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InPlasTwin

Increasing expertise in micro- and nanoplastics analysis through twinning action

D9.3 Progress pathways for exploitation and IP

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Abstract:	This deliverable presents the initial framework for exploitation pathways and intellectual property management in the InPlasTwin project. It explains how the project's main knowledge-based results will be identified, monitored, protected and exploited throughout and beyond the project duration. The document links Key Exploitable Results to stakeholder needs and outlines the project's approach to IP management, sustainability and exploitation risk assessment. As the first dedicated deliverable on these topics, it provides a structured basis for the further development and refinement of exploitation activities during the project.

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List of Abbreviations and Acronyms	
D	Deliverable
IP	Intellectual Property
IPR	Intellectual Property Rights
KER	Key Exploitable Result
MNP	Micro- and Nanoplastics
REA	European Research Executive Agency
WP	Work Package

Executive Summary

This deliverable presents the progress pathways for exploitation and intellectual property management within the InPlasTwin project. The document defines how project outcomes will be identified, utilised, protected and sustained beyond the project duration. The main objective of the deliverable is to ensure that the knowledge and expertise generated during the project continue to produce value for scientific, societal and policy stakeholders after the completion of the project activities.

The InPlasTwin project aims to strengthen research and innovation capacity in the field of micro- and nanoplastics analysis through collaboration between institutions located in widening countries and leading European research organisations. The project promotes knowledge transfer, scientific collaboration and training activities designed to improve analytical capabilities and research excellence in environmental and food safety research related to micro- and nanoplastics.

Due to the nature of the project as a Horizon Europe Twinning Coordination and Support Action, the primary exploitable outcomes of the project are knowledge-based results rather than commercial technologies. These results include advanced analytical methodologies, training programmes, collaborative research networks, scientific publications, datasets and best practice guidelines related to micro- and nanoplastics analysis.

The deliverable identifies the Key Exploitable Results generated within the project and describes their potential exploitation pathways. It also outlines the stakeholder groups that may benefit from these results and provides a framework for managing intellectual property rights associated with project outputs. In addition, the document presents a sustainability plan designed to ensure that the benefits of the project continue beyond its lifetime.

Overall, the exploitation strategy defined in this deliverable provides a structured approach for maximising the scientific, societal and policy impact of the InPlasTwin project.

1. Introduction

1.1. Overview

The InPlasTwin project seeks to enhance research and innovation capacity in the field of micro- and nanoplastics analysis through a strategic twinning collaboration between institutions from widening countries and internationally recognised research organisations in Europe. The project addresses the growing environmental and food safety challenges associated with micro- and nanoplastics contamination by improving analytical capabilities, fostering scientific cooperation and enabling knowledge exchange between leading research centres and emerging research institutions.

Micro- and nanoplastics represent an emerging environmental issue with potentially significant consequences for ecosystems, agriculture and human health. Their presence in soil, water systems and food products raises concerns about long-term environmental sustainability and food safety. Accurate detection, identification and characterisation of micro- and nanoplastics therefore require advanced analytical techniques and specialised research expertise.

The InPlasTwin project responds to these challenges by strengthening the research capacity of participating institutions through knowledge transfer, training activities, scientific exchanges and collaborative research initiatives. The project aims to improve analytical methodologies for the detection and characterisation of micro- and nanoplastics in environmental and food samples while simultaneously establishing long-term research partnerships among consortium members.

The consortium includes six institutions that contribute complementary expertise in analytical chemistry, environmental monitoring, agricultural research, stakeholder engagement and valorisation of research and innovation. The **Jožef Stefan Institute** in Slovenia acts as the project coordinator and provides extensive expertise in analytical chemistry and nanoparticle analysis. The **Agricultural University of Athens** in Greece contributes expertise in agricultural systems and the environmental impacts of plastic use in agriculture. **Foodscale Hub** in Serbia contributes expertise in innovation ecosystems, stakeholder engagement and communication activities.

The consortium also includes three internationally recognised research organisations that provide advanced expertise and infrastructure for micro- and nanoplastics analysis. These organisations include **VITO** in Belgium, the **Institute of Marine Research** in Norway, and the **Technical University of Denmark**. Through this collaboration, the project facilitates access to advanced analytical equipment, specialised training opportunities and scientific expertise that support the development of research capacity in widening countries.

By promoting scientific collaboration and knowledge transfer, the InPlasTwin project contributes to strengthening research excellence in Europe while addressing important environmental and food safety challenges related to micro- and nanoplastics.

