Land-Based Solutions for Plastics in the Sea

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D9.4 Final Exploitation Plan

Due date of deliverable: 31/03/2025

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PROJECT INFORMATION

Project number: 101003954

Project acronym: LABPLAS

Project full title: Land-Based Solutions for Plastics in the Sea

Call: H2020-SC5-2018-2019-2020 submitted for H2020-SC5-2020-2 / 03 Sep 2020

Topic: CE-SC5-30-2020 – Plastics in the environment: understanding the sources, transport, distribution and impacts of plastics pollution

Type of action: RIA – Research and Innovation Action

Starting date: June 1st, 2021

Duration: 48 months

List of participants:

Nº	Participant name	Acronym	Country	Type
1	UNIVERSIDADE DE VIGO	UVI	SPAIN	HES
2	UNIVERSIDADE DA CORUÑA	UDC	SPAIN	HES
3	Bundesanstalt fuer Gewaesserkunde	BfG	GERMANY	RTO
4	LABORATORIO IBERICO INTERNACIONAL DE NANOTECNOLOGIA	INL	PORTUGAL	RTO
5	KATHOLIEKE UNIVERSITEIT LEUVEN	KUL	BELGIUM	HES
6	HELMHOLTZ ZENTRUM FUR OZEANFORSCHUNG KIEL	GEOMAR	GERMANY	RTO
7	NATIONAL OCEANOGRAPHY CENTRE	NOC	UNITED KINGDOM	RTO
8	SORBONNE UNIVERSITE	SU	FRANCE	HES
9	OPEN UNIVERSITEIT NEDERLAND	OUNL	NETHERLANDS	HES
10	LEIBNIZ INSTITUTE FOR BALTIC SEA RESEARCH	IOW	GERMANY	RTO
11	ASSOCIACAO PARA O DESENVOLVIMENTO DO ATLANTIC INTERNATIONAL RESEARCH CENTRE	AC	PORTUGAL	RTO
12	UNIVERSIDADE FEDERAL DO SAO PAULO	UNIFESP	BRAZIL	HES
13	BASF SE	BASF	GERMANY	LE
14	TG ENVIRONMENTAL RESEARCH	ER	UNITED KINGDOM	SME
15	CONTACTICA S.L.	CTA	SPAIN	SME
16	STICHTING EGI	EGI	NETHERLANDS	Non-P
17	STICHTING RADBOUD UNIVERSITEIT	RU	NETHERLANDS	HES
18	UNIVERSIDADE FEDERAL DO PARÁ	UFPA	BRAZIL	HES

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DELIVERABLE DETAILS

Document number:	D9.4
Document title:	Final Exploitation Plan
Dissemination level	PU – Public
Period:	RP3
WP:	WP9
Task:	Task 9.3
Status:	Final
Author:	contactica innovation
Abstract:	This deliverable D9.4 is the final exploitation plan for the LABPLAS project funded by the European Union under Grant Agreement nº101003954. This report sets the structure and pathway to follow in the exploitation plan that guides the project to its completion and provides the consortium with the tools to exploit the results of the LABPLAS project. This deliverable aims at presenting the project's results, the exploitation methodology developed, the Intellectual Protection overview and the next steps for the exploitation activities.

Version	Date	Comments
1.0	13.05.2024	First draft
2.0	27.03.2025	Final version

Disclaimer

1 List of figures

2 List of tables

3 Acronyms and abbreviations

ACRONYM	DESCRIPTION
CA	Consortium Agreement
D	Deliverable
EC	European Commission
ESS	Exploitation Strategy Seminar
EU	European Union
GA	Grant Agreement
HE	Horizon Europe
HRB	Horizon Europe Booster
IEB	Innovation Exploitation Board
IPR	Intellectual Property Rights
KER	Key Exploitable Result
LCA	Life Cycle Assessment
MP	Microplastic
SERS	Surface-Enhanced Raman Scattering
SML	Surface Micro Layer
SMNP	Smaller Macro and Nano Plastics
T	Task
UVP	Unique Value Proposition
WP	Work Package

4 Executive Summary

Within the scope of the European Commission-funded projects (FP7, H2020, HE), the concept of exploitation has been introduced as part of the road to market installed for the completion of funded projects. Those projects are supported to develop innovative technologies and novel knowledge under the range of sustainability and produce results. Exploiting said projects means using those results in a business mindset to bring the world of investigation closer to the market.

According to the provisions of the Horizon Europe program (REGULATION (EU) 2021/695), all the **LABPLAS project** partners must—up to four years after the end of the action —use their best efforts to exploit their results directly or to have them exploited indirectly by another entity, especially through transfer or licensing.

To present concisely how the project consortium and each partner plan to exploit the project results, T9.3 is dedicated to Exploitation activities. The task aims to produce a final document summarising the project's exploitation strategy.

The deliverable D9.4 aims to present the project's results, the exploitation methodology developed, the Intellectual Protection overview and the next steps for the exploitation activities.

5 Introduction

The exploitation strategy is carried out transversally in the project and is related to all tasks. At the end of the project, what is sought with these strategies and plans is that all partners and the consortium as a whole find the best practices to exploit the results and generate a greater impact on the industry, society and the economy.

Partners have been advised and guided to begin outlining their path to exploitation and have previously participated in the second reporting period to pre-identify their Key Exploitable Results.

This document establishes the strategies for commercial, non-commercial, and knowledge exploitation, considering the paths employed by the consortium partners, identifying WHAT those results are, WHO will exploit them, and in WHICH WAY they will be exploited. Using the information provided by involved partners and CTA support, a strategy for each of the KERs is developed. This deliverable also encapsulates the realised strategies and outcomes.

5.1 Definition of the document

This document is the **LABPLAS** project's exploitation plan. The consortium lays down the basis of the exploitation methodology that will be followed within the market and exploitation work package.

This document has two main purposes:

1) Present Key Exploitable Results that the different partners have defined and started developing during the project length,

2) Prepare the following steps regarding exploitation and IP protection that **LABPLAS** will have to undertake after the project's completion.

D9.4 Final Exploitation Plan has the following purposes:

- ➲ Present the Key Exploitable Results that the different partners have defined and started developing during the project length, together with an evaluation of the CAPEX/OPEX for commercial KERs.
- ➲ Prepare the following steps that **LABPLAS** will undertake regarding exploitation and IP protection during and after the project's completion.
- ➲ Draft adequate marketing strategies (through a Business Model CANVAS) when applicable for the innovative processing technologies and products containing information on the segmentation strategy.

This document also includes a section aimed at monitoring technological advancements, focusing on recent patents and publications related to bio-based materials and innovations, as well as a market strategy to encourage the increase of the overall TRL.

Exploiting the results within Horizon Europe projects depends on the work of other packages and the technical advances of the project in general.

D9.4 Final Exploitation Plan is a final version that gathers each final product or service's financial evaluations and marketing strategies. The finalised exploitation plan allows the LABPLAS consortium to exploit, protect, and benefit from its results.

5.2 Roles and responsibilities

The consortium is composed of 17 partners and is led by the University of Vigo. It includes 13 Research and Technology Organizations (RTOs), 2 Small and Medium Enterprises (SMEs), 1 Large Enterprise (LE), and 1 foundation. The consortium is designed to integrate multidisciplinary expertise, ensuring the successful achievement of the project's scientific and technological goals. 15 partners are from the EU and 1 from Brazil, expanding the project's reach to Latin America.

The University of Vigo (UVI) in Spain coordinates the project, managing different research groups to align expertise with project objectives.

Key project activities (Work Packages - WPs) include:

- **WP1:** Global project management by UVI, EGI and CTA.
- **WP2 & WP3:** Sampling and analysis conducted by UDC, INL, BfG, GEOMAR, NOC, SU (CNRS), and IOW.
- **WP4:** Development of nanoplastic detection techniques (INL), study of microplastic additives (UDC), and remote sensing of macroplastics (AC).
- **WP5:** Study of biopolymer biodegradation by BASF, UFPA (Brazil), CTA, UVI, and BfG.
- **WP6:** Assessment of the environmental impact of SMNP by UVI, BASF, UDC, INL, and BfG.
- **WP7:** Development of computational models by partners specializing in computing by KUL, GEOMAR, SU (CNRS), OUNL, SRU, and ER.
- **WP8:** Maximization of project impact through international collaboration by UVI, OUNL, AC, BASF, CTA and SRU.

The **LABPLAS** team is well-balanced, ensuring effective collaboration, technical excellence, and proactive management to achieve its ambitious goals.

Each partner is assigned one or more activities, directly related to other partners in a joint effort to achieve and go beyond the project results.

Table 1. LABPLAS Responsibilities by partner

Partner	Responsibilities
University of Vigo **(UVI)**	Overall project coordination, financial and administrative management, technical reporting, communication with the European Commission, quality control, and risk management
Universidade da Coruña **(UDC)**	Sampling and preparation of samples, analysis of microplastic (MP) additives, and environmental impact assessment
Bundesanstalt für Gewässerkunde **(BfG)**	Sampling activities, environmental impact analysis, and testing of products from biodegradation studies.
International Iberian Nanotechnology Laboratory **(INL)**	Development of detection techniques for nanoplastics, analysis methods for microplastics
Katholieke Universiteit Leuven **(KUL)**	Computational modelling, data analysis, and support in environmental impact assessments
GEOMAR Helmholtz Centre for Ocean Research Kiel	Sampling, data collection, and assessment of microplastic pollution in marine environments
Radboud University **(SRU)**	Developing and expanding of ePiE model
National Oceanography Centre **(NOC)**	Sampling and preparation of oceanographic samples, analysis of marine microplastics
Sorbonne University **(SU)**	Analysis of chemical additives in microplastics, environmental impact studies
Open University of the Netherlands **(OUNL)**	Computational tools for analysis and modelling of plastic pollution
Leibniz Institute for Baltic Sea Research **(IOW)**	Sampling, and analysis of microplastic pollution in coastal and marine environments
Atlantic International Research Center **(AIRC)**	Remote sensing techniques for plastic pollution detection, ocean literacy, and dissemination
Universidade Federal do Pará **(UFPA)**	Support in biodegradation studies of biopolymers
BASF	Research on biodegradation of biopolymers, contribution to environmental impact assessment
TG Environmental Research **(ER)**	Data analysis, modelling, and monitoring of environmental microplastic impacts
Contactica **(CTA)**	Exploitation management, intellectual property (IP) management, commercialization support, technology transfer
EGI Fundation	Development of project DataHub, data preservation strategy, ensuring FAIR principles in data management

5.3 Governance

The Board that controls all the Intellectual Property Rights regarding the LABPLAS project is the Innovation & Exploitation Board (IEB). The IEB is formed by every partner that produced results during the project's length or is prone to IP-sensitive issues. The IEB is chaired by CONTACTICA and formed by at least one person for each partner with exploitable results (with commercial interest or not). The IEB will help develop the exploitation plan for each one of the results planned. Each one of the IEB members is responsible for communicating to the IEB members any IP and project result planned to be protected. Each member needs to communicate the protection strategy to be followed. It is planned that to anticipate or overcome conflicts, an external expert can be called by any member of the IEB. Patentability studies can be performed by external agents. In this case, the project partner willing to proceed will inform the IEB. Below is the complete list of collaborators involved in the IEB:

Table 2. Exploitation Board members

Institution (acronym), Country	Main contact
Contactica **(CTA)**, ES	Exploitation Manager: Cora-Lyne Berhault
University of Vigo **(UVI)**, ES	Ricardo Beiras Cynthia Gómez
University of A Coruña **(UDC)**, ES	Soledad Muniategui Mª Estela del Castillo Busto
Federal Institute for Hydrology **(BfG)**, GE	Friederike Stock Christian Scherer
Iberian Nanotechnology Laboratory **(INL)**, PT	Begoña Espiña Laura Rodríguez-Lorenzo
Leuven University **(KUL)**, BE	Erik Toorman Nithin Shettigar
HELMHOLTZ ZENTRUM FUR OZEANFORSCHUNG KIEL **(GEOMAR)**, GE	Aaron Beck Elke Kossel
National Oceanography Centre **(NOC)**, UK	Richard Lampitt Alice Horton Katsia Pabortsava
Sorbonne University **(SU)**, FR	Maria Luiza Pedrotti Rocío Rodríguez Torres
Radboud University **(SRU)**, NL	Ad Ragas Caterina Zillien
Netherlands Open University **(OUNL)**, NL	Jikke van Wijnen Sya Hoeke
Leibniz Institute for Baltic Sea Research **(IOW)**, GE	Juliana Ivar do Sul
Atlantic International Research Center (**AIRC**), PT	Andre Valente Natalia Ospina
BASF, GE	Glauco Battagliarin Sebastian Gross
TG Environmental Research **(ER)**, UK	Todd Gouin
EGI, NL	Matthew Viljoen Ela Daci
Universidade Federal do Pará **(UFPA)**, Brazil	José Eduardo Martinelli Filho Marcos Felipe Bentes C. Pereira

6 AMBITIONS OF THE PROJECT

6.1 State of the art

Plastic pollution is a growing environmental concern, with millions of tons of plastic waste entering ecosystems each year. While significant research has focused on macroplastics and larger microplastics, smaller micro- and nanoplastics (SMNPs, <100 µm) remain largely unmonitored despite their high potential for bioaccumulation and toxicity. Studies have shown that plastics continuously degrade into smaller particles due to environmental factors such as UV radiation, mechanical stress, and microbial activity. These tiny particles are more easily ingested by organisms and can enter food webs, yet their long-term fate and ecological impacts remain poorly understood. Existing research has identified key plastic pollution pathways, including land-based sources such as urban runoff, wastewater discharge, and industrial waste, as well as atmospheric deposition and marine transport. However, there is still insufficient knowledge regarding how SMNPs accumulate in sediments, interact with biotic and abiotic components, and persist over time.

One of the main challenges in studying SMNPs is the lack of standardized methodologies for their detection and quantification. Current analytical techniques struggle to accurately identify and measure these minute particles in complex environmental samples, making it difficult to assess their true impact. Additionally, the mechanisms governing the transport and fate of SMNPs across different environmental compartments—air, water, and soil—remain poorly understood. This lack of knowledge hinders the ability to predict how these particles spread and accumulate in ecosystems. Moreover, plastics are not inert materials; they contain chemical additives such as flame retardants and plasticizers, which may leach into the environment and pose additional ecological and health risks. The extent of their bioavailability and toxicity remains an open question, necessitating further research to determine their effects on metabolism and organismal health.

Despite growing awareness of plastic pollution, regulatory frameworks still face significant gaps, particularly regarding SMNPs. While the EU Plastics Strategy and Directive (EU 2019/904) have set ambitious targets for reducing plastic waste, policies addressing the specific risks posed by SMNPs lack a strong scientific foundation. Without comprehensive data on their distribution, behaviour, and ecological impact, regulations remain incomplete, and mitigation strategies risk being based on misconceptions rather than evidence.

The **LABPLAS** project is essential in addressing these pressing gaps. By advancing detection technologies, it will improve the accuracy of SMNP quantification in environmental samples, providing a clearer picture of their presence and behaviour. Through targeted research on pollution pathways, LABPLAS will enhance our understanding of how plastics move between different ecosystems and where they ultimately accumulate. In addition, by assessing the environmental and health risks of SMNPs, including their chemical interactions with biota, the project will offer crucial insights into their potential toxicity.

6.2 Project objectives

The LABPLAS project aims to enhance scientific understanding of plastic pollution by investigating its sources, transport, distribution, and impacts across environmental compartments (freshwater, marine, terrestrial, atmosphere, and biota). With a focus on small micro- and nanoplastics (SMNPs), **LABPLAS** develops advanced analytical technologies for their detection and characterization, assesses their environmental risks, and evaluates the effects of plastic-associated chemicals. The project also explores innovative models and remote sensing for plastic monitoring and promotes biodegradable alternatives. By generating robust scientific evidence, **LABPLAS** supports EU regulatory initiatives, including the Plastics Strategy and Directive (EU 2019/904), and informs policy decisions and public awareness efforts based on facts rather than misconceptions.

7 IPR MANAGEMENT

CTA supports the partners in developing individual strategies as well as a joint strategy to ensure to follow the principles of the Horizon Europe projects regarding Open Access as well as ensuring all information and data are thoroughly protected when necessary to protect the partners' interest and added value.

7.1 Methodology

Before the project started, partners signed the Consortium Agreement (CA) for the management of the knowledge produced, which was developed around the following major points:

- The partners identified their pre-existing know-how, to which they grant access rights to the consortium in the Annex 1 to the Consortium Agreement. Partners were able to define the scope of already existing IPR ("background") to which access rights will be granted to the entire consortium.
- The contractors agreed that the access rights on the knowledge needed for carrying out the project shall be granted on a royalty-free basis.
- All project results (foreground) will be available for use to all partners.
- IP arising from the work carried out collectively will be the joint property of the partners. In this case, the partners will jointly apply to obtain and/or maintain the relevant rights and shall strive to set up amongst themselves appropriate agreements in order to do so. Decision-making procedures are well-defined in the CA. Knowledge/IP generated within the life of the project by individual partners will be owned by the partner generating it.

According to the Grant Agreement (Article 24.1), entitled "AGREEMENT ON BACKGROUND", the background is defined as "data, know-how or information (…) that is (…) needed to implement the Action or exploit the results". For this reason, all the partners identified the Background IP in Attachment 1 of the Consortium Agreement.

