The 'maximum grant amount' is the maximum grant amount decided by the EU. It normally corresponds to the requested grant, but may be lower.

<sup>7</sup> See Annex 2a 'Additional information on the estimated budget' for the details (units, cost per unit).

<sup>8</sup> See Data Sheet for the flat-rate.

**ANNEX 2a**

**ADDITIONAL INFORMATION ON UNIT COSTS AND CONTRIBUTIONS**

**SME owners/natural person beneficiaries without salary**

See [\*Additional information on unit costs and contributions \(Annex 2a and 2b\)\*](#)

**Volunteers**

See [\*Additional information on unit costs and contributions \(Annex 2a and 2b\)\*](#)



**ANNEX 3**

**ACCESSION FORM FOR BENEFICIARIES**

**RETE FERROVIARIA ITALIANA (RFI)**, PIC 999434360, established in PIAZZA DELLA CROCE ROSSA 1, ROMA 00161, Italy,

**hereby agrees**

**to become beneficiary**

**in Agreement No 101114310 — LIFE22-ENV-IT-LIFE SILENT** ('the Agreement')

**between ANAS SPA (ANAS) and the European Climate, Infrastructure and Environment Executive Agency (CINEA)** ('EU executive agency' or 'granting authority'), under the powers delegated by the European Commission ('European Commission'),

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 39.

By signing this accession form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and terms and conditions it sets out.

SIGNATURE

For the beneficiary

**ANNEX 3**

**ACCESSION FORM FOR BENEFICIARIES**

**ITALFERR SPA (ITALFERR)**, PIC 924683056, established in VIA VITO GIUSEPPE GALATI 71, ROMA 00155, Italy,

**hereby agrees**

**to become beneficiary**

**in Agreement No 101114310 — LIFE22-ENV-IT-LIFE SILENT** ('the Agreement')

**between ANAS SPA (ANAS) and the European Climate, Infrastructure and Environment Executive Agency (CINEA)** ('EU executive agency' or 'granting authority'), under the powers delegated by the European Commission ('European Commission'),

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 39.

By signing this accession form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and terms and conditions it sets out.

SIGNATURE

For the beneficiary

Andrea Nardinocchi with ECAS id n00a7uw8 signed in the Participant Portal on 16/06/2023 at 13:02:10 (transaction id SigId-11760-frlAG1yWbpqIX6BUGJIL7xhyjWheS7GDFYwLzXXZU2AaOuWV81hE4Bk3ejWBI RItD4HLYGRh6ixdhEKzHNBCdw-jpJZscgsw0K4epxy2XYw0y-HWVQe2 D9mcyRTQilPdPjqcxAB2vTWqP1J3oWzROMSUpaQpfBEfhvZpQ6cNh QUx7xrin3oBJWiSYyDzSQOPCQHq). Timestamp by third party at 2023.06.16 13:02:16 CEST

**ANNEX 3**

**ACCESSION FORM FOR BENEFICIARIES**

**AGENZIA REGIONALE PER LA PROTEZIONE AMBIENTALE DELLA TOSCANA (ARPAT)**, PIC 997237601, established in VIA PONTE ALLE MOSSE 211, FIRENZE 50144, Italy,

**hereby agrees**

**to become beneficiary**

**in Agreement No 101114310 — LIFE22-ENV-IT-LIFE SILENT** ('the Agreement')

**between ANAS SPA (ANAS) and the European Climate, Infrastructure and Environment Executive Agency (CINEA)** ('EU executive agency' or 'granting authority'), under the powers delegated by the European Commission ('European Commission'),

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 39.