1.2. Document scope

The purpose of this deliverable is to define the exploitation pathways and intellectual property management framework for the results generated during the InPlasTwin project. The document describes how project outputs will be identified, analysed and utilised in order to maximise their long-term impact.

The deliverable also establishes procedures for identifying Key Exploitable Results and analysing their potential applications. In addition, it provides a structured overview of stakeholder groups that may benefit from project outcomes and defines mechanisms for ensuring the sustainability of project results after the completion of the project.

Furthermore, the document outlines the intellectual property management strategy adopted by the consortium. This strategy ensures that project outputs are appropriately protected while supporting open science principles and facilitating knowledge dissemination.

1.3. Document structure

This deliverable is organised into several chapters that collectively present the exploitation and intellectual property management framework for the InPlasTwin project. The structure of the document has been designed to guide the reader through the main elements of the exploitation strategy, from the overall project context to the identification of exploitable results and the mechanisms that will ensure their long-term impact.

Following the introductory chapter, **Chapter 2** presents the overall exploitation methodology adopted by the project. This section describes the systematic approach used by the consortium to identify project results with exploitation potential, evaluate their relevance for different stakeholder groups and define appropriate pathways for their utilisation. The methodology also explains how exploitation planning is integrated into the project's implementation and how it will be continuously updated as the project progresses.

Chapter 3 introduces the Exploitation and Intellectual Property Catalogue, which serves as the main tool for identifying and managing project results with potential for exploitation. This chapter explains the purpose of the catalogue and describes how it is used to collect and organise information about project outputs, including their ownership, potential applications and intellectual property considerations.

Chapter 4 presents the stakeholder needs analysis conducted within the project. This section identifies the main stakeholder groups that may benefit from the project results and analyses their specific needs and expectations. Understanding stakeholder perspectives is essential for ensuring that the project outputs are relevant and accessible to potential users.

Chapter 5 outlines the initial exploitation pathways for the project results. This chapter describes the mechanisms through which the identified results may be disseminated, adopted or further developed by researchers, institutions, policymakers and other relevant stakeholders.

Chapter 6 focuses on the Key Exploitable Results generated by the project. Each result is described in terms of its scientific value, potential applications and expected impact. This section also highlights the contribution of consortium partners to the development of these results.

Chapter 7 addresses intellectual property management within the project. It outlines the principles governing the ownership, protection and sharing of project results in accordance with Horizon Europe regulations and the consortium agreement.

Chapter 8 presents the sustainability plan for the project results. This section describes how the consortium intends to maintain and further develop the project outcomes after the completion of the project activities.

Chapter 9 provides an overview of potential risks associated with exploitation activities and describes mitigation measures that may be implemented to address these risks.

Finally, **Chapter 10** summarises the main conclusions of the deliverable and outlines the next steps for the further development of exploitation activities within the project.

2. Exploitation Methodology

The general approach to exploitation within the InPlasTwin project was introduced in the deliverable D9.1 *'Dissemination, Exploitation and Communication plan I'*. In that deliverable, the consortium established the overall framework and guiding principles that define how project results will be identified, assessed and utilised in order to maximise their long-term impact. The methodology presented in the earlier deliverable provided a strategic overview of the exploitation process, outlining the main objectives of exploitation planning and the mechanisms through which project outcomes can generate scientific, societal and policy-related benefits.

Building on this foundation, the present deliverable focuses on the practical implementation of the exploitation methodology. While the initial deliverable described the conceptual framework and strategic objectives, this document presents the concrete steps that have been taken by the consortium to operationalise the exploitation strategy. These steps include the identification of project results with exploitation potential, the development of an exploitation and intellectual property catalogue, the analysis of stakeholder needs and the definition of initial exploitation pathways for the results generated within the project.

The exploitation methodology adopted by the InPlasTwin consortium is designed to ensure that exploitation activities are integrated into the overall project implementation rather than being treated as a separate activity carried out only at the end of the project. By embedding exploitation planning throughout the project lifecycle, the consortium aims to ensure that emerging results are continuously evaluated in terms of their potential applications and their relevance for different stakeholder groups.

The methodology, therefore, combines a structured analytical approach with continuous stakeholder engagement. Project partners contribute to the identification and evaluation of results generated through research activities, training programmes and collaborative exchanges. These results are systematically documented in the exploitation catalogue, which serves as a central tool for tracking their development and analysing their potential for future use.

