Project *Life*-NEEVE:

Innovative technologies to monitor and reduce Non-Exhaust Emissions, particles and microplastics of VEhicles and pavements to improve air quality and human health

LIFE-2023-SAP-ENV

(Circular Economy and Quality of LIFE-Standard Action Projects (SAP))

Deliverable D1.4:

Mid-Term KPI & Management Report

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SUMMARY

Reporting period (M1–M24)

This Deliverable D1.4, titled "Mid-Term KPI & Management Report," covers the activities, financial status, and technical progress of the LIFE-NEEVE project during its first 24 months (M1-M24). The core aim of the project during this period has been to innovate technologies to monitor and reduce Non-Exhaust Emissions (NEE) such as particles and microplastics from brakes, tyres, and pavements from road traffic to improve air quality and human health.

Overall project status

At mid-term, the project is progressing successfully both technically and financially, with no critical deviations currently threatening the achievement of the LIFE-NEEVE objectives. The budget execution aligns with the planned allocations, with only minor administrative internal reallocations that do not alter the total eligible budget. Technically, Work Package 2 (WP2) was successfully completed in month 15. Work Package 3 (WP3) is currently advancing well through its initial laboratory and development phase, and Work Package 4 (WP4) has entered its initial development and early implementation stage. The project's risk management plan has proven effective; while some risks materialized, they were appropriately addressed through technical, organizational, and administrative mitigation measures.

Main achievements and challenges

Main achievements

During this first half of the project, the consortium has accomplished several significant technical and organizational milestones. Work Package 2 was successfully completed, providing the foundational base designs by analyzing state-of-the-art measurement techniques and defining new protocols to mitigate NEE. Building on this, the project saw major breakthroughs in material optimization, notably the development and evaluation of 54 new brake pad formulations that demonstrated up to a 41.3% reduction in particle emissions without compromising performance or noise behavior. In parallel, structured laboratory testing identified Open Stone Mastic Asphalt (OSMA 11) as a highly promising low-emission pavement solution due to its mechanical robustness and optimal surface texture. Monitoring capabilities also advanced considerably; HORIBA's on-board measurement systems showed very strong agreement with GTR-compliant laboratory reference devices, and VTI successfully launched a unique accelerated convoy method for on-road tyre wear testing in April 2026. Furthermore, the project made strides in health and environmental impact assessments. UMH developed a complex, three-layer skin organoid model (currently at TRL 6) incorporating the epidermis, dermis, and hypodermis to evaluate the toxicity of NEE particles, while RDT developed an initial Computational Fluid Dynamics (CFD) framework to simulate the spatial dispersion of these emissions using Murcia as a test scenario. Finally, a robust KPI monitoring methodology was fully established and refined through Deliverables D5.1

and D5.2, ensuring the harmonized tracking of all environmental, socio-economic, and technical impacts.

Main challenges

Despite these achievements, the consortium navigated several operational and technical challenges during the reporting period. A primary hurdle involved testing methodologies, as standard chassis dynamometers proved not fully suitable for representative pavement and tyre testing, prompting CIEMAT to develop and implement an innovative laboratory testing methodology to mitigate this limitation. Additionally, overlaps with WP3 activities and limited resource availability caused a slight schedule delay in WP4; specifically, Task 4.1 and Deliverable D4.1 were rescheduled from month 27 to 30 to guarantee the technical maturity of the results. The development of biological models also faced unforeseen obstacles, including higher-than-expected reagent costs, supply chain distribution delays, and longer-than-anticipated ethical approval times for the lung organoids. Another critical challenge pertains to data transferability; validating pavement data for Northern European regions using the VTI Road Simulator in Sweden requires a pending approval from CINEA for internal invoicing, which remains a crucial unresolved administrative step. Lastly, the University of Seville encountered internal administrative bottlenecks, as restrictions on using internal facilities to avoid self-funding issues forced them to secure multiple external quotes, temporarily delaying the analysis of particle samples.

List of abbreviations and symbols

In this Deliverable abbreviations or symbols in the table below are often used.

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Abbreviation	Explanation	Comment
	Partners, companies or institutions related to this project	
US	Universidad de Sevilla	Partner and Coordinator
CHM	CHM Obras e Infraestructuras S.A.	Partner
CIEMAT	Centro de Investigaciones Energéticas Medioambientales y Tecnológicas	Partner
CTCON	Asociación empresarial Centro Tecnológico de la Construcción Región de Murcia.	Partner
HORIBA	HORIBA EUROPE GMBH	Partner
ICERBRAKES	ICER BRAKES SA	Partner
PAUDIRE	Paudire Innova S.L.	Partner
RDT	RDT Ingenieros Madrid S.L.	Partner
UMH	Universidad Miguel Hernández	Partner
VTI	Swedish National Road and Transport Research Institute (VTI)	Partner
	Technical terminology	
TRL	Technology Readiness Level	
SC	Steering Committee	
STC	Scientific and Technical Committee	
AB	Advisory Board	
NDA	Non-Disclosure Agreement	
CITIUS	Centre for Research, Technology and Innovation at the University of Seville	
	Measures and units	

Table of contents

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1. Introduction

Air pollution is estimated to cause more than 400,000 premature deaths a year in the EU (ELF,2024). According to European Environment Agency (2024) reports that 96% of the EU's urban population is exposed to unsafe concentrations of fine particulate matter (PM2.5).

Road traffic generates non-exhaust emissions (NEE), defined as particles released by the wear and tear of brakes, tyres and the road surface, which are now the main source of particulate pollution from road transport. (DGT, 2025)

The aim of the LIFE-NEEVE project is to innovate technologies to monitor and reduce Non-Exhaust Emissions, from road traffic to improve air quality and human health.

This deliverable will provide an update on the key performance indicators (KPIs) for LIFE NEEVE.

Key performance indicators (KPIs) are quantifiable measures used to assess the success of a project. (Project Management Institute, 2021).

All partners will be kept informed of the project's progress and the achievement of its scientific, technical, and innovative objectives, thereby ensuring the project runs smoothly.

To ensure the quality of the results, compliance with legal requirements and risk management for all activities and procedures carried out within the NEEVE project, a contingency plan will be implemented that includes the identified risks and appropriate mitigation measures.

This document also provides information on whether any deviations have occurred and, if so, the impact this has had on the schedule.

2. Purpose and objectives

The purpose of this deliverable is to produce the mid-term report for the LIFE NEEVE project, which sets out the financial, scientific and legal results.

3. Project Management Overview (WP1) (Lead: US)

3.1. Governance structure (SC, STC). Change of Carmen, Aida and Tawfiq

3.1.1 Leader of SC

Project coordinator, Paloma Álvarez Mateos (US)

SC members: José María Fernandez-Bolaño Guzmán (US), Carmen Barrios (CIEMAT), Mattias Schroeder (HORIBA), Pedro Miguel Martinez (PAUDIRE), Verónica Yunta Escribano (RDT), Lorena Palomo Luis (CHM), Miriam Hernández Pérez (CTCON), Adelfio Zanat (ICERBRAKES), Enrique Barrajón (UMH), Mats Gustafss (VTI).

3.1.2 Leader of STC

Technical coordinator, Carmen Barrios (CIEMAT)

Members of STC: Jose María Fernández Bolaños (US), Mattias Schroeder (HORIBA), Pedro Miguel Martinez (PAUDIRE), Veronica Yunta Escribano (RDT), Lorena Palomo Luis (CHM), Gloria Motos Cascales (CTCON), Adelfio Zanat (ICERBRAKES), Enrique Barrajon-Catalan (UMH), Mats Gustafsson (VTI).

There has been a change at the STC following the death of Carmen Barrios; Aida Domínguez Sáez and Tawfiq Al-Wasif Ruiz are now serving as technical coordinators.

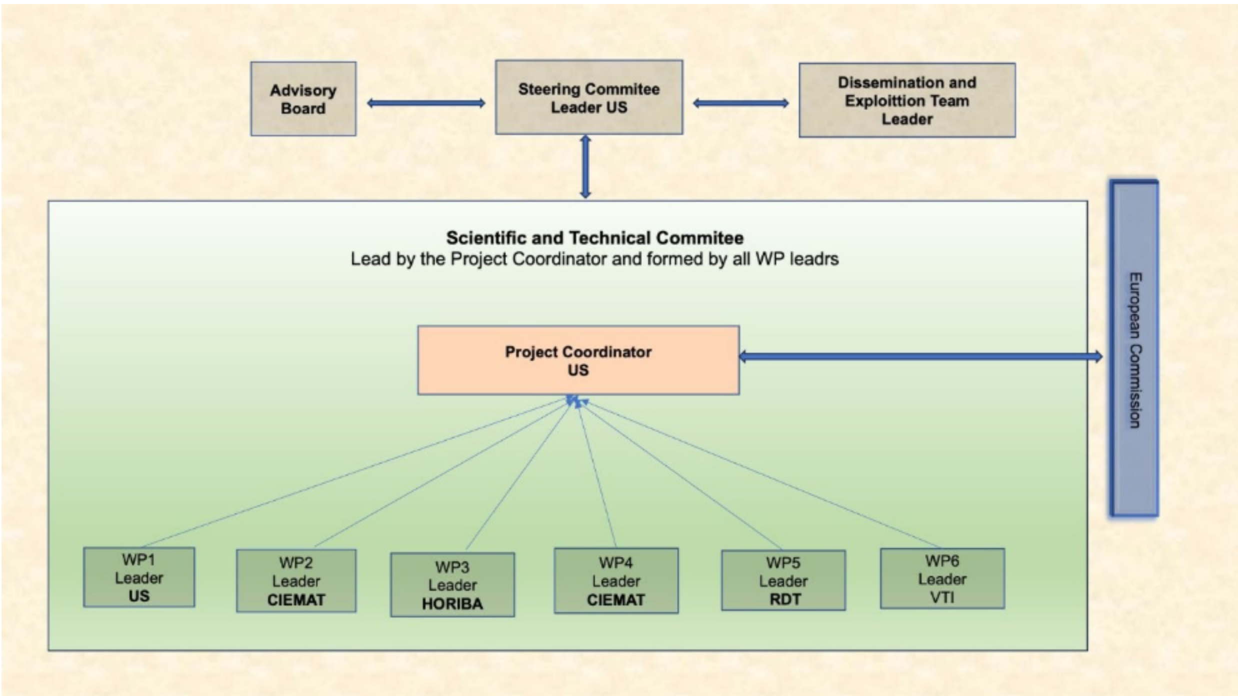

Figure 1: Structural organisation of the life LIFE NEEVE project.

3.2. Advisory Board (AB)

The Advisory Board consists of senior members from key multi-stakeholder groups, who will advise and guide LIFE NEEVE in its vision, strategy and implementation, and contribute to improving its results.

The AB members represent various actors and stakeholders from the tyre, brake disc/pad, automotive industry and road pavement industry, as well as municipalities from different cities in Spain with an interest in the environment and providing political support.

The advisory board will be established at the start of the project to assist in all phases of its development. Supporters of the LIFE NEEVE project as Dr. Gramstat (AUDI), Dr. Vogt (Ford) and Mr. Manuel Valls (Murcia City Council) and new participants who joined before the start of the initiative will be part of the AB. Table 1 shows the confirmed members.

Table 1: Confirmed members of the Advisory Board.

Name	Company/organization	Expertise	Status
Dr Juan Jesus Garcia	Idiada	Coordinator of LEON-T, NEE expert	Confirmed NDA
Mr Manuel Valls	Murcia City Council	R&D projects and circular economy	Confirmed NDA
Dr Christian Bachmann	fka GmbH, RWTH Aachen	Tyre technology	Confirmed No NDA
Prof Filippo Pratico	University Mediterranea of Reggio Calabria, Italy	Road materials	Confirmed NDA
Guillaume Lemasson (TFTA)	Michelin	Tyre technology and wear measurement	Confirmed NDA
Dr Jos van Triel	RIVM, Netherlands	Toxicology	Confirmed NDA

3.3. Meetings and coordination activities

A kick-off meeting (KoM) involving all project partners was held in Seville in May 2024. The project governance structure includes Steering Committee meetings held once a year, Scientific and Technical Committee meetings held twice a year (with one of them aligned with the Steering Committee meeting), and Dissemination and Exploitation Committee meetings, also organised on an annual basis and held in conjunction with the Steering Committee meetings.

In addition, regular follow-up meetings are held to discuss the progress of all the consortium's ongoing activities; these meetings take place monthly during the first year of the project and bimonthly halfway through the project. In addition to these meetings, other technical meetings are also held among the partners involved in technical activities to discuss specific issues related to them.