7.2 Foreground Protection

During the proposal stage of the project, the Exploitable Results and Foreground identified per partner were included in the table below:

Table 3. LABPLAS consortium background and foreground distribution as displayed in the CA

	Background in use	Foreground generation (potential exploitable results)	Type of IP	IP Protection	Exploitation Strategy
UVI	Ecotoxicological test (Terrestrial & Marine water); Vermicomposting; Economic quantification	New ecotoxicological tests adapted to plastics for testing plastic aquatic and terrestrial toxicity, and environmental degradation.	Method	Know-how	New knowledge generation and dissemination to the scientific community and society, Increase in their publication rate indexes and scientific impact. Networking for future R&D&I partnerships and collaborative EU/national projects, Funding resources for the training of PhD and postdoctoral students as well as involved R&D activities Normative Standardization activities Patentability study on sensors for NPs. To feed discussions on the formalization of the Anthropocene as a new Epoch in the Earth's geological history.
UDC	Methods for MP sampling/sample preparation/ quantification; Atmospheric MP; road run-off; Analysis of plastic additives	New analytical methods adapted to SMNP, atmospheric MP, TWP, and road run-off. MP in run-off waters, distribution and transport, and modelling of drainage systems. Characterization of Plastic additives and degradation products in MP and environmental samples.	Method	Know-how	
BfG	MP sampling and sample preparation methods Ecotoxicological test (Freshwater)	New sampling methods adapted to MP & SMNP. Knowledge regarding the ecotoxicity of SMNP.	Method	Know-how	
INL	Analytical procedures; econanotoxicity tests; Raman spectroscopy-based sensors; microfluidics; micro/nanofabrication	New ecotoxicology tests based on freshwater microalgae and zebrafish embryos adapted to SMNP. Guidelines for SMNPs extraction and preconcentration from natural samples. New sensor based on Raman spectroscopy for *in situ* detection and quantification of NPs	Method/ Prototype	Know-how/ Patent	
KUL	Computation and simulation	Plastic dispersion model	Model	Know-how	
GEOMAR	MP sampling methods in the marine environment, Computation and models	New sampling methods adapted to MP & SMNP. Biogeochemical model	Method/ Model		
NOC	MP sampling methods in different environments, Knowledge in MP	New sampling methods adapted to MP & SMNP	Method	Know-how	
SU	Knowledge of the relation between MP - zooplankton	Relation between plastics and zooplankton; settling velocity. New indicator for plastic pollution	Method	Know-how	

OUNL	Computation and models	Source-to-ocean model (EU plastic model)	Method	Patent Know-how	
IOW	MP sampling and sample handling, paleoceanography	MP time trends	Knowledge	Know-how	
AC	Remote Sensing	Improvement of existing Remote Sensing models to identify the existence of plastics in the environment	Method	Know-how	
UFPA	Knowledge of the environmental levels and biological effects of hazardous chemicals in Latin American coastal areas.	Biodegradation on coastal water	Knowledge/ Method	Know-how	
BASF	Research & development and production of biodegradable and bio-based polymers	Biopolymers degradation, ecotoxicity of the degradation products, ecotoxicity of SMNP	Method	Patent Trade secret	Normative Standardization activities Biodegradation and ecotoxicological tests Evaluation and method development
ER	Computational modelling	Role of MP as vector of chemicals for use in risk assessment	Method	Know-how	Service
CTA	Knowledge in LCA-LCC	Knowledge in LCA for plastics and biopolymers	Methodology and service	Trade secret	Service
EGI	Data management aligns with FAIR principles	Data	Method	-	Networking for future R&D&I partnerships and collaborative EU/national projects, Standardization activities

8 Exploitation Methodology

To organize the creation of the exploitation plan, an ex-post facto methodology was followed according to the methods developed by C. R. Kothari (KOTHARI, 1990).

This construction of the exploitation pathway was followed by descriptive research: survey methods of all kinds, including comparative and correlational methods.

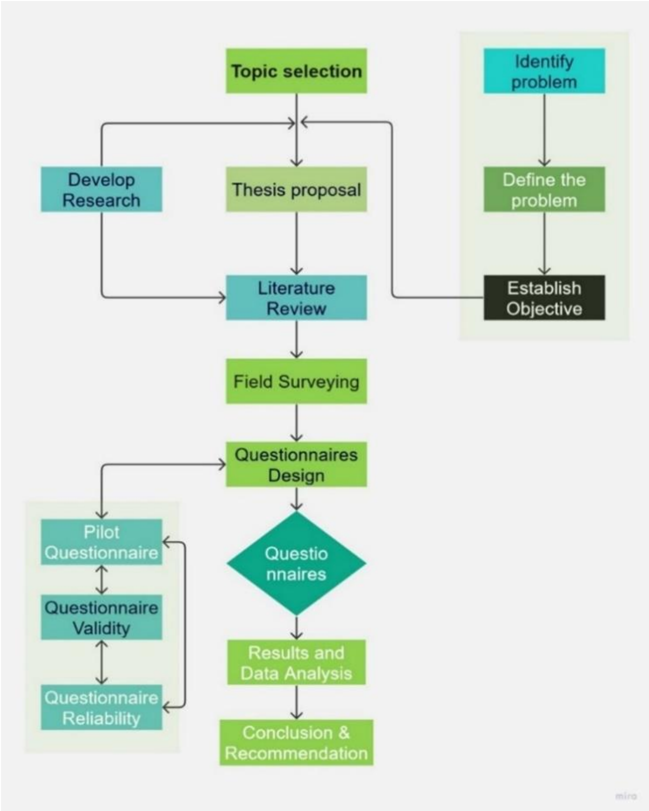


Figure 1. Diagram of the ex-post facto methodology (Kothari)

Based on this method, CTA has developed a methodology for exploitation, linking all the tasks together to provide the best overview of LABPLAS results.

The complete methodology is presented in the figure below:

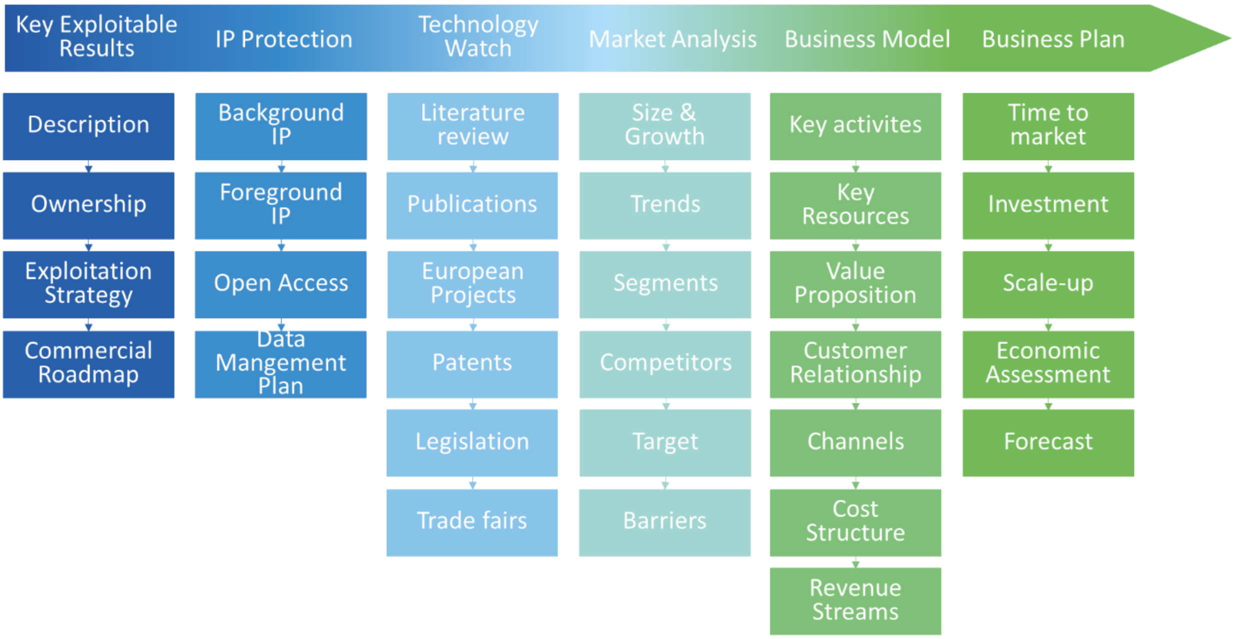


Figure 2. Exploitation Methodology - Source: CTA

Each component of this methodology comes with a set of tools tailored to prepare each segment of exploitation strategies.

The process starts with the identification and definition of the Key Exploitable Results (KER). This involves determining ownership and planning the potential exploitation strategy. Understanding the potential and impact of the results as expected by the partners is crucial.

Subsequently, the protection of Intellectual Property (IP) is addressed. Foreground refers to any project output, whether tangible or intangible, such as data, knowledge, or information generated within the project, as well as any associated rights, including IP rights.

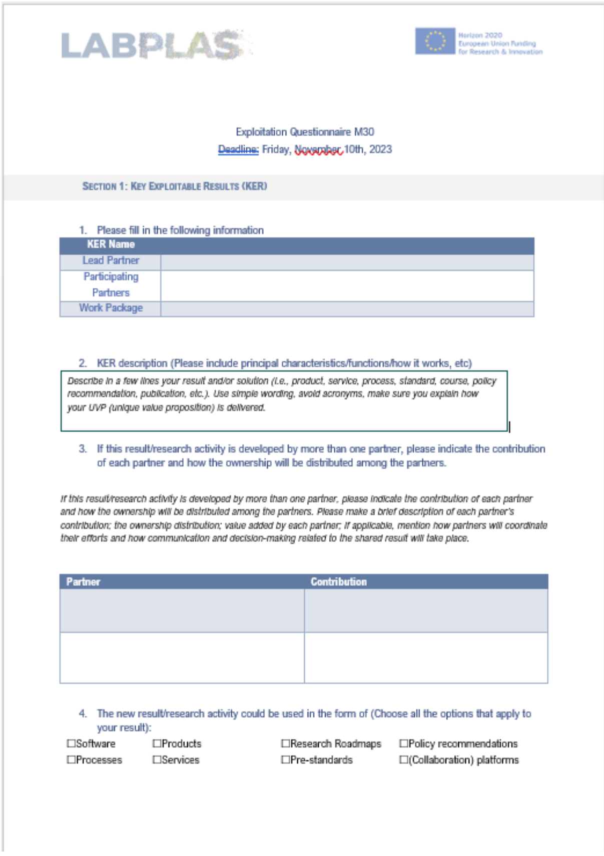
Moreover, the Profit and loss statement and financial projections include estimates of costs and benefits, sales forecasts, and other sources of financing. It must be evoked that exploitation may require investment, resources, additional testing, or scaling up of the project results.

Crafting a business plan is another pivotal aspect when strategizing the exploitation of commercial outcomes. The Business Model Canvas stands out as one of the most utilized tools, known for its effectiveness in facilitating the exploitation of such results. This model scrutinises key variables, positioning the value proposition and stakeholder relationships crucial for developing a marketable service or product at the core. Additionally, it conducts an initial examination of costs and revenues, providing a foundation for subsequent financial projections. As part of the exploitation strategy led by CTA, IPR trainings are delivered during meetings to familiarize all partners with IP protection and collect additional information on the project's progress.

It should be considered that exploitation may require investment, resources, additional testing or scaling up the project results.

To give a thorough image of **LABPLAS**'s results and update the KERs, CTA used a series of tools dedicated to discovering the project's potential and its results. Two types of questionnaires, commercial and non-commercial (both included in Annex 1), have been developed to collect the most appropriate information for each type of result.

Thus, the partners have provided their contributions according to whether their KERs had the potential for exploitation in the market or whether their exploitation strategy is oriented towards further research, publications, open-source dissemination, etc.



Exploitation Questionnaire M30
Deadline: Friday, November 10th, 2023

SECTION 1: KEY EXPLOITABLE RESULTS (KER)

1. Please fill in the following information

KER Name	
Lead Partner	
Participating Partners	
Work Package	

2. KER description (Please include principal characteristics/functions/how it works, etc)

Describe in a few lines your result and/or solution (i.e., product, service, process, standard, course, policy recommendation, publication, etc.). Use simple wording, avoid acronyms, make sure you explain how your UVP (unique value proposition) is delivered.

3. If this result/research activity is developed by more than one partner, please indicate the contribution of each partner and how the ownership will be distributed among the partners.

If this result/research activity is developed by more than one partner, please indicate the contribution of each partner and how the ownership will be distributed among the partners. Please make a brief description of each partner's contribution; the ownership distribution; value added by each partner; If applicable, mention how partners will coordinate their efforts and how communication and decision-making related to the shared result will take place.

Partner	Contribution

4. The new result/research activity could be used in the form of (Choose all the options that apply to your result):

☐Software ☐Products ☐Research Roadmaps ☐Policy recommendations
☐Processes ☐Services ☐Pre-standards ☐(Collaboration) platforms

Figure 3. Exploitation Questionnaire

Using the Exploitation Questionnaire and Exploitation Workshop, the partners' results are included in the project's results individual tables.

Throughout the project, significant progress has been made in defining and advancing the exploitation of **LABPLAS** results. An online training session on Exploitation and Intellectual Property Rights (IPR) provided partners with essential knowledge on managing and protecting project outcomes. Key Exploitable Results (KERs) were identified, updated, and refined through structured questionnaires and consortium feedback.

To further strengthen exploitation efforts, the project engaged with the **Horizon Results Booster service**, leading to external consultancy support for enhancing impact strategies. **LABPLAS** applied and was accepted to utilise one of the key services of HRB, Exploitation Strategy Seminars (ESS). Two of **LABPLAS** KERs were identified and assigned to partner leaders, who developed templates to assess risks and outline exploitation pathways (9) In February 2024, a seminar was held to refine these templates, ensuring they align with the project's objectives and maximize impact.

In addition, CTA worked with the partners to develop a SWOT analysis. A SWOT is a strategic management technique used to identify Strengths, Weaknesses, Opportunities, and Threats to establish the internal and external factors that are favourable and unfavourable to achieving the objectives of the venture or project.

This SWOT analysis helps to identify and describe internal factors that either positively or negatively impact the results and external factors that could enhance or hinder the impact or acceptance of the scientific results. It also helps **LABPLAS** partners identify areas of improvement. We collaborated with each partner so that they could define the Strengths and Weaknesses and the context of their results, thus making more conscious and effective decisions when exploiting their solutions.

To have a clear understanding of the project's overall exploitability, a general SWOT has combined the main challenges and opportunities reflected in the KERs.

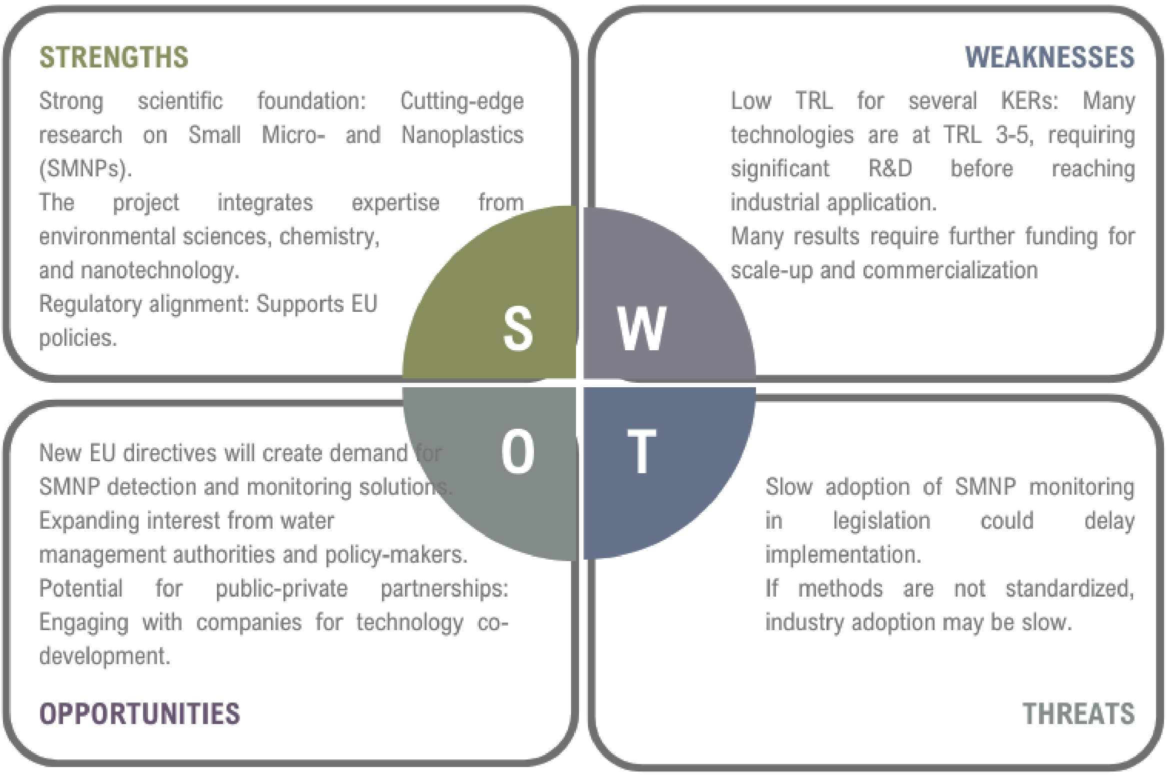


Figure 4. LABPLAS SWOT Analysis. Source CTA

Table 4. KER identification at the Proposal Stage

	KER name	Will it be protected?	IP Type
UVI	New ecotoxicological tests adapted to plastics for testing plastic aquatic and terrestrial toxicity, and environmental degradation		Know-how
UDC	New analytical methods adapted to SMNP, atmospheric MP, TWP, road run-off. MP in run-off waters, distribution and transport, modelling of drainage systems. Characterization of Plastic additives and degradation products in MP and environmental samples		Know-how
BfG	New sampling methods adapted to MP & SMNP. Knowledge regarding the ecotoxicity of SMNP		Know-how
INL	New ecotoxicology tests based on freshwater microalgae and zebrafish embryos adapted to SMNP. Guidelines for SMNPs extraction and preconcentration from natural samples. New sensor based on Raman spectroscopy for in situ detection and quantification of NPs		Know-how / patent
KUL	Plastic dispersion model		Know-how
GEOM	New sampling methods adapted to MP & SMNP. Biogeochemical model		
NOC	New sampling methods adapted to MP & SMNP		Know-how
SU	Relation between plastics and zooplankton; settling velocity. New indicator for plastic pollution		Know-how
OU	SOURCE-TO-OCEAN MODEL (EU plastic model)		Know-how / patent
IOW	MP time trends		Know-how
AC	Improvement of existing Remote Sensing models to identify the existence of plastics in the environment		Know-how
UFSP	Biodegradation on coastal water		Know-how
EGI	Data		
Commercial Results			
BASF	Biopolymers degradation, ecotoxicity of the degradation products, ecotoxicity of SMNP		Patent / Trade Secret
ER	Role of MP as vector of chemicals for use in risk assessment		Know-how
CTA	Knowledge in LCA for plastics and biopolymers		Trade Secret

A first identification of the KERs during the proposal stage introduced three commercial results. As we conclude the projects, the results exploited from **LABPLAS** will essentially contribute to further research activities and standardization activities.