In addition to identifying exploitable results, the methodology also emphasises the importance of aligning project outcomes with the needs of relevant stakeholders. Through stakeholder mapping and needs analysis, the consortium seeks to ensure that the project results respond to real-world challenges related to micro- and nanoplastics pollution and environmental monitoring.

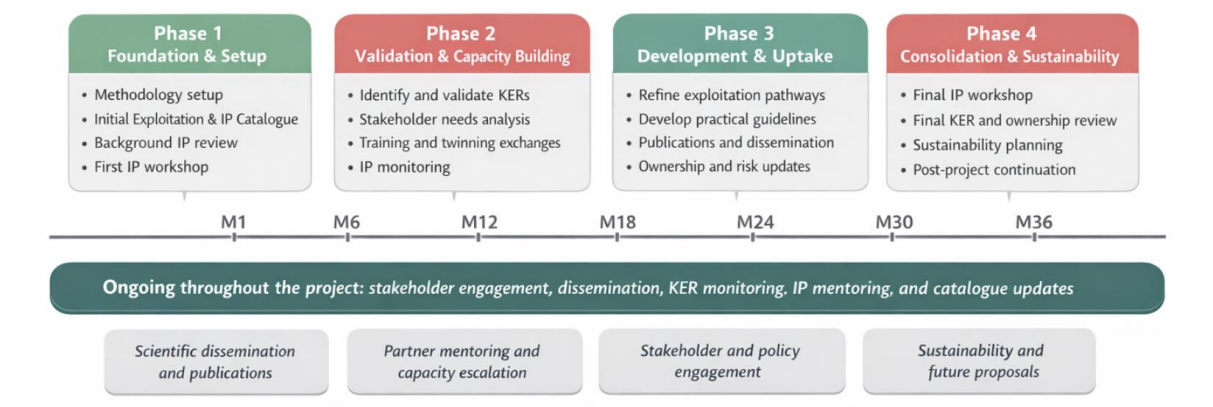

Figure 1: InPlasTwin exploitation roadmap

Overall, the exploitation methodology provides a structured framework for translating the knowledge and expertise generated during the project into tangible long-term benefits for the scientific community, policymakers and other relevant stakeholders. The following sections of this deliverable describe the specific activities and tools that have been implemented in order to realise this methodology in practice.

3. Exploitation and IP Catalogue

The exploitation and intellectual property catalogue serves as a central tool for managing the results generated within the project. The catalogue provides a comprehensive overview of project outputs with exploitation potential and records information related to ownership, potential applications, intellectual property protection measures and target stakeholders.

The catalogue includes both tangible and intangible project results. Tangible outputs include datasets, analytical protocols and training materials, while intangible outputs include scientific knowledge, methodological advancements and collaborative networks developed through the project.

Each result included in the catalogue is described in terms of its potential applications and its expected impact on research, policy development or environmental monitoring activities. The catalogue also records which project partners contributed to the development of each result and identifies the partners responsible for its exploitation.

Table 1: Exploitation and IP Catalogue (M18)

Result	Description	Owner	Type	Exploitation	IP
MNP analytical methods	Detection method	Consortium	Method	Publications	Know-how
Microplastic extraction protocol from food	Lab protocol	DTU and IMR	Method	Research	Know-how
Training workshop series	Training materials	JSI	Training	Courses	Copyright
Microplastic extraction protocol from soil	Lab protocol	VITO	Method	Research	Know-how

Analytical equipment training	Lab training	VITO	Training	Workshops	Copyright
Open dataset on MNP samples	Dataset	Consortium	Data	Open science	Data license
Research collaboration network	Institutional network	Consortium	Network	Projects	Soft IP
PhD training module	Academic course	JSI, AUA	Education	Teaching	Copyright
Agricultural plastic degradation study	Research method	DTU	Method	Publications	Know-how
Analytical technique comparison	Research results	Consortium	Knowledge	Publications	Copyright
Environmental monitoring guidance	Guideline	IMR	Policy	Policy support	Copyright
Stakeholder engagement framework	Communication model	FSH	Model	Outreach	Copyright
Analytical research network platform	Collaboration system	Consortium	Network	Projects	Soft IP
Best practices for MNP analysis	Guidelines	Consortium	Knowledge	Standards	Copyright
Research training materials	Educational resources	JSI	Training	Courses	Copyright
Environmental impact analysis methodology	Method	IMR	Research	Publications	Know-how
MNP analysis curriculum	Teaching program	AUA, JSI	Education	Courses	Copyright

By maintaining a structured catalogue of project results, the consortium can systematically analyse exploitation opportunities and ensure that appropriate intellectual property protection measures are implemented where necessary.