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SIGNATURE

For the beneficiary

GAETANO LICITRA with ECAS id nlicitga signed in the Participant Portal on 16/06/2023 at 12:55:43 (transaction id SigId-11684-e9WpbueTahDTfUXozt6ZNMKaHAIW8sueIQgCzsMqQ5T59XRSkzGqxpRvnHitR4pxslHHJC5wc82ezNjw1es4Pf8-jpjZscgsw0K4epxy2XYw0y-rBUlrdByTzyWSzU3wQR75x7XI52iGIHwUlwayn04Ze86BUawWZcov2X4wC84FRM6HZUYQzXRbsaq6bAf7M4PLG). Timestamp by third party at 2023.06.16 12:55:49 CEST

**ANNEX 3**

**ACCESSION FORM FOR BENEFICIARIES**

**CONSIGLIO NAZIONALE DELLE RICERCHE (CNR)**, PIC 999979500, established in PIAZZALE ALDO MORO 7, ROMA 00185, Italy,

**hereby agrees**

**to become beneficiary**

**in Agreement No 101114310 — LIFE22-ENV-IT-LIFE SILENT** ('the Agreement')

**between ANAS SPA (ANAS) and the European Climate, Infrastructure and Environment Executive Agency (CINEA)** ('EU executive agency' or 'granting authority'), under the powers delegated by the European Commission ('European Commission'),

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 39.

By signing this accession form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and terms and conditions it sets out.

SIGNATURE

For the beneficiary

**ANNEX 3**

**ACCESSION FORM FOR BENEFICIARIES**

**ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA (UNIBO)**, PIC 999993953,  
established in VIA ZAMBONI 33, BOLOGNA 40126, Italy,

**hereby agrees**

**to become beneficiary**

**in Agreement No 101114310 — LIFE22-ENV-IT-LIFE SILENT** ('the Agreement')

**between ANAS SPA (ANAS) and the European Climate, Infrastructure and Environment Executive Agency (CINEA)** ('EU executive agency' or 'granting authority'), under the powers delegated by the European Commission ('European Commission'),

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 39.

By signing this accession form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and terms and conditions it sets out.

SIGNATURE

For the beneficiary



**ANNEX 3**

**ACCESSION FORM FOR BENEFICIARIES**

**UNIVERSITA DEGLI STUDI MEDITERRANEA DI REGGIO CALABRIA (UNIRC)**, PIC 997224894, established in VIA SALITA MELISSARI FEO DI VITO, REGGIO CALABRIA 89124, Italy,

**hereby agrees**

**to become beneficiary**

**in Agreement No 101114310 — LIFE22-ENV-IT-LIFE SILENT** ('the Agreement')

**between ANAS SPA (ANAS) and the European Climate, Infrastructure and Environment Executive Agency (CINEA)** ('EU executive agency' or 'granting authority'), under the powers delegated by the European Commission ('European Commission'),

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 39.

By signing this accession form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and terms and conditions it sets out.

**SIGNATURE**

**For the beneficiary**

Giuseppe Zimbalatti with ECAS id n009yo6h signed in the Participant Portal on 08/06/2023 at 10:12:41 (transaction id SigId-230205-ZId5zNLQ4DLjgeU3CFEckfzKMwGKKf14x3zRsjiwQdXsdb5mu4pW2bwAkg78tXsLVBLBQf5TRzRP0wH5zuOCVzLQm-yntOf97TTHjXwStD2tm9a-eiI41MmeS8usLAC2km7FPjhwaIYppu2CccDPsCNAXR0Gn2AB3wIzYw0BgZ2UhmJS0kTEyntmpr7tzNV6zpbowD0). Timestamp by third party at 2023.06.08 10:12:46 CEST

**ANNEX 3**

**ACCESSION FORM FOR BENEFICIARIES**

**MOPI (MOPI)**, PIC 911227604, established in VIA ANTONIO COCCHI 7, PISA 56121, Italy,

**hereby agrees**

**to become beneficiary**

**in Agreement No 101114310 — LIFE22-ENV-IT-LIFE SILENT** ('the Agreement')

**between ANAS SPA (ANAS) and the European Climate, Infrastructure and Environment Executive Agency (CINEA)** ('EU executive agency' or 'granting authority'), under the powers delegated by the European Commission ('European Commission'),

**and mandates**

**the coordinator** to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 39.

By signing this accession form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and terms and conditions it sets out.