4. Financial Status (Lead: US, Participants: ALL)

4.1. Budget overview (planned vs. spent)

4.1.1 Financial Statement US

Table 1: Financial Statement US

Budget Category (Categoría)	Costs claimed / declared	Budget in GA	Pending budget
A. Direct personnel costs *(A.1/A.2)*	350,397.60€	444,440.00€	94,042.40€
B. Direct costs of subcontracting			
C. Direct costs of financial support		44,000.00€	
D. Other direct costs			
↳ D.1 Travel	3,345.39€	33,700.00€	30.354,61€
↳ D.2 Equipment	2,042.89€	-	2,042.89€
↳ D.3 Other goods and services	9,854.64€	62,500.00€	52,645.36€
↳D.4 / D.5 (Large research / Internal goods)	-	-	-
E. Indirect costs *(Flat-rate 7%)*	25,594.84€	40,924.80€	15,329.96€
[F. Costs of...]	-	-	-
TOTAL COSTS	391,235.35€	625,564.80€	234,329.45€

4.1.2 Financial Statement CHM

Table 2: Financial Statement CHM

Budget Category (Categoría)	Costs claimed / declared	Budget in GA	Pending budget
A. Direct personnel costs *(A.1/A.2)*	73,523.36€	205,506.00 €	131,982.64€
B. Direct costs of subcontracting			
C. Direct costs of financial support			
D. Other direct costs			
↳ D.1 Travel	1,519.98 €	22,337.00 €	20,817.02 €
↳ D.2 Equipment			
↳ D.3 Other goods and services	0.00 €	54,000.00 €	54,000.00 €
↳D.4 / D.5 (Large research / Internal goods)			
E. Indirect costs *(Flat-rate 7%)*	5,253.03 €	19,729.01 €	14,475.98 €
[F. Costs of...]			
TOTAL COSTS	80,296.37 €	301,572.01 €	221,275.64 €

4.1.3 Financial Statement CIEMAT

Table 3: Financial Statement CIEMAT

Budget Category (Categoría)	Costs claimed / declared	Budget in GA	Pending budget
A. Direct personnel costs *(A.1/A.2)*	200,886.37 €	386,100.00 €	185,213.63 €
B. Direct costs of subcontracting	-	-	-
C. Direct costs of financial support	-	-	-
D. Other direct costs			
↳ D.1 Travel	9,495.24 €	28,388.00 €	18,892.76 €
↳ D.2 Equipment	113,575.11 €	106,667.00 €	6,908.11 €
↳ D.3 Other goods and services	30,949.44 €	68,625.00 €	37,675.56 €
↳D.4 / D.5 (Large research / Internal goods)	-	-	-
E. Indirect costs *(Flat-rate 7%)*	88,726.54 €	147,445.00 €	58,718.46 €
[F. Costs of...]	-	-	-
TOTAL COSTS	443,632.70 €	737,225.00 €	293,592.30 €

4.1.4 Financial Statement CTCON

Table 4: Financial Statement CTCON

Budget Category (Categoría)	Costs claimed / declared	Budget in GA	Pending budget
A. Direct personnel costs *(A.1/A.2)*	74,237.19 €	140,600.00 €	66,362.81 €
B. Direct costs of subcontracting	-	-	-
C. Direct costs of financial support	-	-	-
D. Other direct costs			
↳ D.1 Travel	3,840.24 €	22,337.00 €	18,496.76 €
↳ D.2 Equipment	-	-	-
↳ D.3 Other goods and services	4,351.60 €	12,000.00 €	7,648.40 €
↳D.4 / D.5 (Large research / Internal goods)	-	-	-
E. Indirect costs *(Flat-rate 7%)*	5,770.03 €	12,245.59 €	6,475.56 €
[F. Costs of...]			
TOTAL COSTS	88,199.06 €	187,182.59 €	98,983.53 €

4.1.5 Financial Statement HORIBA

Table 5: Financial Statement HORIBA

Budget Category (Categoría)	**Costs claimed / declared**	**Budget in GA**	**Pending budget**
A. Direct personnel costs *(A.1/A.2)*	191,661.25 €	606,800.00 €	415,138.75 €
B. Direct costs of subcontracting	-	-	-
C. Direct costs of financial support	-	-	-
D. Other direct costs			
↳ D.1 Travel	8,208.46€	336,000.00€	25,391.54€
↳ D.2 Equipment	53,558.33€	273,333.00€	219,774.67€
↳ D.3 Other goods and services	28,493.81€	43,800.00€	15,306.19€
↳D.4 / D.5 (Large research / Internal goods)	-	-	-
E. Indirect costs *(Flat-rate 7%)*	19,734.53€	67,027.31 €	47,292.78 €
[F. Costs of...]	-	-	-
TOTAL COSTS	30,656.7 €	1,024,560.31 €	722,903.94 €

4.1.6 Financial Statement ICERBRAKES

Table 6: Financial Statement ICERBRAKES

Budget Category (Categoría)	Costs claimed / declared	Budget in GA	Pending budget
A. Direct personnel costs *(A.1/A.2)*	129,402.90 €	225,000.00 €	95,597.10 €
B. Direct costs of subcontracting			
C. Direct costs of financial support			
D. Other direct costs			
↳ D.1 Travel	3,173.84 €	17,200.00 €	14,026.16 €
↳ D.2 Equipment		72,737.00 €	72,737.00 €
↳ D.3 Other goods and services	18,001.62 €	45,309.00 €	27,307.38 €
↳D.4 / D.5 (Large research / Internal goods)			
E. Indirect costs *(Flat-rate 7%)*	10,540.49 €	25,217.22 €	14,676.73 €
[F. Costs of...]			
TOTAL COSTS	161,118.85 €	385,463.22 €	224,344.37 €

4.1.7 Financial Statement IDIBE UMH

Table 7: Financial Statement IDIBE UMH

Budget Category (Categoría)	Costs claimed / declared	Budget in GA	Pending budget
A. Direct personnel costs *(A.1/A.2)*	82,335.72€	145,700.00 €	63,364.28 €
B. Direct costs of subcontracting			
C. Direct costs of financial support			
D. Other direct costs			
↳ D.1 Travel	399.27 €	6,000.00 €	5,600.00 €
↳ D.2 Equipment	-	-	-
↳ D.3 Other goods and services	16,015.43€	38,000.00 €	21,984.57 €
↳D.4 / D.5 (Large research / Internal goods)			
E. Indirect costs *(Flat-rate 7%)*	7,330.37€	13,279.00 €	5.948,63 €
[F. Costs of...]			
TOTAL COSTS	112,049.93 €	202,979.00 €	90,929.07€

4.1.8 Financial Statement PAUDIRE

Table 8: Financial Statement PAUDIRE

Budget Category (Categoría)	Costs claimed / declared	Budget in GA	Pending budget
A. Direct personnel costs *(A.1/A.2)*	100,738.04€	188,600.00 €	87,861.96 €
B. Direct costs of subcontracting			
C. Direct costs of financial support			
D. Other direct costs			
↳ D.1 Travel	1,078.98 €	10,500.00 €	9,421.02 €
↳ D.2 Equipment			
↳ D.3 Other goods and services	42.74 €	2,075.00 €	2,032.26 €
↳D.4 / D.5 (Large research / Internal goods)			
E. Indirect costs *(Flat-rate 7%)*	7,122.18 €	14,082.25 €	6,960.07 €
[F. Costs of...]			
TOTAL COSTS	108,867.56 €	215,257.25 €	106,389.69 €

4.1.9 Financial Statement RDT

Table 9: Financial Statement RDT

Budget Category (Categoría)	**Costs claimed / declared**	**Budget in GA**	**Pending budget**
A. Direct personnel costs *(A.1/A.2)*	107,814.26 €	297,000.00 €	189,185.74 €
B. Direct costs of subcontracting			
C. Direct costs of financial support			
D. Other direct costs			
↳ D.1 Travel	3,789.26 €	5,500.00 €	1,710.74 €
↳ D.2 Equipment	21,418.99 €	35,200.00 €	13,781.01 €
↳ D.3 Other goods and services	496.00 €	9,256.00 €	8,760.00 €
↳D.4 / D.5 (Large research / Internal goods)			
E. Indirect costs *(Flat-rate 7%)*			
[F. Costs of...]			
TOTAL COSTS	142,864.80 €	371,242.92 €	228,378.12 €

4.1.10 Financial Statements VTI

Table 10: Financial Statement VTI

Budget Category (Categoría)	Costs claimed / declared	Budget in GA	Pending budget
A. Direct personnel costs *(A.1/A.2)*	177,979.08 €	516,250.00 €	338,270.92 €
B. Direct costs of subcontracting	-	-	-
C. Direct costs of financial support	-	-	-
D. Other direct costs			
↳ D.1 Travel	12,696.29 €	54,000.00 €	41,303.71 €
↳ D.2 Equipment	-	-	-
↳ D.3 Other goods and services	11,071.06 €	43,000.00 €	31,928.94 €
↳D.4 / D.5 (Large research / Internal goods)	-	-	-
E. Indirect costs *(Flat-rate 7%)*	14,122.25 €	42,927.50 €	28,805.25 €
[F. Costs of...]	-	-	-
TOTAL COSTS	215,868.68 €	656,177.50 €	440,308.82 €

4.2. Budget distribution per partner and WP

The following tables show the costs of each work package for the various partners.

4.2.1 US

Table 11: Budget distribution per WP US

WP	Personnel	Travel	Other goods and services	Total
WP1	54,794.30 €	2,074.37 €	5,737.09 €	62,605.76 €
WP2	130,464.07 €	-	-	130,464.07 €
WP3	58,708.83 €	1,271.02 €	5,301.69 €	65,281.54€
WP4	2,609.28 €	-	858.75 €	3,468.03 €
WP5	18,917.29 €	-	-	18,917.29€
WP6	57,078.03 €	-	-	57,078.03 €

4.3. 4.2.2 CHM

Table 12: Budget distribution per WP CHM

WP	Personnel	Travel	Other goods and services	Total
WP1	2,341.46€	1,519.98 €	-	3,861.44€
WP2	15,660.65€	-	-	15,660.65€
WP3	46,543.98€	-	-	46,543.98€
WP4	-	-	-	-
WP5	3,142.65€	-	-	3.142,65€
WP6	5,834.62€	-	-	5,834.62€

4.2.3 CIEMAT

Table 13: Budget distribution per WP CIEMAT. The acquired equipment will also be used in the activities of WP4 (although it has not been used yet).

WP	Personnel	Travel	Equipment	Other goods and services	Total
WP1	14,100.67 €	489.39 €	-	-	14,590.06 €
WP2	99,879.42 €	76.46 €	56,787.56 €	26,940.10 €	183,683.54 €
WP3	65,554.42 €	1,564.76 €	56,787.56 €	4,009.34 €	127,916.08 €
WP4	1,029.99 €	-	-	-	1,029.99 €
WP5	5,354.26 €	-	-	-	5,354.26 €
WP6	14,748.05 €	7,364.63 €	-	-	22,112.68 €

4.2.4 CTCON

Table 14: Budget distribution per WP CTCON

WP	Personnel	Travel	Other goods and services	Total
WP1	1,871.94 €	812.43 €	-	2,684.37 €
WP2	56,415.81 €	2,522.47 €	4,022.02 €	62,960.30 €
WP3	3,877.70 €	505.34 €	329.58 €	4,712.62 €
WP4	-	-	-	-
WP5	6,236.26 €	-	-	6,236.26 €
WP6	5,835.81 €	-	-	5,835.81 €

4.2.5 HORIBA

Table 15: Budget distribution per WP HORIBA

WP	Personnel	Travel	Other goods and services	Total
WP1	33,902.82 €	1,400.96€	18,068.62€	53,372.40 €
WP2	54,633.99 €			54,633.99€
WP3	99,802.75 €	589.26€	10,405.19€	110,797.20€
WP4	-	-	-	-
WP5	1,782.70 €	-	-	1,782.70 €
WP6	1,538.98 €	5,739.22€	20.00€	7,298.20 €

4.2.6 ICERBRAKES

Table 16: Budget distribution per WP ICERBRAKES

WP	Personnel	Travel	Other goods and services	Total
WP1	2,412.29 €	906.91 €	-	3,319.20 €
WP2	74,504.08 €	-	4,575.60 €	79,079.68 €
WP3	38,320.42 €	2,266.93 €	13,426.02 €	54,013.37 €
WP4	2,096.79 €	-	-	2,096.79 €
WP5	5,768.76 €	-	-	5,768.76 €
WP6	6,300.56 €	-	-	6,300.56 €

4.2.7 IDIBE UMH

Table 17: Budget distribution per WP IDIBE UMH

WP	Personnel	Travel	Other goods and services	Total
WP1	18,606.38 €	399.27 €	-	19,005.65 €
WP2	-	-	-	-
WP3	63,729.34 €	-	21,984.57€	85,713.91 €
WP4	-	-	-	-
WP5	-	-	-	-
WP6	-	-	-	-

4.2.8 PAUDIRE

Table 18: Budget distribution per WP PAUDIRE

WP	Personnel	Travel	Other goods and services	Total
WP1	592.74 €	-	-	592.74 €
WP2	63,051.65 €	-	-	63,051.65 €
WP5	11,300.44 €	-	-	11,3900.44 €
WP6	25,793.20 €	1,078.98 €	42.75 €	26,914.93 €

4.2.9 RDT

Table 19: Budget distribution per WP RDT

WP	Personnel	Travel	Equipment	Other goods and services	Total
WP1	3,164.20 €	180.67 €	-	-	3,344.87 €
WP2	29,958.90 €	21.00 €	2,735.55 €	496.00 €	33,211.45 €
WP3	26,147.36 €	-	18,683.44 €	-	44,830.80 €
WP4	-	-	-	-	-
WP5	37,023.93 €	-	-	-	37,023.93 €
WP6	11,515.66 €	3,587.58 €	-	-	15,103.24 €

4.2.10 VTI

Table 20: Budget distribution per WP VTI

WP	Personnel	Travel	Other goods and services	Total	Indirect costs 7%	Total incl. OH
WP1	3,737.00 €	3,450.00 €	-	7,188.00€	503.00 €	7,691 €
WP2	51,708.00 €	2,363.00 €	1,164.00 €	55,236€	3,866€	59,102 €
WP3	63,732.00 €	6,481.00 €	9,654.00 €	79,867€	5,591 €	85,458 €
WP4	-	-	-	-	-	-
WP5	130.00 €	-	-	130.00 €	9.00 €	139.00€
WP6	58,672 €	449.00 €	206.00 €	59,327 €	4,153 €	63,479€
Sum	177,979	12,744 €	11,024 €	201,746 €	14,122€	215,86€

4.4. Financial deviations and corrective measures

4.3.1 US

The University of Seville is responsible for analysing the various particles supplied by the different partners. We have experienced delays in analysing the particles provided by HORIBA, as we are not permitted to use the facilities at the University of Seville's CITIUS, since it is considered that doing so would amount to self-funding; which is why we have been forced to use services outside the University of Seville; to do so, we were required to provide at least three quotes to justify why we carried out the analyses at the chosen institution and not at another.

We have finally managed to obtain four quotes, though this has meant having to rely on third parties to provide them, which has inevitably been a waste of time.

The University of Seville has incurred an additional cost due to the need to purchase a computer and particle measurement equipment; this has resulted in an expenditure under a capital expenditure heading that was not originally budgeted for. In order to cover this cost, expenditure under other headings will be adjusted.

4.3.2 CHM

To date, CHM has not deviated from its initial budget, so no adjustments have been necessary at this stage.

4.3.3 CIEMAT

To date, CIEMAT has not experienced financial deviations from the initial budget (i.e., what was originally established in the GA), and therefore no corrective actions have been necessary. The data presented in this report may be subject to slight modifications, both in terms of personnel and equipment. In the case of personnel, this is because the salary figures used for the 2026 calculations are not yet updated; in the case of equipment, the depreciation coefficient still needs to be included. This is due to internal CIEMAT timelines. For the project midterm report, the currently provided values will be adjusted, although the variations are expected to be minor and will not result in deviations from what was presented in the Grant Agreement (GA).