4. Stakeholder Needs Analysis

The identification and analysis of stakeholder needs represent an important component of the exploitation strategy within the InPlasTwin project. Understanding the expectations and priorities of different stakeholder groups allows the consortium to ensure that the results generated through the project are relevant, accessible and capable of addressing real-world challenges related to micro- and nanoplastics pollution. The stakeholder needs analysis therefore aims to identify the key actors who may benefit from the project results and to evaluate how these stakeholders may use or contribute to the exploitation of the knowledge and tools developed during the project.

Based on the analysis conducted during the preparation of the project proposal, five primary stakeholder groups have been identified. These groups include:

- farmers, processors and food manufacturers;
- the scientific community, research institutions and academia;
- industry and technology experts;

- the general public;
- policymakers operating at different governance levels.

Each of these groups interacts with the issue of micro- and nanoplastics from a different perspective and therefore has distinct needs and expectations regarding the outcomes of the project.

Farmers, processors and food manufacturers represent an important stakeholder group because agricultural production systems and food processing chains may be directly affected by plastic pollution. Agricultural practices frequently involve the use of plastic materials such as mulching films, irrigation components and packaging materials, which may contribute to the generation of micro- and nanoplastics in soil environments. Stakeholders operating within agricultural and food production systems, therefore, require reliable scientific knowledge regarding the degradation of plastics and the potential transfer of microplastics into crops and food products. The InPlasTwin project can support these stakeholders by providing improved analytical methods for detecting plastic particles in environmental and agricultural samples, as well as by contributing to a better understanding of the environmental and food safety implications of plastic use in agriculture.

The scientific community, research institutions and academia represent another central stakeholder group for the project. Researchers working in fields such as environmental chemistry, analytical chemistry, food safety and environmental science require advanced analytical tools and validated methodologies for detecting and characterising micro- and nanoplastics in complex environmental and biological matrices. The InPlasTwin project contributes to addressing these needs by facilitating knowledge exchange among leading research organisations and institutions in widening countries, thereby strengthening research capabilities and promoting the development of new analytical approaches. Training activities, research exchanges and collaborative scientific work conducted during the project are expected to support the development of new expertise and enhance the capacity of participating institutions to conduct high-quality research in the field of micro- and nanoplastics analysis.

Industry and technology experts also represent an important stakeholder group, particularly those involved in the development of analytical instruments, environmental monitoring technologies and materials science. These stakeholders may benefit from improved scientific understanding of micro- and nanoplastics as well as from the development of new analytical approaches that could be integrated into technological solutions for environmental monitoring. Collaboration between researchers and technology developers may support the advancement of innovative analytical tools and contribute to the broader application of microplastics detection technologies in environmental assessment and industrial monitoring contexts.

The general public represents another relevant stakeholder group, particularly in relation to environmental awareness and sustainability issues. Plastic pollution has become a widely recognised environmental concern and public interest in understanding its impacts on ecosystems and food systems continues to grow. The InPlasTwin project contributes to increasing public awareness by generating reliable scientific knowledge on the occurrence and behaviour of micro- and nanoplastics in environmental and agricultural systems. Dissemination activities targeting the general public may therefore play an important role in communicating scientific findings and supporting informed public discussion on sustainable plastic use and environmental protection.

Finally, policymakers operating at local, national and European levels represent a key stakeholder group for the exploitation of project results. Environmental regulation and policy development require

reliable scientific evidence regarding the sources, behaviour and impacts of micro- and nanoplastics. Policymakers may therefore benefit from the analytical methods, datasets and scientific insights generated through the project. The knowledge produced within the InPlasTwin project may contribute to informing policy discussions related to plastic pollution, environmental monitoring strategies and food safety regulations.

By addressing the needs of these different stakeholder groups, the InPlasTwin project seeks to ensure that the knowledge generated through research and collaboration activities contributes not only to scientific advancement but also to practical applications in environmental protection, agricultural sustainability and policy development. The stakeholder needs analysis, therefore, provides an important foundation for defining exploitation pathways and identifying opportunities for the long-term use of project results.

4.1. Stakeholder Needs Mapping

Once the relevant stakeholder groups have been identified, the next step in the analysis involves mapping their specific needs and expectations in relation to the outcomes of the InPlasTwin project. This process allows the consortium to ensure that project results are aligned with the interests and priorities of the actors who are most likely to benefit from their application.