9 Horizon Results Booster

The LABPLAS project has actively engaged in the **Horizon Results Booster (HRB)** initiative to enhance the exploitation potential of its research outcomes. This participation included an Exploitation Strategy Seminar (ESS), held on February 29, 2024, which provided project partners with expert support to structure their exploitation plans, assess risks, and define concrete steps for sustainability beyond the project's lifetime.

The seminar focused on two **Key Exploitable Results (KERs)**:

- **Zooplankton: plastic ratio as an indicator of ocean health**: Led by Sorbonne University, this result introduces a new ecological indicator to assess microplastic pollution in marine ecosystems. The objective is to provide policymakers with a standardized and scientifically validated tool for monitoring plastic contamination levels.10.8 10.4.2
- **Integrated Lab-on-a-chip system for detecting small microplastics and nanoplastics in water samples**: Led by the International Iberian Nanotechnology Laboratory (INL), this innovative device offers a portable, cost-effective, and highly sensitive method for identifying and quantifying plastic particles as small as 1 nm in environmental water samples. 10.4.2

An exploitation roadmap for each KER was drafted by the partners with feedback and suggestions from the expert. The roadmap is a tool designed to help the consortium identify and plan activities to be performed after the end of the project. The final version is the result of several iterations, brainstorms and discussions during the webinars and coaching sessions.

The seminar also introduced concepts such as the Priority Map. This provided a quick overview of the main risks identified in the project, based on the Risk Matrix assessment tool. It helps evaluate risks for each Key Exploitable Result (KER) by analysing the type of risk, its importance for the project, the probability of occurrence and possible actions to counter it along with their chances of success.

There were six types of risks analysed:

- Partnership Risks – Issues related to team composition, conflicts of interest, etc.
- Technological Risks – Challenges in technology feasibility, competition, or emerging innovations.
- Market Risks – Demand uncertainty, competition, and market shifts.
- Intellectual Property (IPR) Risks – Patent conflicts, protection difficulties, or infringement risks.
- Environmental Risks – Regulatory changes and standardization issues.
- Financial Risks – Funding challenges for commercialization

The two KERs that were selected identified the risks displayed in the following tables, thus allowing a better overview of the feasibility of the **LABPLAS** results.

Table 5. KER 10.8 Risk Assessment Map - SU

Description of Risks	Degree of criticality of the risk related to the final achievement of this KER. (1 low- 10 high)	Probability of risk happening. (1 low - 10 high)	Risk Grade	Potential intervention	Estimated Feasibility/Success of Intervention (1 low- 10 high)	Conclusion
Partnership Risk Factors						
Participation of several entities in the result development could lead to complex distribution of work and rights	*6*	*4*	**24**	Regular contact between partners. Share results to encourage open science. Set up clear IPR strategies. Previous agreements of coauthorship.	*8*	**Control.**
Technological Risk Factors						
The success of the investigation depends on the availability and functionality of the needed technology.	*7*	*4*	**28**	Find alternative technology	*7*	**Control.**
Market Risk Factors						
Difficulty in reaching policy makers or taking these results into account to formulate policies linked to plastic pollution	*6*	*7*	**42**	Work on the dissemination of project results. Contact entities and associations close to policy makers. Reinforce the importance of results to reach the target audience	*6*	**Control.**
IPR/Legal Risk Factors						
Problems when defining intellectual property rights over the results	*4*	*3*	**12**	Establish clear and early IP agreements between entities and researchers participating in the outcome	*7*	**Control.**

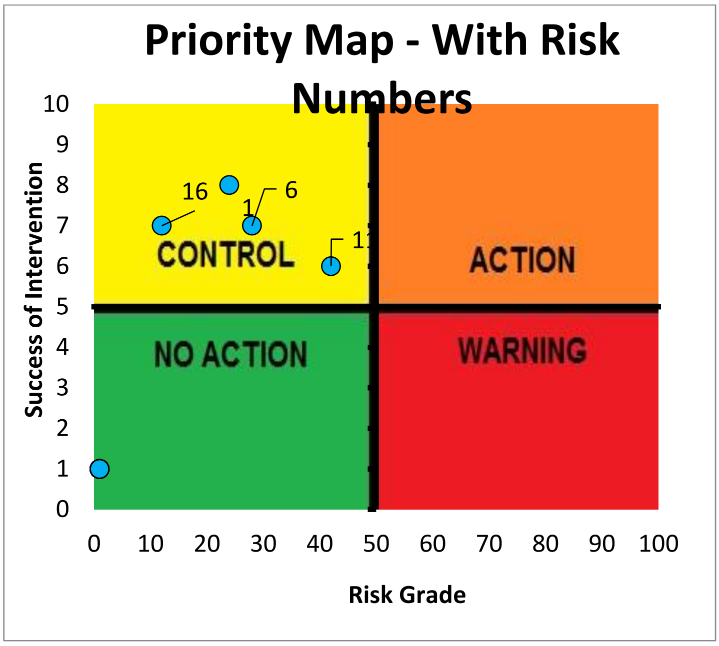


Figure 5. Priority Map - SU – KER 10.8

Table 6. KER 10.4.2 Risk Assessment Map - INL

Description of Risks	Degree of criticality of the risk related to the final achievement of this KER. (1 low- 10 high)	Probability of risk happening (1 low - 10 high)	Risk Grade	Potential intervention	Estimated Feasibility/Success of Intervention (1 low- 10 high)	Conclusion
Partnership Risk Factors						
Conflicts among consortium members regarding project direction, responsibilities, or intellectual property rights.	*7*	*4*	**28**	Very clear exploitation and IPR agreement. Regular communication and conflict resolution mechanisms should be established.	*8*	**Control.**
Technological Risk Factors						
Failure to achieve the desired sensitivity and specificity in detecting and identifying SMNPs	*8*	*8*	**64**	Continuous testing, validation, and optimization of the lab-on-a-chip system. Collaboration with experts in microfluidics, nanotechnology, and environmental analysis to address technical challenges.	*7*	**Action!**

Market Risk Factors						
Limited market demand for the developed lab-on-a-chip system	*7*	*2*	**14**	Conducting thorough market research to understand the potential demand for the technology.	*7*	**Control.**
Low or difficult acceptance in the market	*9*	*5*	**45**	Engaging with stakeholders, including environmental agencies, water management authorities, and research institutions, to assess the market needs and potential adoption of the technology.	*9*	**Control.**
IPR/Legal Risk Factors						
Infringement on existing patents or intellectual property rights	*10*	*1*	**10**	Comprehensive patent searches and legal assessments to ensure freedom to operate.	*10*	**Control.**
Difficulties in understanding the need and convenience of patenting	*5*	*6*	**30**	Receive adequate advice to understand the objectives and convenience of patenting	*10*	**Control.**
Financial/Management Risk Factors						
Budget overruns, delays in project milestones, or resource constraints impacting the successful development of the system	*7*	*8*	**56**	Regular monitoring of project finances and milestones. Contingency planning and proactive management of resources	*6*	**Action!**
Environmental/Regulation/Safety risks						
Non-compliance with environmental regulations or ethical considerations related to the use of the system	*8*	*4*	**32**	Adhering to relevant environmental regulations and ethical standards. Engaging with regulatory authorities and ethical review boards to comply.	*8*	**Control.**

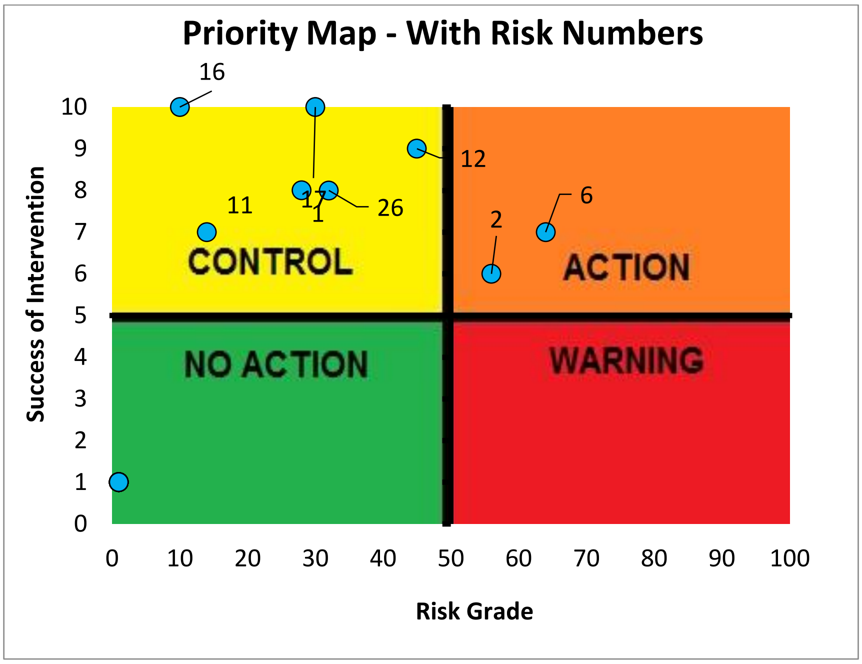


Figure 6. Priority Map - INL - KER 10.4.2

The results of those analyses and the tools in their entirety are compiled in the PDES – Module C Final Report produced by the HRB Expert.

9.1 Key achievements and recommendations from the HRB expert:

The expert assigned to LABPLAS conducted a detailed assessment of the exploitation potential of these KERs and provided strategic guidance on their development. The main outcomes included:

- Partners worked on characterization tables, which helped structure key aspects such as the unique value proposition (UVP), target market analysis, and commercialization pathways.
- Exploitation Roadmap: This included specific actions for each KER, prioritizing steps such as scientific publications, standardization efforts, and potential licensing or commercial applications.
- Risk assessment and priority mapping: A comprehensive risk matrix was established, identifying technological, market, financial, and regulatory risks. Key risks included challenges in engaging policymakers, potential regulatory barriers for standardization, and the need for continued funding to sustain developments beyond the project’s timeline.
- The expert advised multiple potential routes for KER uptake, including policy integration, licensing agreements, research continuation via new funding schemes, and direct industrial applications.

9.2 Strategic actions and next steps

Following the HRB support, LABPLAS is now equipped with a refined exploitation strategy that includes:

- The zooplankton plastic ratio indicator will be published in a high-impact, open-access journal to encourage adoption by policymakers and researchers.
- The lab-on-a-chip technology will pursue patenting and licensing opportunities, while also targeting certification and validation for regulatory compliance.
- The project will explore **follow-up funding opportunities**, including Horizon Europe grants and partnerships with industry and policy stakeholders. This will allow LABPLAS to raise its TRL to achieve marketable results.

Impact of Horizon Results Booster Participation:

LABPLAS's involvement in the HRB program has significantly strengthened its exploitation capacity by providing structured methodologies, expert insights, and strategic recommendations. The HRB engagement has enhanced the project's ability to translate scientific results into real-world applications, ensuring that its findings contribute meaningfully to environmental policy, industry innovation, and sustainable solutions to plastic pollution.

10 Individual KER

10.1 UVI

KER Name	LABPLAS plastic toxicity test battery applicable to conduct ERA for plastics within the REACH regulation framework
Lead Partner	UVI
Participating Partners	UVI, INL, BASF, BfG
Contribution of each partner	UVI – Marine and soil ecotoxicity tests INL and BfG – Freshwater ecotoxicity tests (zebrafish and microcystic) BASF – Freshwater ecotoxicity tests (Daphnia and Lumbriculus) WWTP bacteria
Work Package	WP6
Description	Scientific publication, protocol. Battery of ecotoxicological tests and protocols adapted for the assessment of plastic toxicity in terrestrial, freshwater and marine ecosystems applicable to conduct ERA for plastics within the REACH regulation framework.
Type of result/activity	Data, Reports, Skills and Knowledge, Research Roadmaps, Pre-standards, Policy recommendations and Collaboration platforms
Relevance in the field	Organisms selected for the LABPLAS Plastic Toxicity Testing Scheme and endpoints recorded must be in harmony with international standards for environmental toxicity testing, such as those developed by ISO, US-EPA, ICES or ASTM. However, since most standard methods for regulatory use are not designed for particulate matter, they should be adapted to make them suitable to test a particulate phase and/or its lixiviate. Thus, the battery of ecotoxicity tests proposed should be suitable to assess the effects of environmental plastic samples obtained from terrestrial, freshwater, and marine ecosystems as well as samples of commercial plastic materials, or engineered raw materials disregarding size or origin to establish scientifically sound methods for Environmental Risk Assessment (ERA) applicable to plastic pollution, where potential effects of leached chemicals, ingestion and/or contact with plastic particles are assessed within the micro size range. Most of these tests should also be useful for the evaluation of the ecotoxicological impact of the degradation products from different natural and synthetic biodegradable polymeric materials. Early life stages and sublethal but fitness-relevant endpoints are preferred to maximize the sensitivity of the tests and provide a low level of detection in short-term exposures. Furthermore, specific mechanisms of toxicity due to plastic components may be further explored by the use of non-standard toxicity tests tailored to identify a given adverse outcome pathway. These non-standard tests are normally costly and labour-demanding,

	so they are not included as routine assessment tools but may be useful when certain effects (such as endocrine disruption) are suspected.
State-of-the-art	International standards for environmental toxicity testing, such as those developed by ISO, US-EPA, ICES or ASTM for regulatory use are not designed for particulate matter, they should be adapted to make them suitable to test a particulate phase and/or lixiviate.
Competitors	ISO, US-EPA, ICES or ASTM
Exploitation strategy	Use for further research Standardization activities
Application of results	Environmental Risk Assessment (ERA) applicable to plastic pollution.
Target users	Researchers, policymakers, plastic industry/manufacturers.
Unique value proposition	The plastic ecotoxicity test battery provides a scientifically robust and standardized approach to assessing the environmental risks of plastics. By covering a broad spectrum of ecosystems—including terrestrial, freshwater, and marine environments—this methodology ensures a comprehensive evaluation of plastic toxicity at multiple levels. The inclusion of early life-stage testing and sublethal endpoints enhances sensitivity, enabling the detection of subtle yet significant ecological impacts. This framework not only aids policymakers in establishing regulatory limits but also supports industries in developing safer and more sustainable plastic materials. Through open-access scientific publications, this KER will contribute to establishing safe levels of plastics in different environmental compartments.
Foreground IP	Copyright
Background IP	Open-access publications such as OECD (2012) Daphnia magna Reproduction Test, Test No. 211, Guidelines for the Testing of Chemicals, Section 2, OECD, Paris OECD (2016) Earthworm reproduction test (Eisenia fetida/Eisenia andrei). Test, Test Guideline No. 222, Guidelines for the Testing of Chemicals, OECD, Paris. OECD (2013) Fish Embryo Acute Toxicity (FET) Test, Test Guideline No. 236, Guidelines for the Testing of Chemicals, OECD, Paris OECD (2006) Freshwater Alga and Cyanobacteria, Growth Inhibition Test, Test Guideline No. 201, Guidelines for the Testing of Chemicals, OECD, Paris. OECD (2007) Sediment-Water Lumbriculus Toxicity Test Using Spiked Sediment, Test Guideline No. 225, Guidelines for the Testing of Chemicals, Section 2, Paris. OECD (2006) Terrestrial plant test: seedling emergence and seedling growth test. Test, Test Guideline No. 208, Guidelines for the Testing of Chemicals, OECD, Paris.