4.3.4 CTCON

CTCON has not recorded any financial deviations from the initial budget (as originally set out in the Grant Agreement).

4.3.5 HORIBA

A limited deviation at cost-item level occurred due to the procurement of a used vehicle to enable on-board module development.

Although not explicitly detailed in the original budget description, the expenditure is fully aligned with the project objectives and constitutes an internal reallocation associated with relocation activities.

The total eligible budget remains unchanged.

4.3.6 ICERBRAKES

To date, no significant deviations from the initial budget have been identified.

A minor deviation in effort distribution has been observed in WP2. ICERBRAKES has reported 16.83 PMs, slightly exceeding the 16 PMs initially planned. Given the limited magnitude of this deviation and considering that WP2 has already been completed, no corrective actions are necessary.

4.3.7 IDIBE UMH

At UMH, there has been a slight budgetary deviation due to the increased costs of purchasing reagents for organoid development. Additionally, a small portion of the budget was reallocated to extend the contract of one of our researchers.

4.3.8 PAUDIRE

There is no financial deviation.

4.3.9 RDT

A minor deviation in effort distribution is observed, which does not have any impact on the overall budget or financial planning, nor does it require any corrective measures.

Specifically, within WP2, a total of 5.7 person-months have been consumed compared to the 4 person-months initially planned in the Grant Agreement. This increase is attributed to the higher-than-expected effort required for the activities under this work package and has been accommodated through internal redistribution of resources, with no impact on the total allocated effort across all work packages. Regarding the technical scope, the initial plan included 3D scanning of vehicle geometries for use in the simulations; however, this activity exceeded the available time and budget, and no suitable mechanical pit was identified near CIEMAT to carry it out. Consequently, geometries were generated without 3D scanning, and were defined with sufficient accuracy to perform the intended CFD analyses, ensuring that the objectives of WP2 were fully achieved without compromising the quality or reliability of the results.

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4.5. 4.3.10 VTI

In comparison to a linear estimation of used funding during the project time, VTI has used less than anticipated. This is due to that the start of the project was delayed but also on that more time and resource consuming activities, like project seminars and field measurement in Spain are planned for the later part of the project.

5. Technical and Scientific Progress (Lead: US, Participants: WP leader)

5.1. Summary of progress in WP2–WP6

5.1.1 WP2 (CIEMAT)

This WP analysed the state-of-art of the existing techniques, materials and properties of vehicle/road elements (brakes, tyres, pavement) that are the main pollution sources of the non-exhaust emissions (NEE). The design of novel solutions for brakes, pavements and tyres to minimise the NEE, as well as NEE sampling and measuring techniques was also initiated within WP2 scope.

Task 2.1

Under Task 2.1 the potential effects of NEEVE results on the European Union's regulations, business, and policy were studied. The existing regulations, market needs and legal/business barriers regarding NEE and NEE monitoring and control, were also examined. This task attempted to determine the requirements and needs of the market and the key participants in relation to monitor and reduce NEE in the vehicle sector. A desk research was undertaken, gathering and cataloguing the current needs and requirements of vehicle manufacturers and EU regulations/directives as well as information from reputable sources, such as reports on academic publications and research projects that are pertinent to non-exhaust emissions. In addition to desk research, stakeholder consultations were undertaken. Such consultations are critical to achieving a comprehensive understanding of the current regulatory and market landscape regarding NEE and their future trends.

Deliverable D2.1 (Study of needs and barriers related to regulations and business) was completed and published.

Task 2.2

Under Task 2.2 a State of Art analysis of the current techniques for exhaust and non-exhaust measuring was undertaken. New protocols and methodologies to enable accurate measuring of non-exhaust emissions were defined. In order to test measuring protocols, emissions were measured from two NEE sources (i.e. brake pads/discs and tyres) from a vehicle on a chassis dynamometer. Pavement roughness was simulated attaching anti-slip tape to the dynamometer drum. A physical-chemical analysis of the samples taken was performed. The particles were analysed by several analytical techniques: ICP-MS, electron microscopy, etc.

Deliverable D2.2 (State of the art analysis and standard methods for measurement of non-exhaust emissions) was completed and published.

Task 2.3

Under Task 2.3, an initial tentative prototype measuring module was installed in two different light passenger vehicles (one provided with combustion engine and a electric vehicle). In particular, an enclosure for sampling of brake-wear particles was designed, built and installed in the combustion vehicle. A series of tests were undertaken with the initial prototype module on the chassis dynamometer. Additionally, a series of on-road tests under a set of different real-world braking conditions were done.

Deliverable D2.3 (Design of the initial prototype module on a test bench for monitoring of non-exhaust emissions) was completed and published.

Task 2.4

Under Task 2.4 an analysis of the influence of asphalt pavement design on the generation of Non-Exhaust Emissions was undertaken. The work included a critical review of the state of the art, the selection and formulation of representative asphalt mixtures, and a structured laboratory testing campaign to evaluate mechanical and surface-related properties relevant to NEE. The mixtures studied included both conventional configurations and innovative alternatives, with a focus on varying aggregate sizes and textures. Mechanical characterisation, friction tests, macrotexture measurements, drainage evaluation and particle loss analysis were carried out using standardised protocols to assess each design's suitability.

Stone Mastic Asphalt (SMA11) was selected as the reference pavement. Alternatives considered included different grading (SMA8), porous (PA11, PA16) and open texture (OSMA11) asphalts and alternative materials (PA11/steel slag).

Deliverable D2.4 (Properties and design of road pavements with focus on non-exhaust particle emissions) was completed and published.

Task 2.5

Under Task 2.5 identification and development of new friction materials and disc coatings with improved environmental performance was undertaken, focusing on reducing PM10 emissions during braking events. A market study of raw materials was conducted. It was decided to proceed with 10 different raw materials, to be subjected to various laboratory characterisation tests. The base material brake pads were tested in order to obtain baseline data for future reference. The tests carried out included: performance test (AK Master), wear test (ICER Internal procedure), noise test (SAE J2521) and emissions test (WLTP cycle in disc dynamometer). Furthermore, a Design of Experiments (DOE) for optimisation was developed for testing of candidate new materials during later Work Packages. Regarding braking discs, the following types of innovative candidate solutions were identified, to be developed and tested: Hardened disc material (change in material alloy), FNC (coating) and Laser Cladding (coating)

Deliverable D2.5 (Reformulation and design of new brake pads/discs for lower emissions) was completed and published.

Task 2.6

Under Task 2.6 it was undertaken a study on which tyre properties are important for reducing particle emissions, considering the interactions between wear properties and other functional properties (e.g. skid and rolling resistance and noise). The relation between tyre tread wear and NEE, and its possible impact on expected future tyre labelling of tread wear was also studied. Conflicts and synergies between environmental performance and vehicle safety or efficiency were also paid attention to. The study was based on literature survey and project partners', in particular VTI, experience and expertise on the matter. Temperature, inflation pressure, driving behaviour, vehicle weight and technology and external factors were identified as NEE influencing factors. Challenges identified included lack of standard test methods and manufacturers' secrecy regarding tire formulation. Based on the above, proposals for actions and for testing and/or other validation in WP3 were made.

Deliverable D2.6 (Properties and design of tyres with focus on rubber wear and non-exhaust particle emissions) was completed and published.

5.1.2 WP3 (HORIBA)

WP3 aims to develop a functional onboard module for real-time measurement of non-exhaust emissions from brakes, tyres, and pavements. Innovative brake, and pavement materials will be developed, manufactured, and tested, designed to reduce microplastic and particulate NEE. Tire abrasion tests provide insights into emissions of commercially available tires and help to understand characteristic properties of low emitters. New modelling tools to simulate NEE dispersion and climate effects in urban environments will be supplemented by novel organoid-based approaches to assess human health impacts of NEE. WP3 will be implemented in two phases: an initial phase based on WP2 designs and laboratory studies, followed by a second phase incorporating real-world driving data from WP4 to refine measurements, health impact assessments, and dispersion and climate models. This section focuses on the first phase only, as phase 2 is scheduled for Month 36, onwards.

Task 3.1.1

Task 3.1.1 focuses on the development of the final functional modules for NEE on road measurements. Based on the results of previous projects and the outcome of WP2 the instruments and sampling methods are being adapted to reliably measure PM 2.5, PM 10 and PN from NEE and to provide NEE samples to US and UMH for further characterization. The expected outcome are a functional module for NEE measurements and dedicated sampling methods for post-analysis.

HORIBA evaluated the performance of the OBS-ONE PN and PM for brake dust measurements on brake and chassis dynamometers. Both devices were initially developed for exhaust emission measurements (e.g.: in the PEMS4Nano project). Laboratory instruments were used as reference devices which were either following the Global Technical Regulation 24 for brake emission measurements or provided additional input about the size distribution of the NEE. A very strong agreement ($r^2 > 0.98$) was found between GTR compliant counters and the on bord systems. Brake emission samples, collected on filters were sent to US and CHM to prepare testing protocols and evaluate methodologies for further analysis and characterization. CIEMAT developed and applied a novel methodology for chassis dynamometer of non-exhaust particle emissions from different asphalt compositions. Using this approach, two distinct asphalt formulations were tested under controlled conditions. The results revealed clearly differentiated emission characteristics between the two asphalt types, demonstrating the capability and suitability of the proposed method to discriminate between pavement compositions with respect to their emission behaviour.

Task 3.2.1

Task 3.2.1 focuses on the production and testing of innovative asphalt pavements designed to reduce non-exhaust emissions (NEE), based on pavement concepts developed in T2.4. The task aims to develop and evaluate several modified asphalt mixtures with potential to significantly reduce particle generation while maintaining compliance with European mechanical performance standards. The expected outcome is the identification of asphalt mixtures that minimise particle generation and NEE from road pavements

This task builds on Task 2.4 by applying a consistent methodological and experimental framework to relate pavement design parameters to particle generation mechanisms and to identify promising low-emission pavement concepts. A dedicated laboratory tyre–pavement interaction setup with controlled loading and an aerosol sampling line enabled repeatable, comparative measurements of particle number, size distribution, and mass, supported by a fixed protocol with background checks and triplicate runs. Materials screening resulted in the selection of porphyritic aggregates and a polymer-modified binder, while a tested steel slag was discarded due to insufficient mechanical properties and steel-shot additives were rejected because they degraded OSMA mechanical performance and cohesion.

Measurements on standard laboratory equipment of wear and durability of pavement samples from Spain were also made in Sweden by VTI. Largely they confirmed the Spanish results. Especially, it was found that a porphyritic aggregate of designation 6/12 was superior to another one designated 5/11.

From a mechanical perspective, the evaluated mixtures have shown behaviour consistent with their structural design, confirming the suitability of the selected materials and mixture configurations. In this context, the OSMA mixture has demonstrated a satisfactory mechanical response, indicating a balanced behaviour between surface texture and structural integrity, which supports its potential as a durable and functionally optimised pavement solution.

The emission results showed that porous asphalt (PA) generated the highest particulate mass (0.207 mg) with a coarse, fragmentation-dominated profile, OSMA was intermediate (0.160 mg) with a fine-dominated profile and the lowest 18–35 nm fraction, and SMA produced the lowest mass (0.146 mg) with a more balanced size distribution, with compact surfaces reducing total emissions by up to ~30% versus PA.

Although the setup is not fully representative of real-world aerodynamics and may under-capture the largest coarse particles, the study provides a useful comparative basis for selecting and prioritising low-emission pavement designs for subsequent and necessary validation under real world driving conditions.

Task 3.3.1

Task 3.3.1 focuses on the development and manufacturing of brake pads and discs with reduced emissions, based on material designs developed in T2.5. The task covers the development of multiple friction material formulations, optimisation of mixing processes, and laboratory-scale manufacturing of prototype brake components. The produced mixtures will be characterised through standardized material tests and processed into prototypes at ICERBRAKES' technology centre. The outcome will be validated brake pads and discs suitable for further demonstration under real driving conditions in WP4.

The work expanded the DOE from Deliverable D2.5 by developing and experimentally evaluating 54 new brake pad formulations based on 25 additional raw materials, grouped into three formulation families. Laboratory manufacturing confirmed that all formulations are compatible with existing industrial production processes. Functional testing demonstrated that brake pad optimisation can significantly reduce particle emissions by up to 41.3% versus the baseline, while maintaining or improving braking performance, wear resistance, and noise behaviour. Seventeen formulations were identified as especially promising for further development. Exploratory investigations of disc coating technologies showed potential benefits but also revealed high-temperature performance challenges, highlighting the need for combined optimisation of pads and discs. Overall, the results confirm technical feasibility and strong emission-reduction potential, with the next phase focusing on system integration and validation under real on road driving conditions to support compliance with upcoming regulations such as Euro 7.

Task 3.4

Task 3.4 focuses on the selection and experimental evaluation of tyres with reduced NEE, building on the outcomes of T2.6. Conventional commercial tyres will be compared with low-wear tyre designs under controlled and real-world driving conditions. The comparison will account for equivalent tyre dimensions, load and speed ratings, and operational characteristics. The results will support tyre selection for WP4 pilot demonstrations and provide evidence on the relationship between tyre wear, NEE, and future tyre wear labelling schemes.

First, VTI defined a unique measuring method. The intention was to have a type of convoy method as far as possible similar to the proposal by the UN ECE group TFTA's proposal. However, to apply the TFTA convoy method fully would be far outside the budget of NEEVE. Therefore, VTI worked out an own kind of accelerated convoy method utilizing only two cars and with two test tyres and two reference tyres on each car. They would drive on two 200 km loops per day, covering approx. 400 km per day. This will be repeated 10 times per each tested tyre to reach a total driving distance of 4000 km per test tyre. By a clever change of tyres on the four positions (corners) on the car, order of cars and drivers, a statistically acceptable average wear for each tyre and each position will be obtained. The cars used are equipped with sensors logging the cars' movements during each loop to be able to study the tyre wear in relation to different driving styles among the drivers. Coordination with the responsible authorities was carried out to ensure that no road construction activities are planned along the test routes during the upcoming period.

The Nissan Qashqai was selected as the test vehicle for the measurement campaign, and six experienced drivers from veteran pool were assigned to conduct the tests. Tyres were selected based on abrasion performance results from ADAC studies, supplemented by reference tyres for comparison purposes. All tyres were mounted on 17-inch rims, which correspond to the standard specification of the selected reference tyres.