**SIGNATURE**

For the beneficiary

Camillo CARDELLI with ECAS id nccmillo signed in the Participant Portal on 11/06/2023 at 21:13:44 (transaction id SigId-254478-ZfDyE3DIzlOU8xZx5papLnngsLynj9zdmBAJlxpynWzvp6B2RwPcj3qQ6zc85BpwjxVRzNQCIVYaeXHzmW2bfj5f0-yntOf97TTHqjXwStD2tm9a-FrXJ5LGnmjE5G7zM4zaULrbcZibxUvi7t0iL52J0tvLfB3cmg00BlowGuzmLkZjA3jFB9kvMLkrlevyivcySBeW). Timestamp by third party at 2023.06.11 21:13:51 CEST

FINANCIAL STATEMENT FOR [PARTICIPANT NAME] FOR REPORTING PERIOD [NUMBER]

Eligible costs (per budget category)										EU contribution to eligible costs			EU contribution <sup>7</sup>		Revenues										
Direct costs										Funding rate % <sup>3</sup>	Maximum EU contribution <sup>4</sup>	Requested EU contribution	Total requested EU contribution												
A. Personnel costs		B. Subcontracting costs		C. Purchase costs			D. Other cost categories		Indirect costs					Total costs											
A.1 Employees (or equivalent)		A.2 Natural persons under direct contract		A.3 Seconded persons		A.4 SME owners and natural person significatives		A.5 volunteers		B. Subcontracting		C.1 Travel and subsistence		C.2 Equipment		C.3 Other goods, works and services		D.1 Financial support to third parties		D.2 Land purchase		E. Indirect costs			
Actual costs		Unit costs <sup>5</sup>		Unit costs <sup>5</sup>		Actual costs		Actual costs		Actual costs		Actual costs		Actual costs		Actual costs		Actual costs		Actual costs		Flat-rate costs <sup>6</sup>			
a.1		a.3		a.4		b		c.1		c.2		c.3		d.1a		d.2		e		f = a+b+c+d+e		g = f/Us		h	
Forms of funding										U		g = f/Us		h		m		n							
XX - (short name beneficiary/affiliated entity)																									

**The beneficiary/affiliated entity hereby confirms that:**  
 The information provided is complete, reliable and true.  
 The costs and contributions declared are eligible (see Article 6).  
 The costs and contributions can be substantiated by adequate records and supporting documentation that will be produced upon request or in the context of checks, reviews, audits and investigations (see Articles 19, 20 and 25).  
 For the last reporting period: that all the revenues have been declared (see Article 22).

0) Please declare all eligible costs and contributions, even if they exceed the amounts indicated in the estimated budget (see Annex 2). Only amounts that were declared in your individual financial statements can be taken into account later on, in order to replace costs/contributions that are found to be ineligible.

<sup>1</sup> See Article 6 for the eligibility conditions. All amounts must be expressed in EUR (see Article 21 for the conversion rules).

<sup>2</sup> If you have also received an EU operating grant during this reporting period, you cannot claim indirect costs - unless you can demonstrate that the operating grant does not cover any costs of the action. This requires specific accounting tools. Please contact us immediately via the Funding & Tenders Portal for details.

<sup>3</sup> See Data Sheet for the reimbursement rates.

<sup>4</sup> This is the theoretical amount of EU contribution to costs that the system calculates automatically (by multiplying the reimbursement rates by the costs declared). The amount you request (in the column 'requested EU contribution') may be less.

<sup>5</sup> See Annex 2b 'Additional information on the estimated budget' for the details (units, cost per unit).

<sup>6</sup> See Data Sheet for the flat-rate.

## ANNEX 5

### SPECIFIC RULES

#### INTELLECTUAL PROPERTY RIGHTS (IPR) — BACKGROUND AND RESULTS — ACCESS RIGHTS AND RIGHTS OF USE (— ARTICLE 16)

##### **Rights of use of the granting authority on results for information, communication, dissemination and publicity purposes**

The granting authority also has the right to exploit non-sensitive results of the action for information, communication, dissemination and publicity purposes, using any of the following modes:

- **use for its own purposes** (in particular, making them available to persons working for the granting authority or any other EU service (including institutions, bodies, offices, agencies, etc.) or EU Member State institution or body; copying or reproducing them in whole or in part, in unlimited numbers; and communication through press information services)
- **distribution to the public** in hard copies, in electronic or digital format, on the internet including social networks, as a downloadable or non-downloadable file
- **editing** or **redrafting** (including shortening, summarising, changing, correcting, cutting, inserting elements (e.g. meta-data, legends or other graphic, visual, audio or text elements extracting parts (e.g. audio or video files), dividing into parts or use in a compilation
- **translation** (including inserting subtitles/dubbing) in all official languages of EU
- **storage** in paper, electronic or other form
- **archiving** in line with applicable document-management rules
- the right to authorise **third parties** to act on its behalf or sub-license to third parties, including if there is licensed background, any of the rights or modes of exploitation set out in this provision
- **processing**, analysing, aggregating the results and **producing derivative works**
- **disseminating** the results in widely accessible databases or indexes (such as through ‘open access’ or ‘open data’ portals or similar repositories, whether free of charge or not.

The beneficiaries must ensure these rights of use for the whole duration they are protected by industrial or intellectual property rights.

If results are subject to moral rights or third party rights (including intellectual property rights or rights of natural persons on their image and voice), the beneficiaries must ensure that they

comply with their obligations under this Agreement (in particular, by obtaining the necessary licences and authorisations from the rights holders concerned).

## **COMMUNICATION, DISSEMINATION AND VISIBILITY (— ARTICLE 17)**

### **Communication and dissemination plan**

The beneficiaries must provide a detailed communication and dissemination plan, setting out the objectives, key messaging, target audiences, communication channels, social media plan, planned budget and relevant indicators for monitoring and evaluation.

### **Additional communication and dissemination activities**

The beneficiaries must engage in the following additional communication and dissemination activities:

- **present the project** (including project summary, coordinator contact details, list of participants, European flag and funding statement and special logo and project results) on the beneficiaries' **websites** or **social media accounts**
- for actions involving equipment, infrastructure or works, display as soon as the work on the action starts a **printed or electronic sign** of appropriate size, with European flag and funding statement and special logo
- upload the public **project results** to the LIFE Project Results platform, available through the Funding & Tenders Portal .

### **Special logos**

Communication activities and infrastructure, equipment or major results funded by the grant must moreover display the following logo:

- the LIFE Programme logo



and

- for projects in Natura 2000 sites or contributing to the integrity of Natura 2000 network: the Natura 2000 logo





## **SPECIFIC RULES FOR CARRYING OUT THE ACTION (— ARTICLE 18)**

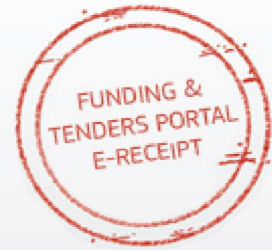
### **Durability**

Unless exempted by the granting authority, beneficiaries of Standard Action Projects, Strategic Nature Projects and Strategic Integrated Projects must commit to continue to use and maintain after the end of the action equipment bought and eligible at full costs, for activities pursuing the action's objectives. Such equipment must be used for these purposes — for at least five years after the end of the action (see Data Sheet, Point 1) or until the end of its economic lifespan (i.e. until it has been fully depreciated) — whichever is earlier.

### **Specific rules for blending operations**

When implementing blending operations, the beneficiaries acknowledge and accept that:

- the grant depends on the approved financing from the Implementing Partner and/or public or private investors for the project
- they must inform the granting authority both about the approval for financing and the financial close — within 15 days
- the payment deadline for the first prefinancing is automatically suspended until the granting authority is informed about the approval for financing
- both actions will be managed and monitored in parallel and in close coordination with the Implementing Partner, in particular:
  - all information, data and documents (including the due diligence by the Implementing Partner and the signed agreement) may be exchanged and may be relied on for the management of the other action (if needed)
  - issues in one action may impact the other (e.g. suspension or termination in one action may lead to suspension also of the other action; termination of the grant will normally suspend and exit from further financing and vice versa, etc.)
- the granting authority may disclose confidential information also to the Implementing Partner.



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