10.2 UDC

10.2.1 KER 1

KER Name	Advanced Analytical Platform for Microplastic Detection
Lead Partner	UDC
Work Package	WP2, WP3 and WP4
Description	This comprehensive analytical platform at UDC combines advanced sample preparation strategies with cutting-edge infrared spectroscopy and mass spectrometry technology to accurately and precisely isolate, prepare, detect, measure, and chemically characterise small micro- and nanoplastics (ranging from > 1 μm to ≤ 100 μm) in environmental samples. It also establishes standard operating procedures and harmonized methodologies for analysing plastics and their chemical additives (organic compounds and metals) in water, sediment, and biota. Additionally, it addresses key knowledge gaps related to airborne particles, atmospheric deposition, tyre wear, water runoff, and road dust. By integrating advanced techniques, this platform at UDC ensures a standardised, reliable, and comprehensive assessment of plastic contamination across various environments, delivering highly accurate and actionable insights for research and policy development.
Type of result/activity	Data, Services, Skills and knowledge, pre-standards, policy recommendations, collaboration platforms, educational material
Relevance in the field	Microplastic pollution is a growing environmental concern, however, its accurate detection and quantification remain significant challenges. The analytical platform at UDC addresses these issues by developing precise, accurate and robust analytical methodologies for the sample preparation and analysis of small micro- and nanoplastics (SMNP, >1 μm and ≤100 μm) in environmental samples. Key benefits and contributions: · Improved environmental monitoring. This platform provides standardised and reliable methods that enhance data comparability across laboratories, supporting environmental agencies, policymakers, and research institutions. · Scientific advancement in plastic analysis. By integrating advanced infrared spectroscopy and mass spectrometry, this analytical platform enhances the accuracy and sensitivity of microplastic detection, overcoming limitations in particle and mass number concentration analyses. · Policy support. The work done with this analytical platform will contribute to regulatory frameworks, including the Drinking Water Directive (DWD 2020/2184) and the Urban Wastewater Treatment Directive (UWWTD 2024/3019), ensuring compliance with new monitoring requirements. · Addressing knowledge gaps. Studies conducted using this analytical platform tackle critical issues such as the identification and quantification of chemical additives, the impact of airborne particles, tyre wear, and road dust, the characterisation of reference standards, and the development of open access and updated spectral databases.

	Ultimately, this analytical platform provides a comprehensive, standardised approach to microplastic analysis, delivering valuable insights that benefit society, regulatory bodies, and scientific communities.
State-of-the-art	The field of microplastic analysis is rapidly evolving, with ongoing efforts to develop harmonised methodologies and improve detection in terms of mass and size. Current challenges include: · Lack of standardized methods. Existing techniques vary between laboratories, making comparisons difficult. Organizations such as ISO (ISO 24187, 16094-2), ASTM (D8333), and California Water Boards are working toward standardization. · Regulatory developments. The EU Drinking Water Directive (2020/2184) mandates microplastic monitoring, with specific measurement methodologies (e.g., Quantum Cascade Laser (QCL)-IR microscopy) under review for implementation by 2029. · Technological advancements and lack of specialised spectral databases. Future methodologies are focused on automated workflows for particle number concentration (e.g., QCL-based systems) and mass number concentration (e.g., thermoanalytical pyrolysis gas chromatography-mass spectrometry, Py-GC-MS), and the development of open access libraries. · Lack of microplastics and nanoplastics reference materials and a few numbers of interlaboratory comparisons. Ongoing initiatives such as EUROqCHARM, VAMAS, and the EU Project PlasticTrace aim to validate methodologies and develop reference standards for instrument calibration and quality control purposes. How UDC contributes to innovation: · Cutting-edge analytical techniques. UDC integrates advanced spectroscopic and mass spectrometric methods, along with AI-driven analysis and open-access spectral libraries, to enhance detection accuracy and sensitivity beyond traditional methods. · Development of robust sample preparation strategies: the developed analytical platform optimizes filtration, chemical digestion, and spectroscopic and thermoanalytical techniques, ensuring reliable data in complex environmental matrices. · Participation in interlaboratory comparisons on microplastic analysis. UDC has actively contributed to key interlaboratory studies, validating its methodologies and advancing standardization efforts via this new analytical platform: ❖ EUROqCHARM Interlaboratory Study (Round 3): applied QCL-IR technology for microplastic analysis in environmental matrices. ❖ VAMAS Interlaboratory Study (TWA 45): validated the Py-GC-MS method for microplastic identification and quantification. ❖ WEPAL-QUASIMEME ILS (Round 4, 2024): ongoing participation using QCL-IR spectrometry. By addressing these challenges, UDC´s analytical platform sets a new benchmark in environmental monitoring and helps shape future policies and methodologies for tackling microplastic pollution.

Competitors	Key competitors include research institutions, technology companies specializing in environmental monitoring, and governmental agencies developing microplastic analysis protocols. Notable competitors could include large environmental research centres and analytical chemistry firms, like the International Atomic Energy Agency that works on marine plastic monitoring.
Exploitation strategy	Use for further research, Cooperation agreement/Joint venture, Standardization activities (new standards or support ongoing procedures),
Application of results	Environmental monitoring, public health studies, industrial waste assessment, regulatory compliance and policy development
Target users	Society, environmental agencies, research institutions, policymakers, industries handling plastic materials
Unique value proposition	Scientific value: This platform will advance research in micro- and nanoplastic detection, characterization and quantification. Societal value: It will support environmental sustainability through more accurate pollution monitoring and provide data-driven insights to inform public health policies and regulations. Economic value: It will also provide commercial opportunities in environmental monitoring and compliance services. To maximize the impact of this research, UDC collaborates with other institutions to enhance its analytical platform, including working with INL in nanoplastic analysis. Findings are disseminated and will continue to be shared through high-impact journals, international conferences, and open-access spectral libraries to advance global research. Additionally, UDC will engage with environmental agencies and industries to apply its methodologies, advocate for standardized regulations, and support the development of certified reference materials for quality control.
Foreground IP	Scientific publications in open-access
Background IP	Know-how of UDC in the development of standardized analytical workflows, enhancing data reliability for regulatory and scientific applications. Past methodologies related to spectroscopic analysis with improved detection sensitivity. Ongoing publications on microplastic analysis are focused on mussels, tyres, road dust, and plastic additives. A manuscript detailing the thermoanalytical characterisation of MPs and tyre wear samples is currently in preparation.

10.2.2 KER 2

KER Name	**Infrared Imaging-Based Microplastic Analysis Software**
Lead Partner	UDC
Work Package	WP3
Description	Easy-to-use automated LDIR data processing tool. This software application based on Excel is integrated into the infrared imaging system to streamline reporting number- and estimated mass-based data on MP analysis. This tool can easily determine the size, plastic-type, number-based particles and estimated mass from LDIR data, reducing analysis time and reporting results.
Type of result/activity	Software, services, data, skills and knowledge, prototypes, collaboration platform
Relevance in the field	Microplastic pollution is a growing environmental concern, however, its accurate detection and quantification remain significant challenges. The developed analytical tool addresses these issues allowing a precise, accurate and high-throughput determination and reporting of microplastics (20 - 5000 µm) in environmental samples. Key benefits and contributions: Improved environmental monitoring. This tool provides standardised and reliable results that enhance data comparability across laboratories, supporting environmental agencies, policymakers, and research institutions. Scientific advancement in plastic analysis. By integrating advanced infrared spectroscopy based on Quantum-cascade laser (QCL-LDIR), this analytical tool enhances the accuracy of microplastic detection, overcoming limitations in particle and mass number concentration analyses. Policy support. The work done with this analytical tool will contribute to regulatory frameworks, including the Drinking Water Directive (DWD 2020/2184) and the Urban Wastewater Treatment Directive (UWWTD 2024/3019), ensuring compliance with new monitoring requirements. Addressing knowledge gaps. Studies conducted using this analytical tool tackle critical issues such as the identification and quantification of microplastics in terms of particle number and mass and can be used to analyse different sample typologies. Ultimately, this tool provides a standardised approach to microplastic analysis, delivering valuable insights that benefit society, regulatory bodies and the scientific community.
State-of-the-art	The field of microplastic analysis is rapidly evolving, with ongoing efforts to develop harmonised methodologies and improve detection in terms of mass and size. Current challenges include: Lack of standardized methods. Existing techniques vary between laboratories, making comparisons difficult. Organisations such as ISO, ASTM and California Water Boards are working towards standardization.

	Regulatory developments: The EU DWD mandates microplastic monitoring with specific measurement methodologies under review for implementation by 2029. Technological advancements and lack of specialised spectral databases: future methodologies are focused on automated workflows for particle number concentration (QCL-based systems) and mass number concentration (thermoanalytical pyrolysis gas chromatography-mass spectrometry, Py-GC-MS) and the development of open access libraries. Lack of microplastics and nanoplastics reference materials and a few numbers of interlaboratory comparisons. Ongoing initiatives such as EUROqCHARM, VAMAS and the EU Project PlasticTrace aim to validate methodologies and develop reference standards for instrument calibration and quality control purposes. UDC contributes to innovation thanks to its analytical techniques. UDC integrates advanced spectroscopic and mass spectrometric methods, along with AI-driven analysis and open-access spectral libraries and goes beyond traditional methods. The developed LDIR data processing tool optimizes infrared spectroscopic techniques, ensuring reliable data in complex environmental matrices. UDC has actively contributed to key interlaboratory studies, validating methodologies and advancing standardization efforts via this tool: - EUROqCHARM Interlaboratory Study (Round 3): applied QCL-IR technology for microplastic analysis in environmental matrices. - WEPAL-QUASIMENE ILS (Round 4, 2024): participation using QCL-IR spectrometry. By addressing these challenges, UDC´s analytical tool sets a new benchmark in environmental monitoring and helps shape future policies and methodologies for tackling microplastic pollution.
Competitors	Notable competitors could include large environmental research centres (such as the IAEA) and analytical chemistry firms. The developed software SIMPLE develops a similar work.
Exploitation strategy	Use for further research, standardization activities and cooperation agreements.
Application of results	Environmental monitoring, public health studies, industrial waste assessment and regulatory compliance and policy development
Target users	Companies like AGILENT developing scientific and business outcomes for labs will allow UDC to further exploit the result in the market. Policymakers and research institutions.
Unique value proposition	This analytical tool provides scientific value, allowing advanced research in microplastic detection, characterization and quantification. It will also support societal value through more accurate pollution monitoring and provide data-driven insights to inform public health policies and regulations.

	Finally, it presents commercial opportunities in the long term through compliance services and environmental monitoring. Findings are disseminated and will continue to be shared through high-impact journals, conferences and open-access spectral libraries to advance global research. UDC also engages with environmental agencies and industries to apply its software and advocate for standardized regulations.
Foreground IP	Publication and methods will be made open-access The software can be under copyright
Background IP	Know-how on microplastic detection and quantification and the use of LDIR data processing.

10.3 BfG

10.3.1 KER 1

KER Name	**New sampling methods adapted to MP & SMNP**
Lead Partner	BfG / NOC
Participating Partners	GEOMAR, NOC, UDC
Contribution of each partner	Each partner sampled with the same methods in the specific river basin/sea
Work Package	WP2
Description	Small microplastics were collected with a filter cascade and a submersible pump (10 µm to 1000 µm), comparable to the one used for the Thames. At the Elbe, 10 µm and 1000 µm filter cartridges were used. A 100 µm filter cartridge was added in between to prevent fast clogging. If a cartridge clogged, it was replaced by a new one. Filtering of the water was carried out in 3-5 hours, depending on the availability of a ship with a total water volume of 0.7 to 1.9 m³. Larger microplastics >335 µm were collected with the same Manta net (Hydrobios Microplastic Net) used for the Thames. The Manta net was attached to a crane next to the boat and hung in the water for 15-20 minutes. Only at one site, trawling was necessary as the current of the river was not strong enough. 130-250 m³ water was sampled depending on the sampling site. As the samples were scanned for zooplankton first, they were fixed immediately with 4% buffered formalin. Further samples for zooplankton were taken with a 200 µm manta net in two different depths (40 cm, 1.50 m) in the estuary and nanoplastics at the site of Hamburg (one sample via the pump and another one via the microlayer). Sediments were taken with a Van-Veen grabber from the edge of the river where fine-grained particles accumulated.

	Water surface microlayer (SML) sampling of the SML was conducted at the Elbe River on the upwind side of the vessel using a screen sampler (Garrett-Screen, stainless steel, mesh size 1.2 mm). Samples were collected in deionized water-rinsed brown borosilicate bottles. Reference samples were taken from the underlying water (ULW).
Type of result	Data, Products, Reports, Skills and Knowledge
Relevance	A harmonized sampling technique is essential for obtaining representative microplastic results. Therefore, this is the most important step before analysing the environmental samples.
State-of-the-art	Multiple studies have been published about microplastics. However, quite often, the results cannot be compared as different sampling techniques were used. Therefore, this project aims to compare the data from different river basins and the sea. Currently, researchers take samples with similar techniques such as van-veen grabber for sediments. The use of a 10 µm filter connected to a pump is something new as quite often water samples were taken with nets and thus a larger mesh size.
Competitors	Sonderforschungsbereich 1357 Mikroplastik (university of Bayreuth)
Exploitation strategy	Use for further research, Standardization activities
Target users	Researchers who will conduct monitoring for microplastics, for a better harmonization of sample methods. For politicians, e.g. when a standardization is planned.
Unique value proposition	This KER will provide harmonized sampling techniques, especially for small water samples. Until now, samples have often been taken with nets of a mesh size of 150 or 330 µm. To go down to 10 µm is a novelty. The disadvantage is that only small amounts of water can be filtered as the pump has a small opening and the filters get stuck more quickly. Moreover, it takes more time. However, smaller plastic particles (<100 µm) are more common and very high in number. Thus, it is important information which has been missing until now. Scientific publication in peer-reviewed journals and collaboration with other researchers will allow for further advancements in the field.
Foreground IP	Techniques made open-access
Background IP	Expertise and knowledge of microplastics in the environment and microplastics in rivers. Know how on different sampling methods, sample preparation and analysis. Also, knowledge of ecotoxicological tests for freshwater.

10.3.2 KER 2

KER Name	Knowledge regarding the ecotoxicity of SMNP
Lead Partner	BfG
Work Package	WP6
Description	The studies produce valuable data for the evaluation of the toxicity of (micro)plastics in environmental scenarios. By using leachates as well as particles from non-aged and environmentally aged plastics, our lab studies encompass several factors commonly associated with the toxicity of microplastics. Thus, the results aim at a better understanding of the role of plastic as a multifactorial stressor in the environment. In addition, the produced data can be used for further research and to identify gaps in knowledge.
Type of result	Data, reports, skills and knowledge, research roadmaps
Relevance	Multiple characteristics of microplastics have the potential to adversely affect species. However, it is still not clear which properties of plastics are the main drivers for the observed toxicity. In addition, the environmental relevance of lab studies with microplastics is often limited due to the application of pristine and non-aged plastics. Thus, BfG studies add useful data for a better characterization of the environmental relevance of microplastics.
State-of-the-art	Microplastic (MP) studies face complexity due to diverse particles with unique physicochemical properties affecting toxic responses. Key factors include polymer type, particle size, shape, concentration, and exposure period. Current studies often isolate factors like polymer type, neglecting the comprehensive complexity of real environmental plastic with various polymers, shapes, and ageing stages. Interactions between these properties and their impact on organisms are rarely explored. It's unclear if embedded plastic chemicals or particles contribute to toxicity. Age-related changes in MP properties are often overlooked. These studies aim to comprehensively address these factors by testing real environmental plastic.
Competitors	Sonderforschungsbereich 1357 Mikropalstik (university of Bayreuth), NTNU, Martin Waggner; Wageningen University, Albert Koelmans.
Exploitation strategy	Use for further research.
Target users	Research community
Unique value proposition	Understanding the toxicity of microplastics in environmental scenarios is crucial for evaluating their impact on ecosystems and human health. This KER provides valuable data by analysing the effects of microplastics in controlled lab studies and identifying key toxicity pathways and risk factors. These insights will support regulatory frameworks, guide policymakers, and inform industries on safer plastic design. Additionally, research fosters collaboration with other scientific institutions, enabling follow-up projects that refine testing methodologies and expand knowledge on plastic

	pollution. Through peer-reviewed publications, this work will drive innovation in environmental risk assessment, leading the way for evidence-based policy decisions and improved plastic management strategies.
Foreground IP	Copyright
Background IP	Existing knowledge on microplastic toxicity. This encompasses ingestion/egestion studies as well as effect studies with microplastics and aquatic invertebrates (published open access). Here, we show that interaction and the effects of microplastics with/on biota are material- and species-specific. Thus, the generated data and knowledge from the previous studies (background) are relevant for the applied test designs in LABPLAS.

10.4 INL

10.4.1 KER 1

KER Name	Guideline for methods for extraction, pre-concentration and purification of SMNPs
Lead Partner	INL
Participating Partners	UDC
Contribution of each partner	INL – Optimization and Standardization UDC - Quantification methods based on Py-GC-MS
Work Package	WP4
Description	Multistep methodology for sample processing and analysis, allowing for the extraction, pre-concentration, and purification of SMNPs with minimal degradation and impact on their size/shape distribution. The proposed guidelines were tested, optimized, and validated using samples from LABPLAS field sampling campaigns, and the detection and identification of suspected SMNPs were carried out by electron microscopy and Nile Red labelling using confocal laser scanning microscopy. The size (distribution) and chemical composition of the SMNPs extracted from lab and field samples were analysed by nanoparticle tracking analysis, scanning electron microscopy, and Raman spectroscopy, and SMNPs were quantified using mass-based Py-GC-MS. The guidelines provide a standardized analytical procedure for the detection and identification of SMNPs in environmentally relevant samples, contributing to land-based solutions for reducing plastic waste in the ocean.
Type of result	Processes, services, skills and knowledge, pre-standards, educational material
Relevance	Plastics can be degraded and form smaller pieces known as micro- (5 mm – 1 µm), submicron- (1 µm – 100 nm), and even nanoplastics (< 100 nm). Microplastic particles have been found within samples from oceans, soils in farmlands, air collected in mountains, foods and beverages, and even within animals or plants.