Test protocols for assessing tyre mass loss have been finalised. In parallel, data logging systems have been prepared to record vehicle position and driving behaviour, as well as relevant environmental parameters including ambient temperature, atmospheric pressure, humidity, and precipitation. The first on-road measurement campaigns commenced on 7th of April. After this we have been lucky with the weather so most days in April have been measuring days, using all-season and winter tyres. This procedure is planned to continue into the autumn 2026. Abrasions were found between 5 – 25 mg/km on first runs and a weak decreasing tendency in repetitive runs of the 200 km loops.

Task 3.5

Task 3.5 focuses on assessing the human health impacts of non-exhaust emissions (NEE) using advanced cell-based and organoid models. NEE particles collected and fully characterised in earlier tasks will be biologically evaluated by UMH using both conventional human cell lines and newly developed lung, skin, and ocular organoids. Initial toxicity screening will address cytotoxicity, phototoxicity, and oxidative stress, complemented by molecular and biochemical analyses to identify underlying mechanisms. Overall, the task aims to quantify health risk reductions achieved through improved tyres, brakes, and pavements, while delivering validated organoid models for future health impact assessments.

University Miguel-Hernandez has achieved significant progress in the development and application of advanced organoid models to assess the human health impacts of non-exhaust emissions (NEE). Skin, lung, and eye organoid models are being developed using co-culturing and bioprinting techniques, with skin organoids successfully reproducing epidermis, dermis and hypodermis of human skin through the combination of keratinocytes, fibroblasts, and adipocytes. Lung organoid development is ongoing based on selected relevant cell lines. The organoids are being systematically characterised in terms of morphology, viability, and structural integrity using microscopy and electrical resistance measurements. Functional assays assessing oxidative stress and cell viability following particle exposure have been established.

Initial biological testing was performed using reference diesel particles. These preliminary studies showed reduced viability and increased oxidative stress responses in monolayer cell cultures, whereas spheroid and organoid-like structures exhibited no significant damage, likely due to their higher structural complexity. In parallel, a dedicated protocol was developed to extract NEE particles from sampling filters.

In a first test with NEE, brake particles obtained from task 3.1 were employed to study cell viability and metabolic activity as well as measure the cellular and oxidative stress in skin organoids. Upon exposure reduced cell viability and metabolic activity were observed and an increase in oxidative and cellular stress, all showing only fable correlation to the administered concentration.

Task 3.6

This task focuses on modelling the dispersion patterns and climate impacts of non-exhaust emissions (NEE) in urban environments using advanced computational fluid dynamics (CFD) simulations. Models will be developed for different urban layouts, road configurations, weather conditions, and particle size distributions, and calibrated using real air quality data from the city of Murcia. The simulations will integrate measured NEE emission data from conventional and improved tyres, brakes, and pavements, as well as biological impact data from organoid studies. Both scenario-based and year-round analyses will be performed to identify high-risk pollution hotspots and assess interactions between NEE particles and greenhouse gases. The outcomes include practical technical guidelines for urban planners and authorities, along with a user-friendly NEE modelling tool to support decision-making, monitoring strategies, and urban design for reduced environmental and health impacts.

RDT has made good progress in the development of a Computational Fluid Dynamics (CFD) framework to model the dispersion of non-exhaust emissions (NEE) and CO_2 in urban environments. The modelling approach is based on the numerical solution of the Navier–Stokes equations, enabling detailed spatial and temporal simulation of airflow and pollutant dispersion under realistic urban conditions. The selected approach allows the interaction between vehicle-related emissions, urban geometry, and meteorological conditions to be explicitly resolved.

An initial test scenario has been implemented with a representative urban street configuration in Murcia, Spain, including surrounding building geometries. Emission sources were placed at a height of 0.2 m above ground to represent vehicle-related sources such as brake, tyre, and pavement emissions. Wind conditions and atmospheric boundary layers were modelled following standard CFD practices. The computational mesh was refined in critical areas, particularly near buildings and emission zones, while coarser resolution was applied elsewhere to optimise computational efficiency.

Preliminary simulation results show that particulate and gaseous emissions are transported predominantly along the prevailing wind direction, with clear penetration into neighbouring streets. Vertical dispersion was found to be limited in the current isothermal setup, indicating that thermal effects and buoyancy need to be incorporated in future simulations to better represent real urban conditions. These initial results confirm the suitability of the modelling framework for analysing dispersion patterns at street canyon scale.

Further modelling progress requires the incorporation of more detailed input data from WP 3, including emission factors for brakes, tyres, and pavements, particle properties such as size distribution, density, composition, and temperature, as well as vehicle characteristics and driving conditions. CO_2 emission data can be sourced from the literature where partner data are not yet available. Model validation will be performed using real-world measurements, including data from air quality monitoring stations in Murcia. In parallel, the framework will be extended to generate classification maps for different vehicle types, urban configurations, and emission scenarios, supporting both interpretation of project results and future urban planning applications.

5.1.3 WP4 (CIEMAT)

WP4 entered its initial implementation stage during the final part of the reporting period. In accordance with the Description of the Action, WP4 addresses the deployment and demonstration of the innovative technologies developed in previous work packages in controlled pilots and real-world scenarios, including the onboard monitoring systems and the low-emission solutions related to brakes, tyres and pavements. Since WP4 starts in month 22 and its first deliverables are scheduled from month 27 onwards, the progress achieved so far corresponds mainly to preparatory coordination and early technical development activities.

During this initial stage, work started on the development of the onboard system related to tyre/pavement interaction. In parallel, CHM initiated discussions with the relevant stakeholders in Murcia in order to identify and define the most suitable location for the future pavement deployment activities. In addition, HORIBA started the development of the brake enclosure, as part of the preparatory work required for the future integration and demonstration of the brake-related monitoring setup. Overall, the progress achieved in WP4 during this stage provides the necessary technical and operational basis for the subsequent optimisation, installation and validation activities foreseen in the work plan.

5.1.4 WP5 (RDT)

Work Package 5 (WP5), led by RDT, spans the full duration of the project (M1–M48) and focuses on the monitoring and evaluation of the Key Performance Indicators (KPIs) to assess the environmental, socio-economic, and technical impacts of the LIFE NEEVE project.

Task 5.1: Measuring and monitoring of NEEVE KPI indicators

During the reporting period, activities have been carried out under Task 5.1, focusing on the implementation of the KPI monitoring framework. This has included the structured collection, consolidation, and validation of KPI data from all partners, as well as continuous coordination to ensure consistency between reported values, definitions, and verifiability.

In addition, selected KPIs have been refined where necessary to improve measurability, consistency, and alignment with project implementation. These refinements include clarification of definitions (e.g. FTE), adjustments to KPI formulations, and alignment of indicators with the practical progress of the project.

Deliverable D5.1: KPI baseline & monitoring framework

Deliverable D5.1 was completed in the 9th month of the project and established the common KPI monitoring methodology, including KPI definitions, baseline values, target values, data sources, and verification approaches. The KPIs were defined in line with the Grant Agreement and LIFE Programme objectives, and based on the recommendations of Dimas Ramos, KPIs manager of the Iberian LIFE project monitoring team. A few additional KPIs were also added, in line with the flexibility foreseen in the Grant Agreement, to better capture project impacts. This deliverable provides the foundation for all subsequent KPI monitoring activities and ensures a harmonized framework across the consortium.

Deliverable D5.2: KPI mid-term monitoring

Building on D5.1, Deliverable D5.2 focuses on the reporting and evaluation of KPI values collected from project start until the mid-term reporting period. It provides a structured assessment of progress towards project targets, together with the justification of reported values and any necessary refinements to improve the robustness and consistency of the monitoring framework.

The mid-term assessment shows that KPIs related to dissemination, governance, and capacity building are already demonstrating measurable progress, while several technical and impact-related KPIs remain at early stages, as their achievement is linked to validation and pilot activities planned mainly in WP4. This distribution is consistent with the overall project timeline.

Overall, WP5 activities are progressing as expected, ensuring a coherent, reliable, and systematic KPI monitoring process. The work carried out during this period provides a solid basis for the continued evaluation of project impacts in the second half of the project.

5.1.5 WP6 (VTI)

The dissemination work is presented in D6.3 and has involved:

- Production of graphical profile logotype and basic material for project dissemination like PowerPoint template, leaflets, roll-ups, a NEEVE presentation and video.
- Building and updating a NEEVE web-page at www.neeve.eu and a LinkedIn page.
- Several presentations of the NEEVE project and project results at conferences, seminars, webinars and meetings.
- NEEVE dissemination to public as well as to scientific and commercial stakeholders in radio shows and via newsletters from partners
- Contacts and networking with other research projects related to the NEE subject.

On the other hand, CIEMAT also led Task 6.2 presenting an initial framework for intellectual property rights (IPR) governance within the LIFE NEEVE project, including the identification of exploitable results, the establishment of protection strategies for new technologies and the definition of procedures to ensure controlled knowledge management across the consortium.

5.2. Main deliverables and milestones achieved

5.2.1. US

During the reporting period, the University of Seville (US) completed several key deliverables related to project management, coordination, and monitoring activities. These included Deliverable D1.1, "Handbook of Management Rules and Procedures," which established the internal management framework of the project; Deliverable D1.3, "9-Month KPI Report," which provided the first structured monitoring of project indicators; Deliverable D2.2, "State of the Art Analysis and Standard Methods for Measurement of Non-Exhaust Emissions," focused on measurement methodologies; and Deliverable D1.4, "Mid-Term KPI & Management Report," which summarises the technical, financial, and management progress during the first 24 months of the project.

In addition, US contributed to the achievement of several important milestones, including MS1 (Kick-off Meeting), MS2 (Handbook, Mitigation Plan and Management), and MS3 (Baseline Physical Meeting and 9-Month KPI Report), ensuring the proper launch, coordination, and monitoring of the project during its initial phase.

5.2.2. CHM

CHM led the preparation and publication of Deliverable 3.3, "Innovative pavements for lower non-exhaust particle emissions", which summarises the main results of the first part of Task 3.2 carried out during the reporting period. The deliverable compiles the joint work performed by the partners involved in the development of low-NEE pavement solutions, including the production, testing and assessment of different asphalt mixture alternatives.

The document presents the progress achieved in the validation of innovative pavement concepts, with particular attention to their potential contribution to reducing non-exhaust particle emissions generated by tyre–pavement interaction. It also provides a basis for selecting the most promising solutions to be further scaled up, produced and demonstrated under pilot and real operating conditions in the next stages of the project.

Overall, Deliverable 3.3 represents an important milestone in the technical development of the pavement-related innovation, consolidating the results obtained so far and supporting the transition from laboratory-scale validation towards future demonstration activities.

5.2.3. CIEMAT

CIEMAT led the preparation and publication of deliverable D2.3 (Design of the initial prototype module on a test bench for monitoring of non-exhaust emissions) during the reporting period. Other deliverables published within WP2, which was also led by CIEMAT, include D2.1, D2.2, D2.4, D2.5 and D2.6. Milestone MS7 (Design of real-time measuring prototype, novel pavements, brakes and tyres) was achieved during the reporting period. The design of the first prototype measuring module, as well as novel pavements, brake pads/discs and tyres, is included in the relevant deliverables.

CIEMAT also led deliverable D6.2 (First report of NEEVE IPR and knowledge protection and management), which presents the initial framework for intellectual property rights (IPR) governance within the project, including the identification of exploitable results, the establishment of protection strategies for new technologies (such as patents, know-how and confidentiality measures), and the definition of procedures to ensure controlled knowledge management across the consortium. Finally, milestone MS22 (Initial IPR Exploitation Plan) was achieved and presented within D6.2.

5.2.4. CTCON

CTCON led the preparation of deliverable D2.4 "Properties and design of road pavements with a focus on non-exhaust particle emissions", during the reporting period. This deliverable provides a comprehensive analysis of how asphalt pavement design influences non-exhaust emissions, particularly particulate matter generated through tyre–pavement interaction. The work included a state-of-the-art review, the selection and formulation of representative asphalt mixtures, and a structured laboratory testing campaign covering mechanical performance, macrotexture, drainage capacity, friction, and particle loss.

The results highlighted the relevance of aggregate selection, binder formulation, and surface texture optimisation for reducing wear-related emissions and identified the OSMA 11 solution as a particularly promising solution due to its balanced performance in terms of mechanical performance and texture properties.

5.2.5. HORIBA

Administratively, HORIBA was in charge of deliverable D1.2 for the risk mitigation plan and green, legal quality management. This report includes identified project risks and mitigation measures as well as management procedures for green, quality and legal aspects. In continuous exchange with the other project partners, risks-management as well as the overview on quality and legal aspects are a continuous responsibility of HORIBA throughout the project.

Technically D3.1 is up to HORIBAs responsibility in the first reporting period. This deliverable is under preparation and will be submitted on time.

MS8 is the production and testing of the first NEE measuring modules for pavements, brakes and tyres in order to be provided for tasks T3.2, T3.3 and T3.4. Following the production and initial testing of the first modules, revised versions are currently being designed, and advanced calibration procedures are being developed and implemented.

5.2.6. ICERBRAKES

During the reporting period, ICERBRAKES has prepared two deliverables: D2.5 “Reformulation and design of new brake pads/discs for lower emissions” (submitted in M15) and D3.5 “Improved brake pads and discs for lower non-exhaust particle emissions” (to be submitted in M24).

Deliverable D2.5 presents the initial results related to the design and development of innovative friction material solutions for brake pads and discs obtained during the first 15 months of the project. Building on this work, Deliverable D3.5 provides an overview of the progress achieved during the reporting period in relation to the manufacturing of improved brake pads and discs for lower non-exhaust emissions. It covers the development, manufacturing and validation of advanced brake pad formulations under controlled but representative testing conditions (including laboratory and dynamometer testing), aimed at reducing particulate emissions, particularly PM10, while maintaining or improving key functional performance indicators such as braking performance, wear resistance and noise behaviour.

5.2.7. IDIBE UMH

During the reporting period, IDIBE UMH developed the first planned organoid model, orresponding to the skin organoid. This skin organoid is more complex than initially planned, as it includes the third skin layer (hypodermis) through the co-culture of the organoids with human adipocytes.

In addition, pollutant particles obtained from other project partners were tested, and their effects at both cellular and molecular levels were studied using the developed skin organoid model, as originally planned.

5.2.8. PAUDIRE

During the reporting period, PAUDIRE contributed mainly to activities within WP2, WP5, and WP6, in line with its role in regulatory analysis, impact assessment, and replication strategy development.

Within WP2, PAUDIRE has led Task 2.1 and was the leadership os the development of Deliverable D2.1 “Study of needs and barriers related to regulations and business” , including the analysis of the regulatory framework, the identification of market barriers, and the design, launch and analysis of a survey targeting relevant stakeholders, as well as direct stakeholder engagement.

Within WP5, PAUDIRE contributed to Tasks T5.1 and led task T5.2, supporting the definition of KPIs, their mid-term monitoring and the preparation of Deliverable D5.2. In addition, PAUDIRE is currently leading the development of Deliverable D5.3, focused on evaluating the project's technical, environmental, economic and social impacts.

Within WP6, PAUDIRE contributed to Deliverable D6.2 and leads the Task T6.3 and is working on the DeliverableD6.6 to provide the replication, sustainability and transferability strategies of the project.

Overall, PAUDIRE's work has contributed to the analysis of the regulatory and market context, as well as to the development of the project's impact assessment framework and the replication strategies.

5.2.9. RDT

During the reporting period, RDT established the KPI monitoring framework as planned, including the definition, structuring, and harmonisation of KPIs across partners. Deliverable D5.1 defined the common KPI methodology, including baseline values, targets, and monitoring approach, while Deliverable D5.2 provided the mid-term KPI assessment with updated values and methodological refinements. This framework has enabled the mid-term KPI assessment and improved the consistency and quality of reported data.

In parallel,CFD-based simulations were carried out under Task 2.2 of the particle collector system, supporting the optimisation of collector placement by analysing flow behaviour and particle transport, thereby contributing to improved system design.

5.2.10. VTI

During the reporting period, VTI achieved Milestone M21, related to the dedicated page of the LIFE NEEVE project on the partners' websites, which was coordinated with Deliverable D6.1 and achieved at the beginning of August 2024. VTI also achieved Milestone M23, related to the completion of the mid-term communication and dissemination actions, which was essentially achieved at the end of April 2026 and will be reported in Deliverable D6.3.

In terms of deliverables, VTI led Deliverable D6.1, "Webpages on the partners' websites," published on 4 August 2024, and Deliverable D2.6, "Properties and design of tyres with focus on rubber wear and non-exhaust particle emissions," published in its final version in July 2025. VTI is currently working on Deliverable D6.3, "Mid-term NEE awareness, communication and synergies report."

VTI was also extensively involved in Deliverable D2.4, "Properties and design of road pavements with focus on non-exhaust particle emissions," which was led by CTCON.

In addition, although not formal deliverables, VTI led the development of the NEEVE Publication Policy and the NEEVE Dissemination Policy, which were discussed during autumn 2024 and finalised in spring 2025.

5.3. TRL progress and innovation status

The following section describes the TRL progress and innovation status of those partners for whom, due to their activities within the project, TRL assessment is applicable

5.3.1. CHM

During the first 28 months of the project, CHM has contributed to the development of the innovative low-NEE asphalt pavement solutions, supporting the transition from the initial design and laboratory validation phase towards a more industrial-oriented development stage. The work carried out has been mainly linked to the definition of feasible asphalt pavement solutions, the assessment of their production requirements and the analysis of their potential implementation under real construction conditions.

The activities performed so far are aligned with a TRL 3–4 stage, where the innovative pavement concepts have been experimentally validated at laboratory scale and the most promising solutions have started to be assessed from an industrial and practical implementation perspective. CHM has provided its experience in asphalt mixture production, pavement construction and road works execution to ensure that the proposed solutions are not only technically promising in terms of non-exhaust emission reduction, but also compatible with real asphalt plant production, paving operations, quality control and future market uptake.

The results obtained during this period have allowed the consortium to compare different candidate asphalt mixtures and identify the most suitable alternatives for further development. From CHM's perspective, the progress achieved provides a solid basis for the next phase of the project, in which the selected low-NEE pavement solution will move towards pilot-scale production, deployment in real trial sections and validation under operational conditions.

In terms of innovation status, the work carried out confirms the potential of the new asphalt pavement technology as one of the key exploitable results of the LIFE NEEVE project. During the following months, CHM will focus on supporting the scale-up, production and implementation of the selected solution, contributing to its progression towards higher TRL levels through demonstration in real road conditions and future integration into CHM's portfolio of sustainable pavement technologies.

5.3.2. CIEMAT

During the first 24 months of the LIFE NEEVE project, CIEMAT has developed several complementary exploitable results combining technological developments and experimental activities. A key outcome is an innovative enclosure for measuring non-exhaust emissions from brake systems, currently at an advanced stage with a patent application in preparation (TRL 3). In parallel, an experimental system to reproduce tyre/pavement contact under controlled conditions is being developed, with its protection potential to be assessed in later stages.

Additionally, CIEMAT has generated relevant experimental results and methodologies, including pavement comparison studies, pilot-scale analyses, and the validation and optimisation of the onboard measurement system developed with HORIBA. These results (TRL 3–5) support the validation of partner technologies and contribute to dissemination and future research activities.

5.3.3. CTCON

During the first 24 months of the project, the development of the innovative asphalt mixtures has progressed through a laboratory-scale experimental phase, corresponding to TRL 3–4. The work carried out has focused on the design, production and characterisation of different pavement solutions under controlled conditions, allowing the validation of the initial concepts related to the influence of pavement properties on non-exhaust emissions.

The experimental results obtained have enabled the comparison and preliminary assessment of the proposed mixtures, identifying promising configurations such as the OSMA-11 solution, which shows a balanced performance in terms of mechanical behaviour and particle loss resistance. These outcomes provide a solid basis for the next stages of the project, where the most suitable solutions will be further validated under pilot-scale and real operating conditions.

5.3.4. HORIBA

HORIBA is evaluating the performance of initially on road exhaust emission analysers for the measurement of brake and tire-road wear particles. In a first step, these analysers are compared to laboratory devices, fulfilling the latest requirements for brake emission measurements according to the upcoming Euro 7 regulations. Laboratory evaluation of applicability for tire and road wear particles are under preparation. Hence, the current TRL is 4.

5.3.5. ICERBRAKES

ICERBRAKES builds on previous experience in the manufacturing of brake systems with advanced materials (initially positioned at TRL 6) to develop low-emission brake pad and disc solutions within LIFE NEEVE. During the reporting period, progress achieved in Tasks 2.5 and 3.3, as reflected in Deliverables D2.5 and D3.5, has enabled the design, reformulation, manufacturing and validation of advanced brake pad formulations. These developments have further consolidated the maturity of the solutions at TRL 6, with functional prototypes demonstrated under controlled but representative conditions using laboratory and dynamometer testing, supporting the transition towards TRL 7. Further activities in WP3 and validation under real vehicle conditions in WP4 are expected to bring the technology to TRL 8, supporting its industrial scalability and market uptake.

5.3.6. IDIBE UMH

The current TRL level for the skin organoid is TRL6 and TRL3 for the lung one. It is expected to reach TRL 7 for both models by the end of Task 3.5 (month 43).

6. KPI Reporting (M24). (Lead: RDT)

6.1. Overview of KPIs and targets

The KPI framework of the LIFE NEEVE project is structured in line with the Grant Agreement and the LIFE Programme indicators, and further refined in Deliverables D5.1 and D5.2. The KPIs cover environmental, socio-economic, governance, dissemination, and project-specific impacts, ensuring a comprehensive assessment of project performance.

The KPIs are aligned with the LIFE KPI Webtool indicators, where applicable. It should be noted that updates and refinements introduced in Deliverable D5.2 are not yet reflected in the LIFE KPI Webtool, as updates to the Webtool now at the project end. Each KPI is associated with a baseline value, a mid-term value, a project-end target, and, where relevant, a 3–5 year post-project projection.

6.1.1. Project Work Area

These KPIs quantify the physical area where project activities are implemented and correspond to LIFE Webtool Indicator 1.5.

- Madrid (Spain)
  - This KPI is based on the prototype for Measuring Non-Exhaust Emissions in Real Driving Emission (RDE).
  - Target: 0.21 km² (project end), 0.21 km² (post-project)
- Oberursel (Germany)
  - This KPI represents the work area of the validation tests of the innovative technologies of the NEEVE T.4.4.
  - Target: 0.31 km² (project end), 0.31 km² (post-project)
- Murcia (Spain)
  - This KPI represents the work area for Murcia Pilot project for the demonstration of developed technologies.
  - Target: 5 000 m² (project end), 500 000 m² (post-project)

6.1.2. Human Impact

These KPIs evaluate the social impact of the project and correspond to LIFE Webtool Indicator 1.6.

- Persons whose quality of life is positively impacted by improved AIR QUALITY achieved by project actions
  - Target: 325 (project end), 32 426 (post-project)
- Persons with improved capacity or knowledge *due to* project actions
  - Target: 343 (project end), 393 (post-project)
- Persons reached (via dissemination or awareness raising project-actions)
  - Target: 8 020 (project end), 11 020 (post-project)

6.1.3. Air

These KPIs represent the environmental objectives of the project and correspond to LIFE Webtool Indicator 6.1.

- Reduction of polluting air emissions (TSP)
    - This KPI measures reduction in total suspended particles (TSP) of transport-related NEE.
    - Target: 22% reduction (project end), 54% (post-project)
- Onboard measurement system uncertainty
    - Target: 30% (project end), 10% (post-project)
- Reduction of tyre emissions
    - Target: 10% (project end), 50% (post-project)
- Reduction of pavement emissions
    - Target: 20% (project end), 50% (post-project)
- Reduction of brake emissions
    - Target: 30% (project end), 60% (post-project)

6.1.4. Governance

These KPIs assess stakeholder engagement and correspond to LIFE Webtool Indicator 10.2.

- Involvement of other stakeholders (not duty holders or enforcement/supervisory bodies) in project activities - NGOs and other civil society organisations (stakeholder entities)
    - Target: 10 (project end), 15 (post-project)
- Involvement of other stakeholders (not duty holders or enforcement/supervisory bodies) in project activities - Policy makers (individuals)
    - Target: 880 (project end), 1 000 (post-project)

6.1.5. Information and Awareness

These KPIs track dissemination activities and correspond to LIFE Webtool Indicator 11.1.

- Website visits
    - The number of unique visits to the website
    - Target: 7 000 (project end), 10 000 (post-project)

6.1.6. Networking and Synergies

These KPIs evaluate collaboration activities and correspond to LIFE Webtool Indicator 12.1.

- Networking and synergies with projects/initiatives - LIFE projects
    - Target: 3 (project end), 6 (post-project)
- Networking and synergies with projects/initiatives - Horizon Europe projects
    - Target: 4 (project end), 7 (post-project)
- Networking and synergies with projects/initiatives - Other projects (additional KPI)

  - Target: 4 (project end), 7 (post-project)

6.1.7. New jobs created

These KPIs measure job creation and correspond to LIFE Webtool Indicator 13.

- New jobs created in terms of FTEs, where 1 FTE corresponds to 48 months of full-time work on the project.
- Target: 5.9 FTE (project end), 7 (post-project)

6.1.8. Economic Sustainability and Catalytic Effect

These KPIs assess economic impact and correspond to LIFE Webtool Indicator 14.

- Revenue during or after project end, due to project outcomes - Revenue from sales
  - Target: €111 352 (project end), €5 070 032 (post-project)
- Catalytic effect - Financial - Cumulative investments triggered or finance accessed - Beneficiary own contribution (other than project co-financing and not included in project budget)
  - Target: €0 (project end), €50 000 (post-project)
- Continuation after the project-end in the same premises/area(s) as those used during the project - Continuation at same scale (compared to the scale during project implementation)
  - HORIBA and RDT will continue selling product and services at the same scale as in the project
- Continuation after the project-end in the same premises/area(s) as those used during the project - Continuation at higher scale (compared to the scale during project implementation)
  - CHM will move to large-scale production of the verified formula

6.1.9. Project-Specific KPIs (Not in LIFE Webtool)

These KPIs are not reported in the webtool, but we considered it in the Gran Agreement. For this reason, they are maintained for evaluate internally the progress of the project.

- Novel Asphalt Pavement – Development and Deployment
  - This KPI measures the development, validation, and deployment of a new low-emission asphalt pavement solution.
  - Target: 1 unit (project end), 1 unit (post-project)
- Number of tons produced and sold of novel pavements for low NEE
  - This KPI measures the production and commercialization of the developed low-emission pavement materials.
  - Target: 900 tons (project end), 50 000 tons (post-project)
- Advanced Brake Pad/Disc Materials Formulation
  - This KPI measures the development and validation of improved brake materials with reduced non-exhaust emissions.

  - Target: 2 formulations (project end), 2 formulations (post-project)
- Number of the produced and sold new brake pads/disks of low NEE
  - This KPI measures the commercialization and market uptake of improved brake components.
  - Target: 48 units (project end), 90 000 units (post-project)
- Equipment for NEE (Onboard Measurement System)
  - This KPI measures the development and deployment of real-time measurement equipment for non-exhaust emissions.
  - Target: 1 units (project end), 20 units (post-project)
- Accuracy of particle dispersion modelling
  - This KPI evaluates the accuracy of CFD-based simulations through comparison with real-world data.
  - Target: 70% (project end), 90% (post-project)
- Reduction of computational costs in CFD modelling
  - This KPI measures the optimization of computational resources and simulation efficiency.
  - Target: 20% (project end), 30% (post-project)
- Development of new organoids for human health assessment
  - This KPI measures the development of biological models to study the impact of non-exhaust emissions on human health.
  - Target: 3 units (project end)
- Quantifying the reduction of harmful effects on human health
  - Target: 30% (project end)
- Identification of new new mechanisms or molecular targets that can be used for future pharmacological interventions
  - Target: 2 mechanisms (project end), 2 mechanisms (post-project)
- Percentage of use of animals on activities related to NEE emissions
  - Target: 5% (project end), 10% (post-project)
- New treatments to reduce the impact of NEE on human health
  - Target: 1 treatment (project end), 2 treatments (post-project)

These KPIs complement the LIFE indicators and provide a more detailed assessment of technical progress and innovation.

6.2. Achieved values at mid-term

This section presents the KPI values achieved at mid-term, together with a brief description of their status. The reported values reflect the natural progression of the project, with early-stage KPIs showing measurable progress, while those linked to validation and pilot activities are expected to be achieved in the second half of the project.