	Currently, the detection and identification of small microplastics (<10 µm – 1000 nm) and nanoplastics (1000 nm – 1 nm) (SMNPs) is highly challenging because of the lack of standardized analytical procedures. This KER covers the optimization and standardization of analytical methods for the extraction, pre-concentration and purification of small microplastics and nanoplastics (SMNPs) from environmentally relevant matrices (water, biota and sediments). The detection of suspected SMNPs is carried out by electron microscopy (EM) and Nile Red labelling using confocal laser scanning microscopy (CLSM). The size (distribution) and chemical composition of the SMNPs extracted from lab and field samples (WP2, D2.1) are analysed by nanoparticle tracking analysis (NTA), scanning electron microscopy (SEM), and Raman spectroscopy. SMNPs are quantified using mass-based Py-GC-MS. Commercially available polystyrene (PS) nanoplastics (SRMs from NIST) with a spherical shape are used to calibrate the described analytical methods and to evaluate the impact of the proposed experimental methods on the size (distribution) and morphology of the SMNPs. Results show low impact for SMNPs dispersed in water and biota samples.
State-of-the-art	Analysing small plastic particles, especially at the nanoscale, has challenges due to their organic nature and size. Environmental concentrations are in the micro- to nanograms per litre range. Separating these particles from organic matrices is tricky, often causing damage or incomplete separation, altering sizes, shapes, stability, and chemical fingerprints. Purifying samples is a crucial initial step. Common physical separation methods include sieving, filtration, and density separation, but they may introduce contaminants or alter particle properties. Chemical digestion methods, categorized into acidic, basic, oxidative, and enzymatic, have different impacts, with basic digestion at 40 °C for 48 hs being optimal. Enzymatic methods are less cost-efficient but less affect small micro- and nanoplastics' integrity. Analysis methods involve optical/electron microscopy, light scattering, vibrational spectroscopy, and mass spectrometry.
Competitors	EuroQCharm Project - Plastic pollution assessment and monitoring - standardising the methods EUROqCHARM. NORMAN network
Exploitation strategy	Standardization activities
Target users	Environmental protection agencies, researchers in water ecology, companies specialized in analytical methods and instruments, and consultancy services.
Unique value proposition	The LABPLAS guideline provides a standardized and optimized method for detecting small microplastics and nanoplastics (SMNPs) across various environmental samples. Integrating advanced analytical techniques such as Raman spectroscopy, electron microscopy, and Py-GC-MS, ensures high sensitivity and accuracy while minimizing particle degradation. This open-access framework supports researchers, environmental agencies, and industry in achieving reproducible results for risk assessment. It also contributes to

	regulatory standardization and land-based solutions, strengthening efforts to monitor and mitigate SMNP contamination in ecosystems.
Foreground IP	The method made open-access
Background IP	Background expertise in aquatic nanomaterial extraction, dispersion, characterization, identification and quantification. The background in this area belongs to INL and is not protected, it is know-how based. The background in the analysis of micro- and nanoplastics by pyr-GC/MS belongs to UDC.

10.4.2 KER 2 (As presented in the Horizon Europe Results Booster)

KER Name	**Lab-on-a-chip system for determination of NPs in environmental water samples.**
Lead Partner	INL
Work Package	WP4
Description	This KER describes the development of a prototype to detect SMNPs using Surface-Enhanced Raman Scattering. The system is being developed to allow decentralized monitoring of NPs in environmental water samples. To achieve that, it uses surface-enhanced Raman scattering (SERS) to detect and identify small microplastics and nanoplastics (SMNPs) in environmentally relevant samples. The prototype includes a microfluidic device for size-sorting and pre-concentration of SMNPs, which enables the detection of SMNPs by conventional Raman spectroscopy. The device is designed to sort plastic particles in four size ranges: i) ≥ 10 µm, ii) 10 µm – 5 µm, iii) 5 µm – 3 µm, iv) 3 µm – 1 µm. Particles < 1 µm are collected in an outlet glass tube. The system has been tested with different SMNPs, including PS, PET, PE, PP, and PHB, and the results show that PS and PET were successfully detected down to low concentrations. Ongoing investigations are being carried out to understand the issues in the SERS/Raman detection of PHB, PE, and PP.
Type of result	Prototypes, skills and knowledge
Relevance	Currently, there are not any available platforms, techniques or equipment that allow the analysis of water samples for the full-size range below 10 micrometres of SMNPs. We developed a prototype that combines size separation between 10 and 1 micrometre sizes for analysis and further SERS analysis of NPs (below 1 micrometre). The SMNPs tested included i) 100 nm PS, ii) 33 nm PS, iii) 161 nm PS, iv) 36 nm PET, v) 126 nm PE, vi) 121 nm PP, and vii) PHB ≤ 250 micrometres. Gold, silver, gold-silver core-shell and TiO_2 nanowires were used as SERS substrates. Based on our findings,

	PHB, PE and PP were not detectable. In contrast, PET, and PS were successfully detected being gold nanospheres and gold nanostars, the most promising substrates. In addition, a microfluidic device for in-situ sorting of the SMNPs was successfully fabricated. We are currently working on integrating the lab-on-a-chip device using the sorting device and an SERS substrate to simultaneously sort by size and detect the SMNPs.
State-of-the-art	Recent reports have confirmed the presence of the smallest microplastics and nanoplastics within environmental water samples: · Ter Halle, A.; Jeanneau, L.; Martignac, M.; Jardé, E.; Pedrono, B.; Brach, L.; Gigault, J., Nanoplastic in the North Atlantic Subtropical Gyre. Environmental Science & Technology 2017, 51, (23), 13689-13697. · Materić, D.; Holzinger, R.; Niemann, H., Nanoplastics and ultrafine microplastic in the Dutch Wadden Sea – The hidden plastics debris? Science of The Total Environment 2022, 846, 157371. · Zhou, X.-X.; He, S.; Gao, Y.; Li, Z.-C.; Chi, H.-Y.; Li, C.-J.; Wang, D.-J.; Yan, B., Protein Corona-Mediated Extraction for Quantitative Analysis of Nanoplastics in Environmental Waters by Pyrolysis Gas Chromatography/Mass Spectrometry. Analytical Chemistry 2021, 93, (17), 6698-6705. · Materić, D.; Kjær, H. A.; Vallelonga, P.; Tison, J.-L.; Röckmann, T.; Holzinger, R., Nanoplastics measurements in Northern and Southern polar ice. Environmental Research 2022, 208, 112741. However, the analytical techniques available are limited for these size ranges (<10 um to 1 nm). SERS has been shown to enhance the signal from the sample of interest by factors of up to 10^14 – 10^15; allowing SERS to be sensitive enough to detect the chemical fingerprints of single molecules, such as proteins, with sizes down to 2 nm. SERS has been reported by Lv et al. to be viable for the detection of 100 nm PS nanoparticles at concentrations down to 40 µg/mL by using aggregated silver nanoparticles (AgNPs) as the SERS substrate; with the potential to differentiate between various types of microplastic particles such as PE and PP. Klarite substrates utilized by Xu et al. were reported to be able to detect PS, PMMA, and PET micro- and submicron particles with sizes down to 360 nm – 450 nm. Zhang et al. reported the use of SERS substrates composed of gold sputtered over a templated surface to detect PET submicron- and nanoplastics, all < 200 nm present in bottled drinking water.
Competitors	Adolphe Merkle Institute (Switzerland), School of Chemistry and Environment, Guangdong Ocean University, Zhanjiang 524088, China; Shanghai Institute of Pollution Control and Ecological Security, Shanghai 200092, Peoples' Republic of China; CNR–IPCF, Istituto per i Processi Chimico-Fisici, Viale F. Stagno D'Alcontres 27, I-98158 Messina, Italy

Exploitation strategy	Part of our developments are being exploited in another project funded by Horizon Europe, D4Runoff, where we expect to apply our developed sensors in runoff waters monitoring. We also expect to be able to exploit the results by patenting (then, licensing or selling IP) The invention will involve only the microfluidic cartridge for the size sorting, preconcentration and identification of the smallest small microplastics. The fabrication of the cartridge together with the specific conditions to obtain the best separation by size of the plastics as well as the protocol for the detection and relative estimation of the plastic quantity will be included in the claims of the patenting application.
Target users	Environmental protection agencies, researchers in environmental sciences, companies with instrumentation for analysis of plastics, and consultancies. Early adopters would be scientific institutions and technological centres interested in investigating the presence of SMNPs in diverse waters. If current unspecific regulations on drinking water microplastics' monitoring include details on the frequency or size ranges needed, this prototype could become early adopted by water suppliers and water management authorities.
Unique value proposition	Scientific and technological contributions. It will lay the foundations for a new generation of sensing platforms for in situ determination of the smallest small microplastics and nanoplastics in water intended for human consumption. This KER will cover the need for "true" mobile systems and provide a generically applicable platform with multiplexing detection capability. It will also help increase visibility in the community of micro- nanoplastics analysis in the environmental matrix promoting further collaborations.
Go-to-Market proposition	The path to be followed to deliver the innovation coming out to the market in the near future could be organized as follows: (i) TRL 5-7 (2025-2026): upgrading and redesigning of the optimized lab-on-a-chip and integration in an alpha prototype. Application to Horizon Europe innovation actions. (ii) TRL 6-7 (2026-2028): upgrading and redesigning the optimized prototype from the alpha phase to the beta phase. Then, the prototype must enter the last phase of industrialization to get the validation & certification of the device. Application to Horizon Europe demonstration funding. (iii) TRL 7-8 (2029-2031): Installation of the technology on reference laboratories and performing the test within real end-user facilities. System completed. Application to investors and public financing (pre-series validation); and (iv) TRL 8-9 (2031-2032): Full commercialization deployment. Extensive Business plan including commercial and marketing plan development.
Foreground IP	Trade secret, patent: A provisional patent has been filled (P1659.3 PP), that will end by 13.09.2025. The next step will be conversion/claiming priority. The INL strategy is to go for an international application (PCT).

Background IP	Know-how related to Raman spectroscopy methods for detecting, identifying and quantifying nanoparticles and Nanomaterials including sample preparation and analysis by NTA, SEM, TEM, confocal Raman microscopy and spectroscopy. Micro/nanofluidic chambers design using CAD software and fabrication using photolithography and soft lithography for the development of platforms for portable Raman sensors and water sample preparation and related know-how. Integration of both Raman spectroscopy methods together with microfluidics. Cartridge for the detection of nanoplastics is not patentable since SERS substrates are already published: 10.3390/nano11051149 and https://doi.org/10.1039/D3EN00401E . The Standard Operation Procedures for the Raman detection without using any cartridges of the smallest small microplastics and nanoplastics in environmental water samples are available in the deliverables D4.1 and D4.3 of the LABPLAS project and our recently accepted publication entitled "Detection of Submicron and Nanoplastics Spiked in Environmental Fresh- and Saltwater with Raman Spectroscopy" in Marine Pollution Bulletin.

10.4.3 KER 3

KER Name	**New Ecotoxicology tests based on freshwater microalgae and zebrafish embryos adapted to SMNP.**
Lead Partner	INL
Work Package	WP6
Description	This KER is presented in Deliverable 6.2 SOPs for adapted TG236 and TG201. In this deliverable, the adaptation of two test guidelines (TG201 and TG236) is proposed to obtain more relevant, meaningful and accurate results on the hazard assessment of small micro- and nanoplastics (SMNPs) on freshwater organisms using two models: Danio rerio embryos and Microcystis aeruginosa cyanobacteria.
Type of result	Services, skills and knowledge, pre-standards, educational material
Relevance	Current test guidelines for aquatic toxicity assessment are described for chemicals but not adapted to nanoparticles or nanoplastics. Their intrinsic properties (particulate material, high specific surface, usual low dispersibility in aqueous solutions) make new or adapted guidelines necessary and start to appear for standardization.
State-of-the-art	An adapted ISO guideline exists for the test of Nanomaterials in zebrafish embryotoxicity (ISO/TS22082), however, it is focused on zebrafish embryos as proxies for human health, but not for aquatic toxicity. Microcystis aeruginosa has been used previously to evaluate the toxicity of nanoplastics as well as their impact on toxin production, but not as a regular test and mostly using standard materials (usually polystyrene).

Competitors	University of Birmingham, University of Leiden, Heriot-Watt University, University of Aveiro, Center for the Environmental Implications of NanoTechnology (CEINT) and others researching the toxicity of nanoplastics.
Exploitation strategy	Use for further research Develop and offer a service
Target users	Environmental protection agencies, researchers and consultancy services for the nanotechnology industry
Unique value proposition	Providing a scientifically validated and publicly available method to improve the hazard assessment of small micro- and nanoplastics (SMNPs) in freshwater environments. By adapting existing test guidelines (TG201 and TG236) to better account for the unique properties of nanoplastics, this methodology enhances the accuracy and relevance of toxicity assessments. It supports regulatory bodies, researchers, and environmental agencies in establishing more reliable standards for the econanotoxicology risk assessment.
Foreground IP	Open access publications
Background IP	Background expertise in aquatic toxicity tests for Nanomaterials; adapted methodology to include more relevant data sets related to nanoparticles' toxicity and characterization methods. The background in this area belongs to INL and is not protected, it is know-how based.

10.5 KUL

KER Name	**Physics-based particle dispersal model**
Lead Partner	KUL
Work Package	WP7
Description	Software development: ○ New modules, describing physical processes that allow for improved physics-based numerical plastic litter transport models, are developed. ○ The theoretical background and generic guidelines for implementation into any suitable existing code are described in a report. ○ The new modules are coded and implemented into the open-source software TELEMAC. The code will be stored in a local GitHub repository and linked with the official GitHub repository of EDF in France, which contains the publicly shared version(s). Once tested and approved by the TELEMAC Steering Committee, the new modules will be merged into this public version, from which moment on it will be publicly available as open-source code. ○ Test cases from the LABPLAS Project (i.e. Elbe River and North Sea) will be added as validation cases. ○ Different new process models will be described in journal paper publications.

Type of result	Software, data, reports, skills and knowledge, research roadmaps
Relevance	The software can be applied to any riverine system or coastal area to study the potential dispersion of plastic litter in 2 and/or 3 dimensions. Since the model computes mass concentrations, it is subsequently possible to estimate environmental and ecotoxicological risks with the appropriate tools (of which some are being developed by other partners in WP7, i.e. the biogeochemical bottom model of Geomar and the food web model of ER). Since the physics-based model incorporates many physical processes that are not or even cannot be described in most other model tools for plastic litter dispersal, the new software allows to address much better where and how much plastic (by total mass) accumulates over time. For instance, the model results indicate that for many EU rivers on the Atlantic coast, most of the litter remains trapped in the estuary and is not flushed into the sea, in accordance with recent field data.
State-of-the-art	This model is unique in terms of new processes that are being studied to be implemented into physics-based numerical models (like incorporating size distribution evolutions and distinguishing between floating, suspended and bottom transport). Part of these model developments are carried out in parallel to similar developments for sediment transport, a topic that has a longer tradition of model development. But the much more fundamental approach at KU Leuven is internationally unique.
Competitors	Research institutes are working on plastic litter transport models.
Exploitation strategy	Use for further research, licence IP rights, The model developments eventually will become part of the public open-source version at www.openTELEMAC.org
Target users	Research institutes, engineering consultants, managing authorities of water resources
Unique value proposition	Few use the Eulerian approach, usually refrain from simplistic process models, and often just use the existing sediment transport modules where the particle properties are adapted to plastics. The model development in LABPLAS goes much further beyond the state-of-the-art. The software developments are expected to be widely used, tested and further extended, either through the offered open-source repository or through the implementation of the newly developed process models in other codes. Unlike many existing models that adapt sediment transport modules for plastics, this tool is specifically designed to provide a more accurate representation of plastic litter accumulation and movement in riverine and coastal environments. Its integration into the open-source TELEMAC suite ensures accessibility, continuous development, and widespread application by researchers, environmental agencies, and water resource managers.
Foreground IP	Copyright
Background IP	The software is based on the existing TELEMAC suite (www.openTELEMAC.org), created (originally at EDF, France) and built by many people from different (mainly European) institutes over many years, but it is open-source and can be used provided that the proper credits and references are given.

10.6 GEOMAR

10.6.1 KER 1

KER Name	New sampling methods adapted to MP and SMNP
Lead Partner	GEOMAR
Contributing partners	UDC
Work Package	WP2
Description	➲ Large sample volumes (~2L) are taken into glass sampling bottles and subsequently filtered through a 10µm stainless Steel filter using a stainless-steel filtration system. The sample only has contact with Steel, Glass and Silicone to avoid plastic contamination. Further open surfaces, such as the filtration funnel are covered with Aluminum foil to avoid airborne contamination. In accordance with protocols developed in WP3, the samples are then prepared by extraction in 2% SDS for 24 hours and 15% hydrogen peroxide for 48 hours. Non-clear samples are additionally incubated in 10% KOH and 0.1% Triton X100 solution. All incubations are done at 130 rpm at 30°C. Surface Microlayer samples require an additional density separation step (Calcium chloride solution with a density of 1.5 g/cm^3), due to the high particle load. They are then analysed by LDIR with the protocol developed by UDC for high particle concentrations on filters. ➲ New sampling methods for microplastics and plastic additives will be tested on field samples from the North Sea. These methods will be described in scientific publications for use by the wider scientific community.
Type of result	Processes, skills and knowledge, codes of conduct
Relevance	The method allows for low contamination yet practical sampling of small microplastics from the Surface microlayer in waters of diverse salinity contents (fresh (rivers and lakes), brackish (estuaries, Baltic Sea), marine (North Sea, open Ocean)). It allows for sampling small microplastics from the µms thin film that separates open water bodies in the atmosphere, which is the basis for understanding, how microplastics influence Ocean-gas exchange. Also, it offers an easily repeatable and adaptable protocol in a field, where there is still little standardization of protocols and method harmonisation done. Improved methods for additive analyses are critical for characterizing the environmental impact of MP and SMNP.
State-of-the-art	Microplastic sampling techniques lack standardization, making it difficult to compare studies and develop global monitoring strategies. While existing methods often focus on bulk water collection and filtration, they fail to effectively sample the SML, where microplastics accumulate and interact with atmospheric processes.

	For chemical additives, a wide range of chemicals are used in different plastic polymers. As new additives emerge in industrial applications, advanced analytical methods must be developed to characterize their presence and potential environmental effects. Novel additives are also being developed and used in industrial manufacture. Further testing and development of analytical methods for new compounds is critical to obtain relevant data in modern samples.
Competitors	JPI Oceans Microplastics Projects: these projects have enhanced sampling and analysis techniques for both water and air, improving cost-effectiveness and accuracy in monitoring microplastics.
Exploitation strategy	Use for further research, standardization activities
Target users	Scientists working on Microplastics in the SML.
Unique value proposition	Results will have societal value. This protocol enables researchers to better understand plastic transport, accumulation, and its role in ocean-atmosphere interactions. Furthermore, the improved additive analysis techniques will enhance chemical characterization, offering valuable insights into the long-term environmental impact of plastic-derived compounds. More standardized sampling for small microplastics will lead to an increased comparability of results. By ensuring high reproducibility and adaptability, this method contributes to international monitoring efforts, policy development, and regulatory compliance.
Foreground IP	Open access publication
Background IP	Know-how on microplastic sampling techniques and advanced chemical processing of samples

10.6.2 KER 2

KER Name	Biogeochemical model
Lead Partner	GEOMAR
Work Package	WP7
Description	The KER “biogeochemical model” is a software code that can be used to simulate the release of potentially harmful chemicals from microplastic particles. The developed software is a module for the biogeochemical transport reaction model C.CANDI combines benthic reactions and transport processes with microplastic transport and release of chemical additives from microplastics.
Type of result	Software, research roadmaps
Relevance	The main environmental hazard of microplastics is the leaching of harmful chemicals from microplastic particles into the environment. This model can estimate the amount and distribution of the leached chemicals and can therefore be used for risk assessment purposes. The main challenge is the parametrization of the model. The processes within

	the model need to be described with realistic parameters and not all of these are known or even well constrained.
State-of-the-art	Benthic transport-reaction models have been developed for decades and the mathematical expressions for the processes are well known. The challenging aspects of the model are the equations and rates for the leachate release and possible reabsorption and the respective parametrization of the model. The research in this field is ongoing and publications are increasing, but the knowledge is not centrally collected and compiled. A current research project focused on the release of leachates into ecosystems is the PLEACH project. Another parameter that is difficult to obtain is the concentration of microplastic particles in the sediment. In conclusion, the worldwide interest in marine microplastic research in recent years has resulted in an improved characterization of natural systems and a constantly increasing knowledge of the distribution and impact of microplastics.
Competitors	To our knowledge, there is no research institution working on implementing microplastic-related processes into a full benthic biogeochemical model. Numerous research institutions are working on one or more partial aspects of the modelling approach.
Exploitation strategy	Use for further research.
Target users	Scientist community
Unique value proposition	This KER provides the scientific community with a tool for modelling the transport and reactions of chemicals and particles in benthic environments. This will be achieved through scientific publications. By remaining open-access, the model fosters collaborative research, ensuring that its insights contribute to global knowledge on microplastic pollution and help shape future environmental policies.
Foreground IP	The software helps to understand and solve specific research questions. It is useful for a very specialized part of the scientific community. Only without protection, it becomes accessible to this community. Science is about increasing knowledge and making it broadly available to the community and beyond, not protecting IP.
Background IP	Existing software package for biogeochemical modelling (C.CANDI). The C.CANDI code is publicly available.

10.7 NOC

KER Name	Data on the spatial and temporal variability of plastics in the rivers Thames and Elbe
Lead Partner	NOC
Participating Partners	BfG, GEOMAR, INL
Contribution of each partner	BfG – Field Sampling NOC, GEOMAR - Analysis of lab and field samples for MP determination INL – Data management
Work Package	WP2 and WP3
Description	We are producing data on the spatial and temporal variability of plastics in the Rivers Thames and Elbe and in the Southern North Sea. Samples are collected from the air, water and different faunal groups and are chemically characterised. Results and insights will be published in open-access peer-reviewed journals and, as described in the proposal the insights will be used to generate policy recommendations.
Type of result	Data, reports, skills and knowledge, policy recommendations, educational material
Relevance	Developing appropriate policies to address plastic pollution is not possible if we do not understand the distribution and characteristics of plastic contamination in terms of spatial and temporal variation and the physical location of the pollution (air, water, sediment, and different faunal groups). The problem that this research aims to solve is the extreme lack of hard and high-quality data on which to make decisions. Without such data, it will be impossible to develop appropriate policies which must of course consider not just environmental damage but the industrial and societal consequences of legislative change.
State-of-the-art	Plastic pollution is a global issue, but the EU has taken a global lead in developing policies on plastic pollution. Current policies must continuously evolve to integrate new scientific evidence and insights, as provided by LABPLAS. While various monitoring initiatives exist, they are often fragmented, regionally focused, or lack long-term observational data. The LABPLAS dataset represents comprehensive efforts to quantify and characterize plastic pollution in major European river systems, offering a baseline for future research and risk assessments.
Competitors	Other research institutions and environmental programs.
Exploitation strategy	Use for further research, cooperation agreements, and standardization activities. The outcomes will be published in open-access peer-reviewed journals and will have enhanced collaboration between scientists.
Target users	Other scientists are involved in research into aquatic pollution and its effects on ecosystems. Policymakers creating plastic waste management strategies.

Unique value proposition	The problem that this research aims to solve is the extreme lack of hard and high-quality data on which to make decisions. Without such data, it will be impossible to develop appropriate policies which must of course consider not just environmental damage but the industrial and societal consequences of legislative change. The value of this research is that evidence-based decisions will then be possible and appropriate policies developed. Developing appropriate policies to address plastic pollution is not possible if we do not understand the distribution and characteristics of plastic contamination in terms of spatial and temporal variation and the physical location of the pollution (air, water, sediment, and different faunal groups).
Foreground IP	All scientific results and insights will be published in open-access peer-reviewed literature.
Background IP	No protected intellectual property: all background knowledge remains open for public use to maximize scientific and regulatory impact.

10.8 SU (As presented in the Horizon Europe Results Booster)

KER Name	**Plastic: Zooplankton ratio. Relation between plastics and zooplankton abundance. New indicator for plastics pollution in aquatic systems.**
Lead Partner	SU
Participating Partners	NOC; BfG
Contribution of each partner	SU – Proposed plastic/zooplankton ratio. Sampling and data analysis. Reporting results NOC – Sample collection in Thames and Elbe rivers BfG – Polymeric characterisation
Work Package	WP3
Description	Plastic size decreases as weathering and fragmentation take place, increasing the interaction with zooplankton species and therefore, increasing also the risk of ingestion by a wide range of organisms, including fish. Plastic and zooplankton samples were taken from the North Sea and from the mouth of the Elbe and Thames rivers to assess whether the quantities of plastics relative to the zooplankton (plastic: zooplankton ratio) could be an indicator to assess the risk of MPs entry in marine food webs, thus providing a valuable tool for assessing levels of micro-waste pollution. In addition, this analysis could be standardized, and the acquired data would allow the community to compare the microplastic pollution state in different regions of the global oceans.
Type of result	Data, reports, skills and knowledge, pre-standards, policy recommendations, collaboration platforms, and educational material.

Relevance	This research is valuable in this field because it provides knowledge about the concentrations of plastics and zooplankton in a continuous aquatic area that includes freshwater and marine ecosystems. Furthermore, those concentrations could be used to calculate the plastic: zooplankton ratio, which analysis could be standardized and applied to other regions. The data resulting from the plastic: zooplankton ratio may be a good indicator of the good state of the environment (GES) described in the Marine Strategy Framework Directive (MSFD). This ratio can be a reference, offering the scientific community the possibility of comparing the extent of microplastic pollution in various areas of the world's oceans.
State-of-the-art	Concentrations of plastic and zooplankton were measured in many places around the global oceans (1-7). However, the plastic: zooplankton ratio has been only mentioned in some studies to date and has never been considered as a possible indicator of the good state of the sea. The ratio was measured in a few studies as a local value (5-7). It was assessed in the Mediterranean Sea to evaluate the risk of microplastic pollution in the aquatic ecosystems (1-4).
Competitors	No research groups working on this subject.
Exploitation strategy	Use for further research, and standardization activities (new standards or support ongoing procedures). Scientific publication.
Target users	Other scientific groups (experimental and modellers) and policymakers.
Unique value proposition	This project aims to establish a European database for assessing plastic pollution risks in marine environments and to develop management tools for the implementation of marine microliter monitoring. The database will provide essential data for scientific analysis and decision-making. Dissemination activities will include article publications and conference presentations, facilitating knowledge exchange. Additionally, collaboration with other scientific groups will support future studies and projects, advancing research in marine pollution and its management.
Foreground IP	Most scientific results and insights will be published in open-access peer-reviewed literature. Copyright if necessary.
Background IP	The knowledge on the relation plastic-zooplankton is already brought by Sorbonne University as know-how.

10.9 OU

KER Name	Actin-oriented course on SMNP in the environment
Lead Partner	OU
Work Package	WP8
Description	The OU has developed an action-oriented course on SMNP in the environment and plastics management. This course aims to inform stakeholders about SMNP in the environment, and the results of the LABPLAS project. This allowed the exploration of opportunities for stakeholders to connect through the course. The course development process included the identification of training needs through a targeted workshop (M25), where OU collaborated with relevant stakeholders. After gathering feedback, an online course was created. Provided during the course were specific examples of how mitigation measures in the supply chain of products can be identified and assessed based on a combination of stakeholder involvement and a description of the source-to-effect chain in the ePLAS model.
Type of result	Skills and knowledge, educational material
Relevance	In this course, various European stakeholders can learn about SMNP in the environment and possible mitigation options. Policymakers can use the course when developing a strategy aimed at reducing plastic problems. In addition, the course is a way of making the knowledge gained in the project available to stakeholders.
State-of-the-art	Research into the sources, fragmentation and distribution of plastics and microplastics is an important issue in environmental sciences. Research on the mitigation of the amount of SMNP in the environment is also very important. Policymakers are looking for ways to mitigate plastic pollution in the environment. For such a mitigation strategy, knowledge of the behaviour of (micro)plastics is essential.
Competitors	In the Netherlands, research institutes are engaged in research on (micro)plastics. The Open University (MOOC on marine litter) and the Wageningen University Research (WUR) (MOOC on microplastics).
Exploitation strategy	Use for further research and spin-off activity.
Target users	Policymakers, stakeholders from industries (e.g., tyre and automotive, textile, plastics), researchers, water managers, services engaged in road or building services/maintenance, shipping industries etc.
Unique value proposition	This novel course on (micro)plastics in the environment and the governance of plastics aims to actively support policymakers and other stakeholders in managing plastics. By integrating scientific knowledge with real-world examples from the LABPLAS project and utilizing the ePLAS model, the course empowers users to understand the sources

	and impacts of plastics in the environment and implement effective mitigation measures. This course also provides an opportunity for knowledge exchange among stakeholders, promoting collaborative governance of plastic pollution across regional, national, and EU levels. The online format allows easy access for diverse stakeholders, ensuring wide dissemination of the findings and tools developed during the project.
Foreground IP	Copyright
Background IP	Extensive know-how of OU in developing and teaching online courses, e.g. the UN MOOC on Marine Litter.

10.10 IOW

KER Name	MP time trends in sediment cores
Lead Partner	IOW
Work Package	WP8
Description	To test the hypothesis of increasing plastic amounts in marine compartments, sediment cores (collected in the Baltic Sea during previous IOW expeditions) will be sampled and analysed. These results (timelines) will feed discussions on the onset of the Anthropocene epoch. LABPLAS will rely on cores sampled at the Landsort Depp, Eastern Gotland basin and the Gulf of Finland (up to 270 m deep). These undisturbed sediments of the deep Baltic Sea basins allow excellent temporal resolution and the potential establishment of microplastic temporal trends over the last century. In the North Sea, sediment cores will be obtained with an intact sediment-water interface using a MUC. Cores will be sliced onboard every 0.5 to 1 cm to be used as single or composite samples. Samples will be stored in Al foil or glass jars previously ashed at 500°C. In the shore-based laboratory, sediment samples will be freeze-dried and weighed (0.001 g). The samples will be measured on gold filters with the LDIR in the German Federal Institute of Hydrology. The results will be published in a research paper in 2024.
Type of result	Data, reports
Relevance	Seafloor sediments have been proposed to act as final sinks for plastic debris distributed globally in the oceans. To date, most studies have focused on plastics floating on the sea surface, such as those accumulated I by currents within the five “great garbage patches”. Since floating plastics account only for <1% of all marine plastics; therefore, most of the plastic likely migrates into the deep sea. Recent seafloor sampling has identified plastics, including MP, in marine environments from shallow to the deepest trenches on the planet. Marine sediments therefore constitute an important sink for ocean plastics and MP. As a final environmental compartment, sediments

	provide an excellent matrix to monitor plastic pollution sequestration and accumulation trends. LABPLAS will define time trends of plastic pollution in dated sediment cores and estimate retention rates of MPs in river sediments.
State-of-the-art	Sediment cores are generally taken in different environments such as lakes or the sea to better understand the sedimentation history. For microplastics, only a few studies have been published until now. The results will give new insights into the accumulation, time trends and retention rates.
Competitors	The IAEA Marine Sediment Studies conduct long-term monitoring and analysis of sediments.
Exploitation strategy	Use for further research and standardization activities.
Target users	The research community working in the fields of marine pollution, environmental science, and sedimentology.
Unique value proposition	This KER provides novel insights into the trends of microplastic pollution in marine sediments, filling a significant gap in the current literature. The data from the sediment cores offer high-resolution, long-term insights into how plastic pollution has evolved over the past century. By offering this data in open access, IOW fosters global collaboration in the field of marine pollution research.
Foreground IP	Data will be made open-access
Background IP	Know-how on MP sampling and sample handling, palaeoceanography

10.11 AC

KER Name	Pipeline based on satellite imagery for ocean features detection and classification
Lead Partner	AIR Center
Work Package	WP4
Description	Improvement of existing Machine Learning models to identify the existence of marine debris agglomerations that can be used as proxies for plastics in the marine environment. POS2IDON is a Python open-source data pipeline designed for long-term analyses and monitoring of suspected marine debris (floating plastics or other polymers, mixed anthropogenic debris) accumulations larger than 10 metres and other ocean features, such as vessels and floating Sargassum. This tool downloads Sentinel-2 satellite imagery, performs atmospheric correction, applies land and cloud masking and uses Machine Learning models trained with a spectral library to create scene classification maps that can be provided to stakeholders. The source code is available at: https://github.com/AIRCentre/POS2IDON

Type of result	Data, products, services, reports, policy recommendations, educational material
Relevance	POS2IDON can detect large accumulations of suspected marine debris over a large coastal area, something that can be challenging for drones and aeroplanes. This detection is important to help stakeholders make cleaning decisions or apply preventive measures. POS2IDON offers an easy-to-use set of options focused on the user that allows them to freely process raw satellite images into useful scene classification maps. Also, the code is open-source and any user can insert their Machine Learning model (Random Forest, XGBoost or U-NET) inside the pipeline. The U-NET option is optimised to run on the GPU which allows to obtain fast classification results for large regions of interest, which is also useful for long-term analysis.
State-of-the-art	Recent publications showing the state-of-the-art address important insights on the monitoring of marine pollution using Sentinel-2 together with Machine Learning. MARIDA is currently the biggest dataset of spectral signatures extracted from Sentinel-2 images for 11 thematic classes, it was developed by Kikaki et al. and used initially to train a U-Net and three variations of the Random Forest model. Recent studies are based on the findings from different researchers well-known in the marine litter remote sensing community such as Konstantinos Topouzelis, Lauren Biermann, Victor Martinez-Vicente, Chuanmin Hu, Achille Carlo Ciappa, Manuel Arias, among others.
Competitors	Similar to POS2IDON is the study by Henry Booth from the School of Computer Science and Informatics, Cardiff University, UK; and the company Plastic-i by James Doherty.
Exploitation strategy	Use for further research, cooperation agreement: The AIR Centre made a business arrangement to produce custom reports on the occurrence of plastic debris pollution events.
Target users	Policymakers. Aquaculture entities. Cleaning entities.
Unique value proposition	By utilizing Sentinel-2 satellite imagery, POS2IDON offers an automated solution to detect and classify marine debris agglomerations larger than 10 meters, which can serve as proxies for plastic pollution in the ocean. This pipeline combines atmospheric correction, land/cloud masking, and cutting-edge machine learning models (including Random Forest, XGBoost, and U-NET) to provide rapid and accurate scene classification. The open-source nature of POS2IDON allows users to insert their machine-learning models, providing flexibility for custom solutions. With GPU optimization for fast processing, the pipeline is well-suited for long-term monitoring and large-scale analyses, offering stakeholders timely insights into plastic pollution trends. This KER will serve scientific and societal purposes through dissemination and publications.
Foreground IP	The results are open-source and protected by the GNU General Public Version 3 License.

Background IP	The laboratory tests EO/Remote Sensing procedures and methods to connect peripheral regions into globally competitive technological sectors by supporting research, innovation and entrepreneurship. The scene classification results produced by POS2IDON are free and open to everyone. The developed Python POS2IDON pipeline is open-source and only relies on GNU General Public Version 3.