6.2.1. Project Work Area

These KPIs quantify the physical area where project activities are implemented:

- Madrid (Spain)
  - Mid-term value: 0 km²
  - Activities related to the validation of the onboard measurement system are ongoing, with implementation planned in later stages.
- Oberursel (Germany)
  - Mid-term value: 0 km²
  - Validation activities are in preparation and will be executed in the second half of the project.
- Murcia (Spain)
  - Mid-term value: 0 m²
  - Pilot deployment has not yet started, as it is scheduled for WP4 implementation phase.

6.2.2. Human Impact

These KPIs evaluate the social impact of the project

- Persons whose quality of life is positively impacted
  - Mid-term value: 0
  - This KPI depends on measurable improvements in air quality, which will be assessed after pilot implementation.
- Persons with improved capacity or knowledge
  - Mid-term value: 41
  - Achieved through training activities, internal knowledge transfer, and academic contributions.
- Persons reached (via dissemination or awareness raising project-actions)
  - Mid-term value: 5 000
  - Achieved through conferences, workshops, publications, and outreach activities.

6.2.3. Air

These KPIs represent the environmental objectives of the project:

- Reduction of polluting air emissions (TSP)
  - Mid-term value: 0%
  - Dependent on validation of tyres, brakes, and pavement solutions in WP4.
- Onboard measurement system uncertainty
  - Mid-term value: ~100%
  - Initial prototype stage; improvements expected with further development and validation.
- Reduction of tyre emissions
  - Mid-term value: 0%
  - Experimental validation pending.
- Reduction of pavement emissions
  - Mid-term value: 0%

- Dependent on Murcia pilot deployment.
- Reduction of brake emissions
    - Mid-term value: 0%
    - Dependent on validation of developed brake materials.

6.2.4. Governance

These KPIs assess stakeholder engagement:

- Involvement of other stakeholders (not duty holders or enforcement/supervisory bodies) in project activities - NGOs and other civil society organisations (stakeholder entities).
    - Mid-term value: 5
    - Ongoing engagement with stakeholders through project activities.
- Involvement of other stakeholders (not duty holders or enforcement/supervisory bodies) in project activities - Policy makers (individuals)
    - Mid-term value: 50
    - Achieved through dissemination events and networking activities.

6.2.5. Information and Awareness

- Website visits
    - Mid-term value: 646
    - Continuous increase is expected with ongoing dissemination efforts.

6.2.6. Networking and Synergies

- Networking and synergies with projects/initiatives - LIFE projects
    - Mid-term value: 2
    - Initial collaborations were established.
- Networking and synergies with projects/initiatives - Horizon Europe Projects
    - Mid-term value: 5
    - Active collaboration and exchanges are already ongoing.
- Networking and synergies with projects/initiatives – Other Projects
    - Mid-term value: 2
    - Additional collaborations beyond LIFE and Horizon programmes.

6.2.7. New jobs created

New jobs created in terms of FTEs, where 1 FTE corresponds to 48 months of full-time work on the project:

- New jobs created (FTE basis)
    - Mid-term value: 1.4 FTE
    - The reported value reflects good progress at mid-term, indicating that job creation activities are successfully on-going.

6.2.8. Economic Sustainability and Catalytic Effect

- Revenue during or after project end, due to project outcomes - Revenue from sales
  - Mid-term value: €0
  - Revenue generation is expected after development and commercialization phases.
- Catalytic effect - Financial - Cumulative investments triggered or finance accessed - Beneficiary own contribution (other than project co-financing and not included in project budget)
  - Mid-term value: €0
  - No investments expected till the project end.

6.2.9. Project-Specific KPIs

- Novel Asphalt Pavement – Development and Deployment
  - Mid-term value: 0
  - Development ongoing; deployment planned in later stages.
- Number of tons produced and sold of novel pavements
  - Mid-term value: 0
  - Production linked to pilot implementation.
- Advanced Brake Pad/Disc Materials Formulation
  - Mid-term value: 1
  - Initial formulation developed; further formualtion ongoing.
- Number of produced and sold brake components
  - Mid-term value: 0
  - Commercialization not yet started.
- Equipment for NEE (Onboard Measurement System)
  - Mid-term value: 0
  - Initial development activities have been carried out, further validation ongoing.
- Accuracy of particle dispersion modelling
  - Mid-term value: 0
  - Validation pending with real data.
- Reduction of computational costs in CFD modelling
  - Mid-term value: 0
  - Optimization activities ongoing.
- Development of organoids for human health assessment
  - Mid-term value: 1
  - Initial organoid developed; further work ongoing.
- Quantifying reduction of harmful health effects
  - Mid-term value: 0
  - Dependent on full experimental validation.
- Identification of molecular targets
  - Mid-term value: 0
  - Research ongoing.

- Percentage of use of animals
  - Mid-term value: aligned with target
  - Activities conducted in accordance with project planning.
- New treatments to reduce health impacts
  - Mid-term value: 0

Development planned in later stages.

6.3. Deviations and justification

At mid-term, no major deviations from the expected KPI trajectory have been identified that would require changes to the overall project strategy or implementation pathway. However, some targeted adjustments and refinements have been identified and are addressed in this section. These primarily relate to improvements in KPI interpretation, calculation methodology, and the use of updated input data. In particular, refinements have been made to the interpretation and calculation of FTE for the "New jobs created within the project consortium" KPI, as well as to the methodology used to assess the "Reduction of polluting air emissions" KPI. These updates reflect methodological alignment and improved accuracy in reporting, rather than any deviation from the project objectives.

A number of KPIs, particularly those related to Project Work Area, Air Quality, Economic Sustainability, and several Project-Specific indicators, currently show values equal to zero. This is consistent with the project implementation plan, as most of these KPIs are mainly linked to pilot, validation, and demonstration activities, mainly foreseen under WP4, which are scheduled for the second half of the project.

In contrast, KPIs related to Human Impact (capacity building and awareness), Governance, Networking, and Dissemination already show measurable progress at mid-term, reflecting the early-stage focus of the project on coordination, knowledge transfer, and stakeholder engagement.

However, several updates have been introduced in Deliverable D5.2, including both corrective refinements to selected KPI formulations or values and positive updates reflecting improved information, stronger progress, or a more complete representation of project impacts. These updates do not indicate a deviation from the project objectives or implementation pathway but rather contribute to a more robust KPI definition and reporting framework at the current stage of the project.

For Reduction of polluting air emissions, the KPI was revised from an absolute formulation in g/year to a percentage-based formulation. The original approach was considered difficult to monitor reliably and less robust for reflecting the combined contribution of tyres, brakes, and pavement-related developments. The revised percentage-based formulation provides a more transparent and measurable approach for tracking progress.

For the KPI "New jobs created" within the project consortium, the updated values reflect a more consistent interpretation in Full-Time Equivalent (FTE) terms and a more realistic representation of actual recruitment plans, timing, and dedication levels across the consortium. The revisions were introduced to correct earlier inconsistencies and to better align the reported values with the agreed FTE-based approach and the effective implementation of the project. While the revised estimate (~5.9 FTE) is lower than the initial value indicated in the Grant Agreement (12), this does not imply a reduction in impact. Although FTE was used as the unit in the Grant Agreement, its explicit definition was not initially specified; it has since been clarified as 1 FTE corresponding to 48 person-months. Under this definition, the updated value still represents a substantial cumulative employment effort and therefore maintains a meaningful and comparable level of impact in terms of job creation.

For Networking and synergies with projects/initiatives: LIFE projects, the project-end and post-project values were adjusted to better reflect the expected timing of these interactions, with part of the synergies now expected to materialize after project completion rather than during implementation.

For Networking and synergies with projects/initiatives: Other Projects, a new KPI has been introduced to better capture relevant collaboration, replication, and networking activities beyond LIFE and Horizon Europe projects. This represents a positive extension of the monitoring framework and is consistent with the flexibility foreseen in WP5 to incorporate additional relevant KPIs when needed.

For Revenue from sales, commercialization of organoids was already foreseen as a potential project outcome, but the corresponding revenue estimates had not yet been included in the original KPI values. At mid-term, this potential has been assessed more concretely, and the KPI has been revised positively to reflect the additional revenue expected from UMH in relation to organoid commercialization. This update therefore represents a more complete and realistic estimation of the project's revenue potential rather than a corrective adjustment.

For the human-health-related project-specific KPI "Identify new molecular targets or mechanisms to be addressed by new strategies to combat the negative impact of NEE particles on human health", the project-end value was revised from 0 to 1. This update reflects positive scientific progress already achieved at mid-term through the identification of a potential inhibitor based on a vegetal extract.

Overall, these updates represent targeted refinements and positive developments within the KPI framework, introduced to improve realism, internal consistency, and reporting quality, while providing a more accurate representation of project progress at mid-term.

7. Risk, Quality and Legal Management (Lead: HORIBA)

7.1. Updated risk assessment and mitigation

In the context of the Management Report, the LIFE NEEVE consortium carried out a comprehensive review of the risks identified in the project risk management plan finalized in Del.1.2. All partners were asked to reassess the risks relevant to their tasks and work packages, indicate whether the risks had materialised, and describe in detail the mitigation measures applied during the first reporting period M1 to M23.

The review confirms that the majority of identified risks were either successfully prevented or effectively mitigated through the risk management framework defined in Deliverable D1.2 and related coordination tasks. However, several risks did materialise to some extent during the first reporting period. These cases, together with the applied mitigation measures, are summarised below and are presented in detail in Table 21.

Delays in technical tasks and deliverables occurred in particular in relation to Task 4.1. Due to remaining technical activities and limited resource availability, partly caused by overlaps with WP3 activities and the preparation of the mid-term meeting, the execution of Task 4.1 was delayed. As a mitigation measure, the task and the associated deliverable D4.1 were rescheduled from month M27 to M30. This rescheduling was implemented to ensure the completeness and robustness of the technical results. According to the partner assessment, no significant negative impact on WP4 or on the overall project objectives is expected as a consequence of this delay.

Methodological limitations related to NEE measurement systems materialised during testing activities. Specifically, available chassis dynamometer benches were not fully suitable for the appropriate testing of pavements or tyres under representative conditions. To mitigate this risk, an innovative testing methodology was developed for pavement testing on the chassis dynamometer. The new approach, described in Del.3.1, enables controlled and reproducible vehicle speed and load conditions as well as defined contact forces between tyre and pavement. While the methodology does not fully replicate real-world driving conditions, it allows for meaningful comparative assessments between different pavements and was considered an effective mitigation strategy.

Supply chain uncertainties partially materialised for specific materials. While no supply failure occurred for ICER BRAKES, uncertainty remained regarding the availability of desirable steel slag for CHM. At the same time, the risk highlighted that material supply chains differed between partners. The situation continues to be monitored closely, and no critical impact on ongoing testing activities has been reported so far.

Technical and financial challenges during organoid development materialised within WP3. The reagents required for organoid creation were more expensive than initially expected, and delays occurred in their delivery due to distribution problems. Furthermore, technical difficulties were encountered in obtaining lung organoids, and ethical permissions took longer than anticipated. These issues were mitigated through several corrective actions, including a short internship at the University of London to address technical challenges and the successful completion of the delayed ethical approval process. The partner confirmed that these actions allowed the work to continue without compromising the scientific objectives of the task.

Dissemination and stakeholder engagement risks materialised in relation to the late establishment of the Advisory Board. Due to this delay, the consortium was unable to fully benefit from the Advisory Board's expertise during the first half of the project. As a mitigation measure, dissemination and engagement efforts were reinforced later in the project through repeated reminders, increased coordination within WP6, and adjustments of communication activities. While the delay could not be fully compensated, the consortium has taken corrective actions to ensure effective stakeholder engagement during the remaining project period.

A risk related to data transferability of NEE results was discovered. Transferability of data for new road pavements to regions outside southern Europe proved challenging, as pilot testing was originally limited to Spain.

Due to a mismatch in the wording of activities in WP3 and WP4 descriptions, a confusion about where pilot field tests will be conducted has occurred. According to Task T3.2 of the GA, “the aim is to, as far as possible, test two or more pavements in field and on-road tests, in both Spain and Sweden”. However, the current implementation plan foresees pilot testing in WP4 only in Spain. A partner has interpreted, according to the Grant Agreement, some road tests might be implemented in Sweden; this would be feasible provided that the European Commission approves it and VTI adjusts its budget to implement it. In accordance with T3.2, pavement manufacturing and testing activities are expected to be performed in VTI laboratories with NEEVE pavements adapted to cold climates to support transferability assessment. To simulate on-road tests in Nordic climates, we suggest using the VTI road simulator. The simulator is a large-scale facility, capable of testing the wear of up to 14 pavement samples simultaneously with real studded and non-studded tires at sub-zero temperatures. The simulator has a good correlation with real road abrasion. The use of the simulator is under discussion within the consortium, therefore this new risk is not yet integrated in the risk management review. It will be updated if the mitigation measures are agreed on by all partners.

Overall, although several risks materialised during the reporting period, none of them threaten the achievement of the LIFE NEEVE project objectives. All materialised risks were addressed through appropriate technical, organisational or administrative mitigation measures. The residual risk levels remain acceptable, and the consortium considers the risk management approach effective and appropriate for the remaining project duration.