10.12 UFPA

KER Name	**Biodegradation on Amazon coastal waters**
Lead Partner	UFPA
Other partners	UVI, BASF
Contributions of each partner	BASF, UVI – Standardization, Biodegradation assessment UFPA – Field work, sample processing, data analysis, writing of the draft manuscript, review and editing.
Work Package	WP5
Description	This KER involves the study of the biodegradation of biopolymers (PLA and PHB) in the coastal zones of the Amazon region as this environment has specific physicochemical and biological characteristics. These findings are expected to play a pivotal role in setting preliminary criteria for the standardization of degradation tests for biopolymers, which could have large implications for the biodegradable plastics industry. Furthermore, understanding the degradation of these polymers will help in understanding the pollution that mainly reaches marine animals. The aim is to understand how the degradation of polymers contributes to the pollution of marine environments and the organisms in this ecosystem. This KER provides preliminary results, for further investigation on the many mechanisms which led to the degradation of the three tested polymers.
Type of result	Reports, skills and knowledge, policy recommendations, educational material
Relevance	The data generated by UFPA is useful to shape future policies and practices related to biodegradable plastics, helping to ensure that these materials meet environmental safety standards and do not contribute to marine pollution or disrupt ecological processes. Moreover, UFPA's involvement in testing methodologies and providing practical recommendations will facilitate the adoption of best practices across the research community, ensuring that the transition to biodegradable materials is both effective and responsible.
State-of-the-art	Polymer degradation in marine environments has been a subject of increasing scientific interest in recent years, as plastic pollution continues to be a major environmental challenge. Several key studies have provided important insights into the processes, rates, and pathways of plastic degradation *(i) Degradation Rates of Plastics in the Environment Moon et al. 2020 ii) Degradation of plastic carrier bags in the marine*

	environment Brine; Thompson, 2010. Marine Pollution Bulletin iii) Pathways for degradation of plastic polymers floating in the marine environment Gewert; Merle, 2015) There remains a critical gap in research on the degradation of polymers in specific marine ecosystems, such as the Amazonian coastal environment. While most of the existing literature focuses on degradation rates in temperate or subtropical regions, there is a lack of studies addressing how polymers degrade in the unique environmental conditions of the Amazonian coast.
Competitors	Specifically for the Amazon coastal region, there is no work being developed that competes with LABPLAS. However, the Brazilian National Institute for Amazonian Research (INPA) researches environmental pollution on a broader level. Microplastix project and the Tara/Atlantecos project are also involved in similar research.
Exploitation strategy	Use for further research, cooperation agreement.
Target users	Research communities, policymakers and aquaculture entities
Unique value proposition	UFPA offers a new approach to the study of polymer degradation by comparing the degradation rates of selected biopolymers between two distinct coastal regions: the Mediterranean and the Amazon. This is the first research experience to assess how polymers degrade in these ecologically unique and environmentally contrasting areas. The results will not only allow for more effective waste management strategies but also enhance the development of materials tailored to specific regional needs, ensuring sustainable polymer solutions for both coastal areas.
Foreground IP	Open access publications
Background IP	Know-how on the environmental levels and biological effects of hazardous chemicals in Latin American coastal areas.

10.13 EGI

KER Name	**DataHub and Data Management best practices**
Lead Partner	EGI
Work Package	WP1
Description	This KER includes the preservation of data outputs of the project via the EGI DataHub, to complement the other data storage solutions (e.g. Zenodo) and the existing data storage solutions from project partners. The KER also includes recommendations for best practices for Data Management, for example, an alignment of schemas and descriptive files alongside the data containing information such as how the data was obtained, provenance of the information, etc.
Type of result	Processes, skills and knowledge

Relevance	This KER plays a critical role in ensuring the long-term accessibility and usability of LABPLAS data. The DataHub serves as a central repository, making research outputs available for further analysis, validation, and policy development. The Data Management best practices provide a standardized framework that enhances data transparency, accuracy, and reproducibility within the scientific community.
State-of-the-art	While many projects employ open-access repositories, challenges remain in standardizing data formats, ensuring interoperability, and maintaining long-term usability. The DataHub aligns with Horizon 2020 Open Science requirements, ensuring that research data is stored and shared in compliance with European Commission guidelines. The EGI DataHub, built on Onedata technology, offers a scalable storage system that enhances data accessibility and cross-platform integration.
Competitors	Zenodo, Figshare, and Dryad: They offer open-access data storage but lack advanced federation capabilities. PANGAEA (Earth & Environmental Sciences), and GBIF (Biodiversity Data) are specialised in open access data for climate research.
Exploitation strategy	Use for further research and collaboration with research infrastructures.
Target users	Research community, policymakers
Unique value proposition	The Data Management best practices establish a new standard for metadata documentation, provenance tracking, and schema alignment, facilitating better data discovery, usability, and cross-disciplinary research. These contributions position EGI, within the project, as a leader in open environmental data science, bridging gaps between scientific research, policy development, and industry applications.
Foreground IP	Output intends to be open-access
Background IP	The existing IP compromises the EGI DataHub which is based on the OneData solution for data storage, which has been developed and maintained by EGI using funds which include EC grants (EGI-Inspire, EGI-Enhance). EGI DataHub is used under the MIT license. Other knowledge related to this KER consists of EGI's extensive experience in data management across diverse scientific disciplines.

10.14 BASF

KER Name	New biodegradation test methods adapted to plastics for assessing biodegradability and to provide samples for ecotoxicity evaluation of water-soluble decomposition intermediates from biodegradable plastics.
Lead Partner	BASF
Work Package	WP5
Description	Three laboratory methods were developed to investigate the biodegradability of plastic materials in freshwater environments. The basic principle is based on existing methods, which were standardized under ISOs. In all three developed test methods, a defined amount of an environmental freshwater and/or freshwater-sediment sample is placed in a glass bottle together with a defined amount of a plastic sample, e.g., a compostable plastic film stripe. The bottle is closed airtight. The biodegradation of the plastic sample is performed by microorganisms naturally present in the environmental sample. During biodegradation, the microorganisms consume oxygen and release carbon dioxide. The consumption of oxygen and the release of carbon dioxide by the microorganisms is measured over time. By comparing a blank sample, with a sample containing plastic material, the biodegradation percentage of the plastic sample is calculated.
Type of result	Services, reports, pre-standards, policy recommendations, educational material
Relevance	The freshwater biodegradation methods for plastics described herein contribute to closing a methodological gap of standard biodegradation methods. Current biodegradation methods, which are required to assess the biodegradability of plastics in aquatic environments and are accepted in the regulation of plastic materials (e.g., Commission Regulation (EU) 2023/2055 – Restriction of microplastics intentionally added to products) do not use freshwater samples as the basis for the test, but instead, for example, sludge from a wastewater treatment plant (e.g., ISO 14852). The biodegradation test methods developed within the LABPLAS Project increase the pool of possible methods for assessing freshwater biodegradability and they set the basis for the development of new standard methods using freshwater samples.
State-of-the-art	There are currently only two standard plastic biodegradation methods used to assess biodegradability in freshwater environments: ISO 14851 and ISO 14852. In these standards, sludge, soil or compost are used to produce the inoculum, but no freshwater is sampled from rivers or lakes. If sludge is used, the "test simulates the biodegradation processes that occur in a natural aqueous environment." To BASF's knowledge, there are currently no standardization activities for new freshwater plastic biodegradation methods that use freshwater from natural habitats.
Competitors	There are no major competitors that also work on the development of new freshwater biodegradation methods for plastics. Organizations involved in biodegradability testing, environmental research, and plastic sustainability initiatives may seek to adapt or refine similar methodologies in the future.

Exploitation strategy	Use for further research and standardization activities.
Target users	Enterprises offering services to assess polymer biodegradation. Research groups (universities, institutes, enterprises) to assess different plastic polymers and publish data. Enterprises selling or advertising biodegradable plastics
Unique value proposition	The new biodegradation test methods provide an ecologically relevant approach to assessing the environmental fate of biodegradable plastics. By moving beyond traditional sludge-based testing, these methods offer a more accurate representation of real-world biodegradation rates, ensuring that biodegradable plastics perform as intended in natural freshwater systems. These methods can be applied to internal screening processes for BASF material development, facilitating the design of next-generation biodegradable polymers that meet both environmental and regulatory requirements. This KER will set the basis for an international test to validate methods to enable standardization and advertise the standard method to bring it into new regulations on biodegradable plastics. It allows the development of new methods applicable to other test substances than plastics and the introduction of methods in internal screenings for BASF material development.
Foreground IP	Open Access - Standard methods should be used by as many stakeholders as possible
Background IP	The methods are based on standard methods ISO 18830, ISO 19679, ISO 23977-1 and ISO 23977-2. To the best of our knowledge, there is no existing IP.

10.15 TG Environmental Research

KER Name	**Role of MP as vector of chemicals for use in risk assessment**
Lead Partner	ER
Work Package	WP7
Description	Modification of an existing freely available food web model (ACCHUMAN) to include dietary exposure to nano- and microplastic particles at all trophic levels. Specifically, microplastic can be ingested by fish, cows and humans. Exposure to plastic-associated chemicals for organisms ingesting microplastic can be controlled in the model, whereby exposure to chemicals is entirely influenced by the ingestion of the microplastic only, with no influence of exposure from other environmental exposure pathways (e.g. diet), or both from the microplastic and the environment or only from the environment. By considering different exposure pathways it is possible to quantify the relevant differences between the different types of exposure to plastic-associated chemicals. The novelty of the model is that it can enable users to explore the sensitivity of different factors that can potentially influence exposure, insight from which can help inform both the risk assessment and risk mitigation efforts.

Type of result	Software, services, skills and knowledge, policy recommendations, collaboration platforms, educational material
Relevance	The model developed and applied can be used to evaluate the relative importance that nano- and microplastic particles represent as vectors of exposure to plastic-associated chemicals. The application of a model enables greater control of system parameters, which permits a sensitivity analysis to be performed and ultimately demonstrates which scenario and suite of parameters are needed for the hypothesis to be true. Thus, a key benefit of the research will be towards providing a stronger quantitative understanding of the relative importance that microplastics play as vectors of exposure to chemicals, which can help better assess the potential risk for both humans and the environment and which can be used to help direct the implementation of effective and efficient mitigation strategies, where necessary. The model developed and applied here includes both aquatic and terrestrial food webs, with humans as the key indicator for the exposure assessment.
State-of-the-art	There is an ongoing debate in the scientific literature regarding the relative importance of nano- and microplastic particles as vectors of exposure to plastic-associated chemicals. A key challenge in interpreting the validity of the hypothesis is that the majority of lab-based test systems fail to address fundamental experimental design aspects. Models, on the other hand, enable a robust method to control various factors thereby providing the capability to evaluate the relative importance of the role that microplastic may play as vectors of exposure. Currently, there have only been a limited number of studies that have developed and applied models aimed at assessing the process. There are currently no other models that have been developed to address the research need identified. Consequently, the model is based on a current state-of-the-art holistic food web model, which has been modified to include the ingestion of nano- and microplastic particles by organisms at all trophic levels.
Competitors	There are no other tools currently available that can enable this type of evaluation. The research here is complementary to the one made at Wageningen University.
Exploitation strategy	Use for further research and policy-making, spin-off activity.
Target users	Policymakers should represent an important group that could adopt the knowledge developed and communicated from this exercise. Additionally, the tool should provide a valuable tool to both industry and regulators aimed at ensuring the safe use of plastic additive chemicals in consumer products. Also, the general public by providing a better understanding of the potential risks of microplastics in the environment. The project helps to support the development of a model, which can ideally be used to support future collaborative activities between Wageningen and TG ER.

Unique value proposition	The primary added value of the KER is the communication of the results obtained from the model to the scientific community. Ideally, the model can also be used to help enable the holistic assessment of exposure to plastic additive chemicals throughout all life cycle stages of a product and can therefore potentially be used to help support technological innovation. Finally, an improved understanding of the relative role that nano- and microplastic play as vectors of exposure to plastic additive chemicals for both humans and the environment would hopefully help to address concerns that have been raised by the media and the general public regarding the safe use of chemicals in consumer products.
Foreground IP	Open access tool
Background IP	The model developed as part of this research is based on the publicly available model, ACCHUMAN, which was developed by a research group at Stockholm University under the leadership of Dr Michael McLachlan. The model has been applied in the scientific literature by several researchers over the last 10-15 years. Currently, the model can be obtained as an Excel Spreadsheet, but it is understood that an open-access version of the model is being coded in Python.

10.16 SRU

KER Name	**Source-to-Ocean model**
Lead Partner	RU
Other partners	KUL
Partner's contributions	Radboud University is the owner of the background IP: Original ePiE model and developer of the expanded model. The Catholic University of Leuven provides suggestions on how to model microplastic dispersion and makes part of the sounding board.
Work Package	WP7
Description	Within the context of other European Research Projects (i-PiE, PREMIER), Radboud University developed a spatially explicit model to predict concentrations of pharmaceuticals in European surface waters. This existing model will be adapted to simulate the dispersal of microplastics in European surface waters. It is a piece of software (coded in R) in combination with a set of input data (e.g. quantifying the location and strength of different sources of microplastics such as textile fibres, tyre wear and microbeads).
Type of result	Software, data
Relevance	The model can provide insight into where in Europe concentrations of microplastics in surface waters are (too) high (= hotspot identification). The model can identify the sources contributing to these hotspots which can be used by policy makers and other stakeholders to develop an appropriate mitigation strategy to tackle potential problems.

State-of-the-art	Environmental fate and exposure models assess chemical distribution by integrating data on partitioning, degradation, environmental conditions, and emissions. For 25 years, advancements have included modelling nanomaterials, refining spatial and temporal scales, improving chemical property estimation, and enhancing sensitivity and uncertainty analyses. However, challenges remain, such as estimating partition coefficients for polar and ionizable chemicals, improving bioavailability descriptions, and incorporating ecological realism in exposure predictions. ePiE is a state-of-the-art model to predict the fate of chemicals in the environment. The ePLAS model is a steady-state river network model that simulates the transport of microplastic particles within European river basins. The newest scientific data and insights on microplastics will be used to expand the model and make it suitable for modelling the fate of microplastics in European surface waters.
Competitors	Other research groups involved in modelling chemicals in the environment, e.g., Wageningen University Research (WUR), the Dutch National Institute for Public Health in the Environment (RIVM), Stockholm University, Stantec and EMPA.
Exploitation strategy	Use for further research and spin-off activity.
Target users	Research community, policymakers (environmental policy), stakeholders involved in microplastics (e.g. tire industry; textile industry; plastics industry; citizens; water managers; road maintenance; etc.).
Unique value proposition	Promotion of the science of microplastics to improve the quality of our environment. This value will be obtained by writing scientific publications and stimulating stakeholders to use the model.
Foreground IP	Open access
Background IP	The ePiE model but this is owned by us and also publicly available.

10.17 CTA

10.17.1 Commercial KER

KER Name	**Comparative LCA Methodology for Plastics**
Lead Partner	CTA
Other partners	BASF, UVIGO
Contribution of each partner	Partners provide the plastic samples that are used as data inputs.
Work Package	WP5
Description	Methodology to perform a comparative Life Cycle Assessment (LCA) between conventional fossil-based vs bio-based plastics (both non-degradable and biodegradable) based on the Plastics LCA methodology developed by the Joint

	Research Centre (JRC) but making adaptations to take into consideration the concerns raised by the European Bioeconomy Alliance and the European Bioplastics Association regarding the previously mentioned methodology. Also, the methodology is defined to allow the inclusion of the LABPLAS Project results in the development of the LCA, overcoming current methodological and data gaps.
Type of result	Services, skills and knowledge
Relevance	Current methodologies do not include characterization factors to estimate the toxicity impacts of discarded plastic in different environmental compartments. LABPLAS will develop impact categories related to toxicity and litter through degradation and toxicity results in different scenarios.
State-of-the-art	The Joint Research Center developed the Plastics LCA methodology and a comparative attributional LCA was performed highlighting the potential environmental impacts and hotspots of bio-based and bio-degradable plastics in comparison to current alternatives.
Competitors	MariLCA is a project focused on filling methodological gaps related solely to marine litter. Additionally, The Plastic Leak Project efforts to create a methodology to map, measure and forecast plastic leaks along the value chain.
Exploitation strategy	Developed and validated methodology offered as an LCA service specialised in plastics to companies. To reach this market, marketing actions would have to be developed, and the methodology would have to be adapted to the product or needs of the client.
Target users	Plastics manufacturers, laboratories working on biodegradable plastics, and other ACV experts.
Unique value proposition	Enhancing Life Cycle Assessment for plastics by incorporating toxicity impact factors and microplastic assessments for a more complete environmental evaluation. Improved methodologies and the development of specific techniques offer a reliable way to compare fossil-based, bio-based, and biodegradable materials, helping the scientific community and policymakers make informed, sustainable decisions.
Foreground IP	Open access
Background IP	CTA has no IP-protected background. CTA has brought previous knowledge and expertise in LCA methodologies and comparative plastics analysis.

The financial planning for the service provided by CTA is structured into **CAPEX (Capital Expenditures) and OPEX (Operational Expenditures)**. **CAPEX** includes one-time investments such as IT infrastructure, proprietary tools, and specialized training that support long-term service delivery. **OPEX** covers recurring costs like salaries, software subscriptions, travel, and office expenses, ensuring smooth day-to-day operations.

Table 7. CAPEX/OPEX of CTA's KER

CAPEX			OPEX		
Laptop (25%)	200	€/year	**Personnel**	1720	hours/year
% Use Laptop	100%	% use	**Personnel**	143.33	hours/month
Total Laptop	**16.67**	€/month	**Personnel**	4200	€/month
Software 1 (SimaPro)	1200	€/year	**nº Employees**	1	persons
% Use Software 1	25%	% use	**Total hours/month**	143.33	hours/month
Total Software 1	**25**	€/month	**Total Personnel**	**4200**	€/month
Software 2 (Apsen)	0	€/year	**Other: electricity & bills**	**100**	€/month
% Use Software 2	25%	% use	**Other: Office Rent**	**200**	€/month
Total Software 2	**0**	€/month	**Other: Insurance**	**100**	€/month
EQUIPMENT	**0**	€/month	**Other**		
TOTAL	**41.67**	**€/month**	**TOTAL**	**4600**	**€/month**

LCA SERVICE

Within the LABPLAS project, CTA has developed a methodology to perform a comparative Life Cycle Assessment (LCA) between conventional fossil-based vs bio-based plastics (both non-degradable and biodegradable). The methodology has been successfully applied to two different case studies: (i) mulch films and (ii) garbage bags. In both cases, a comparative LCA was conducted to assess the environmental impacts of fossil-based and non-biodegradable vs biodegradable plastics. For the garbage bag case study, paper was also included as an alternative material.

One of the main advantages of this methodology is that current LCA approaches do not include characterization factors to estimate the toxicity impacts of littered plastics in different environmental compartments (i.e., air, water and soil). To address this limitation, CTA has adapted impact categories related to toxicity, incorporating degradation and toxicity results in different environmental scenarios.

The LCA procedure follows a systematic process in accordance with international standards like ISO 14040 and ISO 14044, which define the four steps to be followed when performing an LCA study:

(i) goal and scope definition
(ii) inventory analysis
(iii) impact assessment
(iv) interpretation.

In this regard, the provision of service will follow these steps:

- An initial meeting with the client is proposed, in which the client will describe the product or process to be analysed, and CTA will focus on explaining the LCA approach.
- The goal and scope of the study are defined, establishing the specific objectives of the assessment, the functional unit that will serve as a basis for comparison, the system boundaries that determine which life cycle stages will be included in the analysis and the impact categories to be evaluated.
- CTA prepares a data template to collect all necessary information for the inventory analysis. The template includes key information to be provided such as raw material inputs, energy consumption, water requirements, use of auxiliary products, generation of by-products and their corresponding quantities, disposal processes, and any other relevant data.
- Clients will fill this template with the support of CTA, who will assist with any questions that arise.
- The data is processed using the Simapro software tool, allowing for the calculation of environmental impacts across various categories, including climate change, ozone depletion, human toxicity and water use, among others. Since in the impact assessment step there is currently no specific impact category for assessing the effects of microplastics, if applicable, their impacts will be included as additional information using the most advanced methodologies available (e.g., MarILCA).
- A comprehensive report will be prepared, detailing the results, identifying key environmental hotspots and proposing mitigation strategies.
- Likewise, a final meeting with the clients will be held to present and discuss the findings.

11 TECHNOLOGY WATCH

11.1 Description

The objective of this section is to provide an overview of the bio-based materials and the technological developments shaping them, helping guide the project's decisions and ensure alignment with market needs and innovation trends.

A continuous review of recent patents, publications, and advancements in bio-based solutions was conducted to maintain an up-to-date understanding of the state of the art.

At this stage, the results obtained are not yet technologically ready to develop a comprehensive business plan that includes detailed market analysis and specific commercialization tools. While the findings provide valuable insights, further research and validation are needed to reach a level of maturity that allows for concrete market-oriented strategies. Future work should focus on refining the results and assessing their potential applicability in relevant market sectors.

11.2 Current trends

The field of bio-based materials and microplastic detection is advancing rapidly, driven by growing environmental concerns and evolving regulatory frameworks. Detection technologies are becoming more sophisticated, with innovations such as Raman spectroscopy, mass spectrometry, and AI-driven image analysis enhancing accuracy and efficiency. Portable lab-on-a-chip solutions are also gaining traction, enabling real-time, on-site detection of micro- and nanoplastics. At the same time, regulatory and standardization efforts are intensifying, particularly in the EU, where stricter policies on plastic usage and extended producer responsibility (EPR) are being implemented. Establishing standardized toxicity testing methods remains a priority to ensure consistency in environmental risk assessments. In parallel, sustainable material innovations are focusing on the development of biodegradable and bio-based plastics, balancing durability with controlled degradation to minimize long-term pollution. These trends highlight the increasing convergence of technology, policy, and environmental science in tackling plastic pollution.

11.3 Patents related to LABPLAS

A patent search in several databases, including the European Patent Office (Esp@cenet) and World Intellectual Property Organisation (WIPO), was performed, which did not show any competing results for LABPLAS implementation and exploitation of results, therefore allowing "freedom to operate".

- CN114627318A Micro-plastic or nano-plastic identification method, terminal equipment and storage medium
- CN113189253A Method for detecting nano-scale plastic particles in the soil environment
- CN117471006A Method for detecting micro/nano plastic in the atmospheric environment
- CN118583840A Method for Raman detection of micro/nano plastic by coffee ring deposition and application
- IT202100006089A1 SISTEMA E METODO PER LA RIMOZIONE DI MICROPLASTICHE DA ACQUE MARINE
- CN119086205A Dimensional and hierarchical progressive extraction and identification method for microplastics in bivalve in deep-sea methane leakage area
- CN110907429A Surface-enhanced Raman spectrum detection method for micro/nano plastic

11.4 Publications related to the LABPLAS project

- A López-Rosales; B Ferreiro; J Andrade; M Fernández-Amado; M González-Pleiter; P López-Mahía; R Rosal; S Muniategui-Lorenzo. A reliable method to determine airborne microplastics using quantum cascade laser infrared spectrometry. Science of The Total Environment 913 (2024) 169678.10.1016/j.scitotenv.2023.169678.
- A López-Rosales; J Andrade; V Fernández-González; P López-Mahía; S Muniategui-Lorezo. A reliable method for the isolation and characterization of microplastics in fish gastrointestinal tracts using an infrared tunable quantum cascade laser system. Marine Pollution Bulletin 178 (2022) 113591. https://doi.org/10.1016/j.marpolbul.2022.113591.
- A López-Rosales; JM Andrade; P López-Mahía; S Muniategui-Lorezo. Development of an analytical procedure to analyze microplastics in edible macroalgae using an enzymatic-oxidative digestion. Marine Pollution Bulletin, 183 (2022) 114061 https://doi.org/10.1016/j.marpolbul.2022.114061.
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- C Román-Zas; B Ferreiro; J Terán-Baamonde; ME Del Castillo Busto; JM Andrade; S Muniategui. Measurement of tyre-based microplastics using traditional and quantum cascade laser-based infrared spectrometry. Spectrochim Acta Part A: Molecular and Biomolecular Spectroscopy 2025, 327, 125321.
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12 MARKET STRATEGY

12.1 High potential KERs

The project LABPLAS successfully managed to identify KERs that will encourage future improvements and application of its results. However, the current TRL of the results remains low, thus focusing on scientific exploitation, by providing strong scientific outputs on a lab-scale basis.

Some KERs include a more elaborated go-to-market application and can anticipate a marketing pathway:

- Lap-on-chip System for SMNP Detection 10.4.2
- Advanced Analytical Platform for MP Detection 10.2.1
- Infrared Imaging-Based Microplastic Analysis Software 10.2.2
- Plastic Toxicity Test Battery 10.1
- New Ecotoxicology tests based on freshwater microalgae and zebrafish embryos adapted to SMNP 10.4.3

Multiple strategies exist to successfully turn **LABPLAS** results from research to market. Securing additional funding through Horizon Europe programs, stakeholders' collaborations and regulatory partnerships will support TRL advancements and industrial validation. Strengthening partnerships with laboratory equipment manufacturers (e.g., Thermo Fisher, Agilent) and regulatory agencies (e.g., ECHA, ISO) will facilitate technology integration. Accelerating standardization efforts will help establish project methodologies as industry standards. Combining scientific dissemination through open-access publications with commercial pathways such as patenting, licensing, and technology transfer will maximize impact and ensure the long-term sustainability of **LABPLAS** innovations.

12.2 Business Model Canvas

The Business Model Canvas (BMC) is a strategic tool that helps define and visualize the key components of a market strategy.

The KERs introduced in this deliverable require a structured strategy to navigate market entry barriers such as low TRLs, regulatory acceptance, and funding needs. The BMC helps identify key stakeholders, revenue models, and value propositions that align with industry needs.

Table 8. Business Model Canvas

<table>
<tr>
<td rowspan="2">Key Partnerships

Regulatory agencies (ECHA, OECD, ISO, EU Parliament).

Academic and research networks (EuroqCHARM, VAMAS, NORMAN Network).

Environmental monitoring service providers</td>
<td>Key Activities

Prototype optimization and field validation for lab-on-a-chip.

Standardization efforts for toxicity tests and analytical methods.

Fundraising for TRL advancement (Horizon Europe, private investment).

Establishing industry partnerships for technology transfer.

Public awareness and policy engagement.</td>
<td>Value Proposition

Advanced analytical and monitoring solutions for SMNP.

Standardized toxicity testing for regulatory compliance.

High-precision sampling and extraction methodologies for environmental monitoring.

Support for standardization and policy development in plastic pollution assessment.</td>
<td>Customer Relationships

Open-access publications

Online course

Social platforms

Website</td>
<td>Customer Segments

Environmental regulatory agencies (ECHA, EPA, ISO)

Water quality and monitoring authorities (municipal water suppliers, EU agencies).

Research institutions and universities</td>
</tr>
<tr>
<td colspan="2">Key Resources

Intellectual Property (patents, know-how, trade secrets).

Research expertise in micro- and nanoplastic detection and ecotoxicology.

Existing partnerships with regulatory and research institutions.

Lab facilities.</td>
<td colspan="2">Channels

Direct partnerships with environmental agencies and policymakers.

Scientific publications and open-access dissemination

Licensing agreements with analytical instrument companies.

Horizon Europe follow-up projects for validation and funding.</td>
</tr>
<tr>
<td colspan="3">Cost Structure

R&D for advancing TRL of key technologies.

Regulatory and certification expenses.

Intellectual Property protection and legal fees.

Marketing and dissemination activities.

Personnel and operational costs.</td>
<td colspan="2">Revenue Streams

Licensing of lab-on-a-chip and analytical platforms to commercial labs and equipment manufacturers.

Service-based revenue from standardized environmental risk assessments.

Government and EU-funded research grants.</td>
</tr>
</table>

13 Open Source in Exploitation

Open-source approaches play a crucial role in enhancing the impact and exploitation of research results. By making project outcomes openly accessible, **LABPLAS** ensures that its scientific advancements, data, and methodologies can be widely used by policymakers, researchers, industry stakeholders, and the general public. This strategy fosters innovation, accelerates the development of solutions, and enhances the long-term sustainability of project findings.

As it has been demonstrated in this deliverable, the Key Exploitable Results of this project have evolved into non-commercial results, in alignment with the project's goals to contribute to policymaking and to make scientific data accessible.

Open access to data, analytical tools, and methodologies allows researchers to build upon existing work, reducing duplication of efforts and enabling continuous improvement. Additionally, open-source frameworks encourage transparency and reproducibility, which are fundamental to scientific credibility and regulatory decision-making. By ensuring that results are publicly available, the project contributes to evidence-based policymaking, particularly in the context of European environmental regulations, including the EU Plastics Strategy and Directive (EU 2019/904).

Moreover, open access enhances the exploitation potential of the project by allowing industry and technology developers to integrate **LABPLAS** findings into innovations. Companies developing biodegradable materials, environmental monitoring tools, and plastic waste management solutions can leverage the project's datasets and models to refine their products and services.

LABPLAS is committed to ensuring that all its results, including datasets, models, methodologies, and key findings, are openly accessible. The existing standards within the project help to guarantee that the results will respect existing practices, enhance interoperability and reach market application. Promoting the research results in publications to be included in future standards (methods, protocols, guidelines, etc.) can facilitate the dissemination of the innovations. Standardization activities in **LABPLAS** are considered therefore as a valuable tool for supporting the exploitation of the project outcomes, by facilitating future replicability and wider use.

14 Conclusion

The **LABPLAS** project has developed a comprehensive exploitation strategy that ensures the accessibility and impact of its findings beyond the project's completion. By identifying Key Exploitable Results (KERs) and integrating both commercial and non-commercial exploitation pathways, the project strengthens its contribution to scientific advancements, policymaking, and industry applications.

A critical aspect of **LABPLAS'** approach is its emphasis on open-access data, fostering transparency and collaboration within the scientific community while enabling policymakers to make evidence-based decisions. Furthermore, the project's focus on intellectual property management and risk assessment ensures that potential challenges in levelling the technological readiness aspect, commercialization, market adoption, and regulatory compliance are proactively addressed.

The **LABPLAS** project has strong scientific outputs, but many results are still at low TRLs (4-6), delaying their path to market. A focused TRL advancement strategy is needed to bridge the gap from research to commercial application. The outlined steps should guide the transition from lab-scale findings to real-world impact.

The deliverable D9.4 Final Exploitation Plan also highlights the potential for continued research and policy development. Through strategic dissemination and collaboration with relevant stakeholders, **LABPLAS** maximizes its long-term impact in tackling plastic pollution and advancing sustainable environmental solutions.

15 ANNEX

Exploitation Questionnaire M30

SECTION 1: KEY EXPLOITABLE RESULTS (KER)

Please fill in the following information

KER Name	
Lead Partner	
Participating Partners	
TRL	Initial: Current: Expected at the end:
Work Package	

TRL 1 – basic principles observed
TRL 2 – technology concept formulated
TRL 3 – experimental proof of concept
TRL 4 – technology validated in lab
TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 7 – system prototype demonstration in operational environment
TRL 8 – system complete and qualified
TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

(Commission, 2023)

KER description (Please include principal characteristics/functions/how it works, etc)

Describe in a few lines your result and/or solution (i.e., product, service, process, standard, course, policy recommendation, publication, etc.). Use simple wording, avoid acronyms, make sure you explain how your UVP (unique value proposition) is delivered.

If this technology is developed by more than one partner, please indicate the contribution of each partner and how the ownership will be distributed among the partners.

If this result/research activity is developed by more than one partner, please indicate the contribution of each partner and how the ownership will be distributed among the partners. Please make a brief description of each partner's contribution; the ownership distribution; value added by each partner; if applicable, mention how partners will coordinate their efforts and how communication and decision-making related to the shared result will take place.

Partner	Contribution

The new technology/product could be used in the form of (Choose all the options that apply to your result):

☐Software	☐Products	☐Research Roadmaps	☐Policy recommendations
☐Processes	☐Services	☐Pre-standards	☐(Collaboration) platforms
☐Data	☐Reports	☐Codes of conduct	☐Educational material
☐Prototypes	☐Skills and knowledge		

What makes this new technology/product (KER) attractive to the potential markets/users? Key benefits or problems solved by this new technology/product? What is its added value compared to existing technologies?

Please mention the key benefits or advantages that this technology offers and why is better to the existing ones; describe the challenges or problems that this technology aims to solve focusing in a simple way on how the result could benefit or add value to the market/society/community/stakeholders.

What is the current state-of-the-art in the domain of this new technology/product (KER)?

Provide information about most recent developments in the field of the technology or product, key technological advancements, relevant research or innovations that have recently emerged, emerging trends and areas of focus in the industry or community related to your KER, any references to leading products, solutions, or companies in this domain. Also explain how the technology fits within or contributes to the current state-of-the-art.

What technology/product or company/research centers do you think will be the major competitors for this KER?

Mention any existing technologies/products/research outcomes that are similar or related to the result; Name some companies or organizations that are currently active in the same field

How do you plan on exploiting the project results after the end of the project? (You can choose one or more options)

☐Use for further research

☐Develop and sell the new product/service

☐Spin off activity

☐Cooperation agreement/Joint venture

☐Sell IP rights or IP-based business

☐License IP rights

☐Transfer ownership of IP rights to another partner from the consortium

☐Standardization activities (new standards or support ongoing procedures)

☐Other methods. Please indicate:

Will this new result/research activity (KER) be marketable? Yes☐ No ☐ - If so, what is the time to market after the end of the project (in years)?

Provide an estimate of the time it will take to bring this result to the market after the project's completion. When estimating the time to market, consider factors such as product development, testing, regulatory approvals (if applicable), market research, and any other relevant steps in the commercialization process.

What are the different applications for this technology (KER)?

Potential applications for the new result. Think broadly about how this technology or research finding could be applied in different contexts. Examples of how the result could be used in practical applications (These examples should illustrate the versatility and adaptability of the technology).

Who will be the target customers or users of the new technology?

Enumerate the specific user groups or stakeholders who are expected to benefit from, interact with or by affected by the new result; Identify early adopters

What is the value that you would like to get from this KER? (e.g., for scientific, societal, or economic purposes, etc.) And how do you plan to get the value?

Define the types of value you seek to derive from the result; Describe specific objectives related to the value. Outline strategies or approaches you plan to use to get it

What is the advantage and disadvantage of this new result/research activity (KER) comparing to existing ones?

Advantages: Identify the unique features or value of the new result that set it apart from existing ones and describe how it performs better than existing solutions; If applicable, explain how the new technology is more cost-efficient. *Disadvantages: limitations or drawbacks of the new result. Explain if there are barriers to initial adoption or implementation that potential users may face.*

SECTION 3: IPR STRATEGY AND PROTECTION

Foreground IP (Intellectual protection of the KER)

How do you plan to protect this techonolgoy, service, product, asset?

☐Trade secret

☐Copy right

☐Trade mark

☐Patent

☐Utility model

☐Industrial design

☐Other methods. Please indicate:

☐No protection is foreseen. Please explain why:

Background IP (existing IP, previous to project start):

Does this KER rely on any existing IP/background IP? What is it? Who owns it? Is the background IP protected? If so, how?

Thank you very much for your contribution!

contactica innovation