Table 21: Risk level likelihood and impact review

Legend

State: 2026-04-29

Risk	
high	10
medium	5
low	2

Likelihood	
high	3
medium	2
low	1

Rating	
high	600 - 3.000
medium	200 - 599
low	1 - 199

		Risk							Expected risk after defined actions									
Possible risk	**Work package No**	**Compliance risk**	**Financial risk**	**Individual evaluation**	**Likelihood**	**Rating**	**Risk owner**	**defined activities**	**Compliance risk**	**Financial risk**	**Individual evaluation**	**Likelihood**	**Rating**	**Risk acceptable? (rating >199)**	**Reporting Period**	**Did you apply risk mitigation measures? (Y/N)**	**Did your risk materialise? (Y/N)**	**Comments (Please add here your comments. If the risk mitigation measures couldn't be applied, please explain why)**
Administrative risks																		
A partner resigns or is underperforming	ALL	10	5	10	1	500	coordinator (US)	The NEEVE coordinator (US) requests the partner to take corrective actions. If the partner attitude persists, the consortium shall decide on requesting this partner to leave the consortium. The pending workload will be redistributed among partners, based on their expertise, or the involvement of a replacement partner will be considered.	5	5	5	1	125	yes	1	N	N	
Delayed tasks and deliverables	ALL	5	5	10	2	500	Work package leader	Special attention will be given to timing of any development including status reports and achievement of milestones to ensure timely completion and delivery. When required, SC in T1.1 will undertake interventions required to reach the NEEVE goals.	5	2	10	1	100	yes	1	Y	Y	Delay in Task 4.1 due to remaining technical activities and limited resource availability (overlap with WP3 and mid-term meeting preparation). Mitigation consisted of rescheduling Task 4.1 and Deliverable D4.1 from M27 to M30 to ensure completeness and robustness of results. No significant impact on WP4 or overall project objectives expected.
Issues related to IPR rights arise during exploitation	ALL	10	5	10	1	500	IPR Coordinator (CIEMAT)	The consortium agreement will constitute the primary source to resolve IPR issues. Furthermore, the project partners have defined and agreed the exploitation and IPR strategies indicated in Section 2.4.	2	2	2	1	8	yes	1	Y	N	The LIFE NEEVE consortium builds upon the risk mitigation framework defined in Deliverable D1.2 and Task T1.3. No IPR-related issues have materialised during the reporting period. Preventive mitigation measures have been implemented, including NDAs, internal publication clearance procedures and a structured IPR management framework. The current approach is considered effective to avoid conflicts and premature disclosure.

Table 22: Risk level likelihood and impact review (continued)

Technical Risks																		
Complexity of low-NEE design, development	2-3	5	5	10	2	500	Work package leader 2/3 (CIEMAT/ HORIBA)	The consortium has high experience and background in similar projects of the technological design and development related to emissions and transport as proven their participations in R&I projects indicated in sections 1.5 and 1.6. Moreover, in T1.2, S&TC will control the technical advances and propose mitigation actions to reach the NEEVE innovations.	5	5	10	1	250	yes	1	N	N	
Potential failure in quality of deliverables, and green implementation of the project actions	ALL	5	5	5	2	250	Leader of quality, legal, risk and green management (HORIBA)	NEEVE partners have proven certifications and accreditations in quality processes and environmental management systems (ISO 14001, ISO 9001). Moreover, T1.3 will follow the Plan-Do-Check-Act (PDCA) methodology to check the quality of deliverables and manage the mitigation actions and procedures for green measures, quality and legal aspects related to the project.	5	5	5	1	125	yes	1	N	N	
Lack of standardised methodology and instruments for NEE measurements.	2-3	5	5	10	1	250	Work package leader 2/3 (CIEMAT/ HORIBA)	The partners (US, CIEMAT, HORIBA) will utilize their experiences and previous research developments to implement the NEE measuring system. Moreover, an effective approach will be used according to the iterative comparisons among dyno bench measurement vs onboard measurement system and the usage of particle post-analysis to mitigate such risk.	5	5	5	1	125	yes	1	Y	Y	Available dyno benches not sufficiently good for appropriate testing of pavements or tyres. Mitigation: •An innovative methodology was developed for testing of pavements on the chassis dynamometer. The methodology caters for controlled and reproducible vehicle speed and load, as well as contact force between tyre and pavement. The methodology allows comparison between different pavements although it does not completely replicate real driving conditions.
Supply failure of materials required to test and produce brakes, tyres, pavements.	2-3	5	5	5	1	125	Task leaders (ICERBRAKES, CHM and VTI)	ICERBRAKES, CHM and VTI have their established supply chains and partnerships described in section 1.4 to ensure the access to the material required to test and produce brakes, tyres, pavements with lower NEE. Moreover, the supply of materials will be tracked in WP3.	5	5	5	1	125	yes	1	Y	Y	No failure in supply chain (ICER BRAKES), but desirable steel slag may not be available to CHM (still uncertain)
Not all available data in pilot site for developing the CFD models and simulations of the NEE impact in urban areas.	3-4	5	5	10	1	250	Work package leader	The consortium has already the support of two city councils (Murcia and Cartagena) with monitoring stations for providing data about weather and pollution conditions in the urban areas. During the project execution, the onboard measuring system will be used to provide realtime data about the non-exhaust emissions in the trial scenarios. The Murcia city is the initial pilot site, but as alternative, the Cartagena city must be used as pilot site.	5	5	5	1	125					

Table 23: Risk level likelihood and impact review (continued)

Technical problems during organoids development.	3	5	5	10	2	500	UMH	UMH will leverage its experience and infrastructure for cellular analysis and organoids implementation in research projects. Moreover, different cellular lines, bioprinting additives and coculturing techniques will be checked to overcome the risks in the organoids development.	5	5	5	1	125	yes	1	Y	Y	Economical problems appeared because the reagents needed to create the organoids were more expensive than expeted and some of them took long periods to be received in our facilities (distribution problems). In addition, technical problems for obtaining lung organoids occurred: Most of them were solved in a short internship in the University of London, ethical permissions also took longer time than expected, but it was solved .
Potential failure in the installations and demonstrations in real world driving scenarios.	4	5	5	10	1	250	Work package leader 2/3 (CIEMAT/ HORIBA)	NEEVE partners have high experience and background in pilot demonstrations according to their participations in R&I projects indicated in sections 1.5 and 1.6. Moreover, T1.3 will manage any pilot risks, licences and permissions to ensure the installations and demonstrations in real pilot sites in WP4.	5	5	5	1	125	yes	1	N	N	
Failures in the LIFE KPI monitoring and impact evaluation	5	10	10	10	1	1000	All	All NEEVE partners will cooperate closely to collect all the LIFE KPIs described in section 2.1 following the measuring methods detailed in the section 2.2 and the framework of impact monitoring & evaluation defined in section 3.4.	5	5	5	1	125	yes	1	Y	N	A structured KPI monitoring framework was followed, combining regular partner coordination, standardized data collection templates, and validation of inputs. Alignment with common methodology and continuous follow-up ensured completeness, consistency, and reliability of KPI reporting
Ineffective low NEE awareness, dissemination, and inability to engage stakeholders	6	5	5	10	2	500	WP6 leader (VTI)	Periodically review and assess the actions and strategy of low-NEE awareness and engagement, considering the level of dissemination and sharing the results within a wider relevant audience. Dissemination & communication performance indicators will be set and tracked in T.6.1.	5	5	10	1	250	yes	1	Y, many reminders	Y	The Advisory Board was established much too late (responsibility of WP1). so we could not use its competence in the first half of the project
Potential failure of actions and strategies for replication, exploitation	6	5	5	10	2	500	WP6 leader (VTI)	LIFE NEEVE has a good balance of industrial/research partners with a joint exploitation plan defined in Section 2.4. Moreover, WP6 will develop detailed actions and strategies for replication, IPR exploitation and business modelling based on the creation of an wide community for the sustainability of the LIFE NEEVE results in multiple road transport sectors.	5	5	10	1	250	yes	1	Y (request to CINEA)	Y	Unless our request to CINEA about use of existing budget to make Road Simulator testing in Sweden, the transferability will fail

7.2. Quality assurance procedures

To ensure the high quality of all LIFE NEEVE deliverables, the project follows the quality assurance framework defined in the *Handbook of Management Rules & Procedures (D1.1)*. During the reporting period, this framework has been further operationalised and successfully implemented through the establishment of a structured peer review process for deliverables.

Overall responsibility for quality assurance lies with the Steering Committee (SC), which is intentionally positioned outside the day-to-day operational activities in order to ensure objectivity and independence in quality control. The SC has taken an active role in supervising the quality assurance activities and in overseeing the review and approval of project outputs.

A formal deliverable peer review process has been developed and is now applied systematically across the project. This process is designed to guarantee consistency, scientific soundness, and compliance with LIFE programme requirements. It includes the following key elements:

- Each deliverable undergoes a two-step peer review prior to submission.
- The first review is performed by an internal peer reviewer who is not involved in the respective Work Package, ensuring independence from content creation.
- The second review consists of a formal validation by a Steering Committee member, providing an additional level of quality control and strategic alignment.
- Reviewers are appointed by the Steering Committee, based on expertise and independence from the deliverable authors.

The peer review procedure covers both technical quality (clarity, methodology, consistency, and scientific validity) and formal aspects (structure, completeness, alignment with LIFE templates and reporting guidelines). Feedback from reviewers is documented and systematically addressed by the deliverable authors prior to final submission.

This structured quality assurance approach has already been applied to ongoing and completed deliverables and has contributed to early identification of inconsistencies, improved clarity of results, and harmonisation of deliverables across Work Packages. The implemented process therefore represents a significant step forward from the initial planning phase towards a fully operational and robust quality management system within LIFE NEEVE.

[NEEVE Publication Policy - final 250514.pdf]

7.3. Licenses, legal compliance and green management

Licenses, Legal Compliance & Legal Management

Legal Management and Compliance Structure

During the first 24 months of LIFE NEEVE, the legal and administrative management structure defined in the Grant Agreement (GA) and Consortium Agreement (CA) has been fully implemented. The University of Seville (US) has continued to act as the official project coordinator and the sole interface with CINEA, ensuring compliance with all reporting, financial and administrative requirements.

All partners complied with:

- EU Grant Agreement obligations
- Consortium Agreement provisions
- Internal institutional legal and compliance procedures
- Ethical and national regulations concerning laboratory work, particle analysis, material development and on-road testing preparation

No legal deviations, violations or conflicts were reported in this period.

Decision-Making Procedures

The decision-making mechanisms defined in D1.2 were applied consistently throughout M1–M24:

- Steering Committee (SC) and Scientific & Technical Committee (STC) were installed.
- All partners retained equal voting rights.
- Decisions were taken by the required ¾ majority with a 2/3 quorum.
- No changes in consortium composition occurred, so no additional membership approvals were required.

Meeting minutes reflect transparent procedures, timely communication and full partner participation.

Management of Licenses and Permissions

Task T1.3 is responsible for coordinating all required licenses and permissions for upcoming test sites under WP4 (laboratory and real-road demonstrations). During M1–M24, the following steps were undertaken:

CIEMAT (Spain) Testing Site:

- CIEMAT confirmed that all laboratory-based brake, tyre and particle sampling activities fall under existing institutional licenses and safety regulations.
- No additional external permits were required for chassis dyno testing or controlled mechanical tests.

HORIBA (Germany) Testing Sites:

- HORIBA conducted all WP3-related measurements under its existing certified testing licenses and facility regulations (ISO 9001 & ISO 14001 compliant).
- No new permits were required for dynamometer testing, material characterization or emissions sampling in the reporting period.

Road/Motorway Demonstration Activities (Spain & Germany):

While WP4 on-road measurement campaigns start in the next reporting period, preparatory legal steps were initiated:

- CIEMAT and VTI reviewed national requirements for on-road measurement campaigns (particularly vehicle instrumentation rules, safety requirements, and municipal authorizations).
- HORIBA verified German requirements for road testing with measurement systems, confirming that no extraordinary permits are required as long as the vehicle remains road-legal and sensors are safely installed.
- Coordination with Murcia municipality and Spanish authorities was initiated to ensure compliance for future pilot scenarios.

At this stage, no licensing or permitting barriers have been identified.

Financial and Administrative Legal Compliance:

- The coordinator ensured correct distribution of EU funds to partners, according to the CA.
- All partners submitted cost documentation in line with the GA rules.
- Minor delays in payment scheduling (as coordinated with US) were administrative in nature and not related to legal compliance.
- No financial irregularities or legal issues were reported.

Intellectual Property Rights (IPR) & Access Rights:

- Partners continued to follow the CA's IPR regulations.
- Background IPR declarations were respected and updated where needed.
- No conflicts regarding access rights, ownership or licensing occurred in M1–M24.
- Several WP3 technical results (e.g. organoid workflows, brake material formulations, CFD models) were shared among partners strictly under the access provisions defined in the CA.

Green Management

<u>Implementation of Green Management Principles</u>

During the first 24 months of LIFE NEEVE, the consortium implemented the ecological management strategy defined in T1.3 and aligned with ISO 14001 and ISO 9001 principles. All partners continued to follow their institutional environmental policies and internal quality systems, ensuring that project activities adhered to sustainable and resource-efficient practices.

Most administrative and coordination meetings were conducted online, significantly reducing the carbon footprint associated with travel. Physical meetings were planned only when technically necessary (e.g., measurements, workshops), and travel arrangements were optimized to minimize environmental impact.

Reduction of Environmental Impact in Project Operations

Sustainable Meeting and Travel Practices:

- Majority of WP and Steering Committee meetings took place via video conferencing.
- Physical workshops (e.g., at HORIBA Oberursel) were organized with:
  - consolidated travel schedules to avoid unnecessary trips,
  - local public transport recommendations,
  - digitized meeting materials instead of printed handouts.
- Multi-day meetings combined several work package sessions to reduce overall travel frequency across the reporting period.

Ecological Practices in Laboratory and Technical Work:

All partners involved in WP2–WP4 reported the following measures:

- Reduction and separation of waste in laboratories (e.g., chemical waste, particle filters, PPE).
- Reuse of sample housings, mechanical adapters, and measurement setups whenever possible.
- Efficient use of laboratory infrastructure (shared use of equipment, consolidated measurement days).
- Minimization of consumables (e.g., optimized filter runs, combined particle sampling sessions).

HORIBA, ICERBRAKES, CHM, and other technical partners also applied internal ISO 14001-based procedures for:

- safe chemical handling in particle and brake material analysis,
- minimizing hazardous waste,
- energy-efficient operation of dynamometers and test benches (shutdown of unused auxiliary systems).

Resource Efficiency & Energy Reduction

The consortium took specific measures to reduce energy and material consumption:

- Test planning was optimized to cluster measurement campaigns and reduce repeated warm-up and calibration cycles on brake dynos and chassis dynamometers.
- Tyre and pavement tests were aligned across partners (VTI, CHM, CIEMAT) to avoid duplicated measurement loops.
- CFD simulations (RDT) were executed on remote computing clusters using job-bundling to reduce server runtime and improve energy efficiency.

Green Procurement and Material Selection

Even though material development is still ongoing, the consortium already considered green management principles:

- Brake pad and disc prototypes were designed with a focus on reduced harmful constituents and improved longevity (link to environmental impact reduction goals).
- CHM and CTCON considered environmental criteria when selecting:

  - recycled aggregates (e.g., steel slag),
  - raw materials with lower transport distances,
  - low-emission asphalt additives.
- Tyre selection for WP4 convoy testing prioritized tyres with known lower wear rates and longer lifetimes.

GHG Protocol Alignment

Within the reporting period, the consortium prepared the foundation for GHG reporting:

- Partners began collecting travel activity data for CO_2 estimation (virtual meeting logbooks and physical-meeting travel records).
- First guidelines for GHG Protocol tracking (Scope 2 and partly Scope 3: travel) were shared within WP1.
- A consolidated methodology is planned for the next reporting period, when more on-road measurements, workshop activities, and material testing will occur.

PDCA Methodology in Practice

The consortium applied the Plan–Do–Check–Act cycle as follows:

PLAN:

- Establish green management guidelines, promote sustainable travel, reduce material and energy consumption.

DO:

- Online meetings, optimized lab usage, shared measurement campaigns, waste minimization.

CHECK:

- Regular WP1 meetings tracked progress; partners reported environmental actions in semi-annual internal updates.

ACT:

- Adjustments for next periods include:
  - expanded GHG tracking,
  - optimizing measurement planning for large WP4 on-road campaigns,
  - encouraging partners to report green KPIs more systematically.

8. Outlook (Lead: US, Participants: ALL)

8.1. Impact on timeline

8.1.1. US

Although we have experienced delays due to the issues mentioned in section 4.3, 'Financial deviations and corrective measures', the project timeline has not been affected, as the issue was resolved in due time.

8.1.2. CHM

The allocation of tasks within WP3 required more time than initially anticipated. However, the overall workload remained consistent with the original plan, since the minor deviation concerned timing rather than cost or effort. As a result, there are no consequences for the budget or financial planning, and no corrective actions are needed.

8.1.3. CIEMAT

CIEMAT has identified a potential delay in the completion of Task 4.1, leading to an adjustment of its timetable from M22–M27 to M22–M30. This is mainly due to the remaining activities, including the design and manufacturing of different enclosures, the execution of RDE experiments and the limited availability in March, April and May due to concentration of project deliverables and experimental activities corresponding to WP3 and the preparation of the mid-term meeting. This delay in Task 4.1 will consequently result in a delay in the completion of Deliverable D4.1, which is now also expected to be finalised at M30 instead of M27.

Based on the current planning, no material impact is expected on WP4 or on the project objectives, other than the adjustment of the timetable for Task 4.1. This adjustmentaims to ensure the technical maturity, completeness and robustness of the results to be reported under Task 4.1.

8.1.4. CTCON

The distribution of work in WP2 took longer than expected. Nevertheless, the workload remained in line with the initial plan, as the slight deviation was in terms of timing rather than cost or workload. Consequently, this has no impact on the budget or financial planning, nor does it require any corrective measures.

8.1.5. HORIBA

Although a limited deviation occurred at the cost-item level due to the procurement of a used vehicle to support the development of the on-board module, this adjustment was managed as an internal reallocation and implemented in a timely manner. As a result, no impact on the overall project timeline is expected, and all activities remain aligned with the planned schedule.

8.1.6. ICERBRAKES

The activities will continue as originally planned.

8.1.7. IDIBE UMH

All tasks are proceeding according to schedule, with the exception of the lung organoid, which is running slightly behind schedule due to a delay in approval from the hospital's Ethics Committee.

8.1.8. PAUDIRE

The activities are proceeding according to the original plan.

8.1.9. RDT

As a participant of task 4.1, RDT is experiencing the same delays as highlighted in section 8.1.3. However, the activity will be successfully completed under the new timeline. Furthermore, no other delays are expected from RDT activities, and the tasks are progressing in line with the planned project timeline.

8.1.10. VTI

VTI activities are broadly in line with the plan. However, an uncertainty is the potential use of the VTI Road Simulator in testing pavements in northern European conditions. This requires approval from CINEA to let VTI charge the costs of the Simulator by internal invoicing as is common in many of our EU projects. This is crucial for NEEVE to reach the transferability of the new pavements to other than South European conditions. A decision on this is needed soon, to avoid severe time delays.

8.2. Planning for M25-M48

8.2.1. US

The University of Seville will continue to act as coordinator of the LIFE-NEEVE project, ensuring the overall technical and administrative coordination of all work packages throughout the second phase of the project. In this context, it will continue to lead WP1, contributing to all related tasks and deliverables in accordance with the Grant Agreement and supporting the proper implementation of project management, reporting,

In addition, the University of Seville will continue to carry out the analysis of non-exhaust emission (NEE) particles, as well as asphalt materials, tyres, brake pads, and brake discs provided by the project partners. As part of its scientific role within the consortium, it will also perform air quality measurements using an outdoor monitoring system deployed in the city of Murcia, contributing to the assessment of environmental impacts under real operating conditions.

8.2.2. CHM

CHM will continue to participate mainly in WP3, WP4, WP5 and WP6 throughout the second phase of the project. Within WP3, it will continue its work in Task 3.2, focused on the production and testing of innovative pavements for lower non-exhaust emissions. In this context, CHM will contribute to the final adjustment and industrial production of the selected asphalt pavement solutions, in close cooperation with CTCON, VTI, CIEMAT and the rest of the partners.

CHM will also participate in the analysis of results obtained from the testing of candidate asphalt mixtures and tyre–pavement interactions, supporting the optimisation of the final low-NEE pavement solution. This technical contribution will be complemented by its active role in WP4, particularly in Task 4.3, where CHM will contribute to the deployment of trial scenarios for the evaluation of novel pavements for lower non-exhaust emissions. In this task, CHM will be involved in the preparation, production and implementation of the innovative asphalt pavement in the real pilot scenario, including coordination with local stakeholders and support during paving works.

In addition, CHM will participate in Task 4.4, supporting the demonstration and validation of the NEEVE technologies under real road conditions, mainly by providing technical input related to pavement performance and construction quality. CHM will further continue its contribution to WP5 by providing data for KPI monitoring and for the assessment of the technical, environmental and economic impacts of the developed pavement solution.

Finally, CHM will participate in WP6 activities related to dissemination, replication, sustainability and exploitation of project results. In particular, CHM will support the definition of the market uptake strategy for the new low-NEE asphalt pavement, as well as its future integration into the company's portfolio of sustainable pavement solutions.

8.2.3. CIEMAT

CIEMAT will continue its participation in several tasks within WP3, focusing on experimental validation and measurement activities related to non-exhaust emissions. In this context, CIEMAT will perform testing in the chassis dynamometer of the final functional module for onboard measurement of NEE developed by HORIBA. It will also finalise the analysis of results obtained from chassis dynamometer testing of candidate asphalt mixtures, supporting the evaluation of their performance under controlled conditions.

In addition, CIEMAT will participate in the testing of newly developed brake pads and discs designed for reduced non-exhaust emissions, including the measurement of particulate matter emissions. It will continue providing NEE particle samples to UMH and US for the characterisation of particles and their use in biological studies based on organoid models. CIEMAT will also continue to provide input and data to RDT for CFD modelling of dispersion patterns and climate impacts of NEE in urban areas, particularly in relation to the Murcia pilot scenario.

Within WP4, CIEMAT will lead the deployment and demonstration activities of NEEVE project results developed in WP3 under real operating conditions. This includes the installation and adjustment of the onboard NEE measurement module, as well as the integration of novel brake pads, discs and tyres into three types of commercial vehicles, namely internal combustion engine (ICEV), hybrid electric (HEV) and electric (EV) vehicles, all under real driving conditions.

CIEMAT will also lead the optimisation of the onboard NEE measurement module for real operating conditions using Real Driving Emissions (RDE) cycles, including operation across different vehicle types. Furthermore, CIEMAT will participate in the deployment of trial scenarios for the evaluation of novel pavements for lower non-exhaust emissions, and will collaborate with Murcia City Council in defining the locations for pavement deployment.

In addition, CIEMAT will closely cooperate with HORIBA in the demonstration and validation of the performance of novel low-NEE brakes, tyres and pavements under real driving conditions using the onboard measurement system. Finally, CIEMAT will continue to lead Task 6.2 on IPR and knowledge protection and exploitation within WP6.

8.2.4. CTCON

During the second phase of the project (M25–M48), CTCON will continue to actively contribute to the successful achievement of the NEEVE project objectives, building on the results obtained during the initial laboratory phase and supporting the transition towards validation under real operating conditions.

In this context, CTCON will continue contributing to project management, coordination and KPI reporting activities within WP1, supporting progress monitoring and ensuring alignment with the overall project objectives. Within WP3, CTCON will further develop and optimise the asphalt mixtures designed for reduced non-exhaust emissions, incorporating the knowledge gained during the first phase and supporting their refinement based on experimental and pilot-scale data.

CTCON will also participate in the implementation and validation of pilot sections under real operating conditions within WP4, contributing to the assessment of pavement performance and particle generation. In addition, it will contribute to the monitoring of project KPIs and to the assessment of technical, environmental, economic and social impacts within WP5.

Finally, CTCON will participate in dissemination, knowledge transfer and exploitation activities within WP6, promoting the replication, scalability and transferability of the project results to the construction sector and other potential application contexts.

8.2.5. HORIBA

HORIBA leads the development of the final functional module, while CIEMAT is responsible for testing using the chassis dynamometer bench, and we contribute to the post-analysis of NEE data. In addition, HORIBA manages the production phase as an internal company process, which can be shared with the development partner CIEMAT if needed.

Furthermore, HORIBA collaborates on optimization activities and accompanies test drives on German roads and highways. The company also supports the installation of the onboard measurement system. In addition, HORIBA conducts demonstrations and Real Driving Tests (RDT) on regular roads and highways in Germany. These tests serve as additional validation of the equipment and methodology and are carried out at HORIBA's European site as well as on nearby test routes.

Moreover, HORIBA leads these activities in close cooperation with CIEMAT, particularly in supplying and testing three types of vehicles (diesel, hybrid, and fully electric). Finally, HORIBA takes the lead in developing the global engagement strategy and business models to accelerate international market uptake, with all project partners actively contributing.

8.2.6. ICERBRAKES

During the next reporting period, ICERBRAKES will mainly focus, under WP3, on the further optimisation of the selected formulations, as well as on the integration and evaluation of pad and disc technologies. Under WP4, it will contribute to the validation activities under real vehicle conditions.

8.2.7. IDIBE UMH

We will be finishing the lung organoid model in the following months and test all the particles generated in other project tasks in order to bioguide the development of the new materials for lower pollutant emissions and a reduced impact on human health.

8.2.8. PAUDIRE

PAUDIRE will lead regulatory barrier analyses and coordinate comprehensive technical and environmental impact evaluations. The entity will also manage dissemination through training, event engagement, and showcasing demonstrations to drive global market uptake and influence Green Deal policies.

8.2.9. RDT

During the next reporting period (M25–M48), RDT will continue leading WP5 with a focus on KPI monitoring under Task 5.1, including the collection, consolidation, and reporting of KPI data across partners. RDT will ensure consistency in definitions and reporting, support updates to the LIFE KPI Webtool, and contribute to the overall KPI monitoring and evaluation process.

In parallel, RDT will contribute to Task 3.6 (WP3) through CFD-based dispersion modelling of non-exhaust emissions, supporting the evaluation of environmental impacts at pilot locations. RDT will also support validation activities under WP4 (including Task 4.4), particularly in the analysis and interpretation of results from demonstration and pilot implementations, ensuring alignment between modelling outcomes and measured data.

In addition, RDT will continue to support other project activities, including dissemination, networking, and coordination efforts, contributing to stakeholder engagement and providing technical support across work packages where required.

8.2.10. VTI

VTI continues the tyre convoy tests during 2026 and except to finalize the work and publish result first half of 2027. We expect to take part in planning of WP4 pilot tests. An uncertainty is the potential use of the VTI Road Simulator in testing pavements in northern European conditions. This needs the approval of CINEA to let VTI charge the costs of the Simulator by internal invoicing as is common in many of our EU projects. Note that VTI does not ask for an extra budget. This is crucial for NEEVE to reach the transferability issue of the new pavements to other than South European conditions. A decision on this is needed soon, to avoid severe time delays. Dissemination in WP6 will go into a phase where focus will be on disseminating project results to the scientific community, stakeholders and the public.

9. Conclusions

At the mid-term stage (M24), the LIFE-NEEVE project is progressing towards its objective of innovating technologies to monitor and reduce Non-Exhaust Emissions (NEE) to improve air quality and human health. This report consolidates the financial, scientific, and legal achievements attained during this period. The project governance, comprising the Steering Committee, Scientific and Technical Committee, and Advisory Board, is in place and has supported coordination of the consortium through regular meetings.

From a financial perspective, project implementation remains aligned with the planned budget distribution. While some partners experienced minor internal reallocations and administrative delays, such as the University of Seville's quoting process or HORIBA's vehicle procurement, these were successfully managed. These minor deviations have not affectedthe total eligible budget or threatened the financial stability of the project.

Significant technical and scientific progress has been achieved, particularly through the completion of Work Package 2, which established critical base designs and measurement protocols. Within Work Package 3, important developments include the development of 54 new brake pad formulations capable of reducing particle emissions by up to 41.3% while maintaining performance. Additionally, structured testing identified OSMA 11 as a highly promising low-emission asphalt pavement. Advances were also made in monitoring and health assessments, with HORIBA evaluating on-board measurement systems, VTI launching a unique accelerated convoy method for tyre wear, and UMH developing complex, three-layer skin organoids to assess particle toxicity.

The Key Performance Indicator (KPI) monitoring framework is fully established and operational. Mid-term evaluations indicate measurable progress in capacity building, governance, and dissemination activities. As anticipated in the project plan, impact-related KPIs concerning direct emission reductions and air quality improvements remain at baseline levels, awaiting the upcoming pilot and validation activities scheduled for the second half of the project.

The consortium's approach to risk, quality, and legal management has proven highly effective. Although certain challenges materialized, such as limitations with standard chassis dynamometers and minor schedule delays in Task 4.1, they were adequately addressed through innovative testing methodologies and schedule adjustments. Legal compliance has been strictly maintained, and a robust peer-review process, alongside green management principles, is actively applied to all deliverables and operations.

Looking ahead to the M25-M48 period, the project is well-prepared to transition from laboratory development to real-world deployment. The primary focus will shift to Work Package 4, involving the demonstration of the developed technologies in controlled pilots. A key requirement for ensuring the transferability of pavement data to Northern European climates is securing CINEA's approval for the use of the VTI Road Simulator, which is essential to avoid future delays.

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