Farmers, processors and food manufacturers primarily require reliable scientific information about the presence and behaviour of micro- and nanoplastics in agricultural environments and food production systems. In particular, these stakeholders may benefit from improved knowledge regarding the degradation of agricultural plastics, the potential accumulation of plastic particles in soil, and the possible transfer of microplastics into crops and food products. The analytical techniques and scientific knowledge generated through the project can therefore support better risk assessment and contribute to improved agricultural practices.

Members of the scientific community, including research institutions and academic organisations, have a strong interest in methodological advancements and access to specialised training opportunities. Researchers working in fields such as environmental chemistry and food safety require advanced analytical techniques that allow them to detect and characterise micro- and nanoplastics in complex environmental and biological samples. The training activities and collaborative research initiatives conducted within the InPlasTwin project, therefore, play an important role in supporting the development of new expertise and strengthening research capacity among participating institutions.

Industry and technology experts may benefit from improved scientific understanding of micro- and nanoplastics detection and monitoring. Companies involved in developing analytical equipment or environmental monitoring technologies may use the knowledge generated by the project to refine existing technologies or develop new tools capable of detecting plastic particles more efficiently. Collaboration between researchers and industry stakeholders may therefore facilitate the transfer of scientific knowledge into technological innovation.

The general public increasingly expresses concern about the environmental and health impacts of plastic pollution. Members of the public, therefore, require accessible and reliable information that helps them understand the scale and implications of micro- and nanoplastics contamination. Through

dissemination activities and public engagement initiatives, the InPlasTwin project can contribute to improving public awareness and promoting informed discussions about sustainable plastic use and environmental protection.

Policymakers at regional, national and European levels require robust scientific evidence in order to develop effective environmental policies and monitoring frameworks. Reliable analytical data regarding the occurrence and behaviour of micro- and nanoplastics is essential for designing appropriate regulatory responses to plastic pollution. The knowledge generated within the project may therefore support evidence-based policymaking and contribute to the development of improved environmental protection strategies.

4.2. Stakeholder Roles in Exploitation

In addition to understanding stakeholder needs, it is also important to consider how different stakeholder groups may contribute to the exploitation and long-term use of project results. Exploitation does not only involve the dissemination of project outputs but also requires active engagement from stakeholders who may apply, adapt or further develop the knowledge generated through the project.

Farmers, processors and food manufacturers may contribute to exploitation primarily through the practical application of scientific knowledge generated by the project. By adopting improved agricultural practices or monitoring approaches informed by project results, these stakeholders can contribute to reducing the environmental impacts associated with plastic use in agriculture and food production systems.

The scientific community, including research institutions and academic organisations, represents the most direct pathway for the exploitation of project outputs. Researchers may further develop the analytical methodologies and scientific insights generated through the project, integrate them into new research initiatives and disseminate them through scientific publications and academic training programmes. In this way, the project contributes to expanding the scientific knowledge base related to micro- and nanoplastics.

Industry and technology experts may support exploitation through the development of technological applications based on the project's scientific findings. The collaboration between research institutions and technology developers may enable the translation of new analytical techniques into practical tools that support environmental monitoring and assessment.

The general public contributes to exploitation indirectly through increased awareness and engagement with environmental sustainability issues. Public understanding of micro- and nanoplastics pollution may influence consumer behaviour and support broader societal demand for sustainable environmental practices.

Policymakers play a critical role in the exploitation of project results by incorporating scientific knowledge into environmental policy frameworks and regulatory strategies. By using the evidence generated through the project, policymakers can support the development of more effective policies aimed at addressing plastic pollution and protecting environmental and food safety.

4.3. Linking Stakeholder Needs to Project Results

Following the identification of stakeholder groups and the analysis of their needs, the next step involves linking these needs to the specific results generated within the InPlasTwin project. Establishing this connection allows the consortium to better understand how project outputs may be utilised by different stakeholders and how exploitation activities can be designed to maximise the impact of the project.

The InPlasTwin project generates several types of results that address the needs identified in the previous sections. These include advanced analytical methodologies for detecting and characterising micro- and nanoplastics, training programmes designed to strengthen research capacity, collaborative research networks developed through twinning activities, research protocols related to plastic degradation in agricultural systems and scientific publications and datasets generated through research activities.

Each of these results responds to specific stakeholder needs and may contribute to solving practical challenges associated with plastic pollution in environmental and agricultural contexts. For example, improved analytical methodologies support researchers and analytical laboratories in detecting micro- and nanoplastics in environmental samples, while training activities help build research capacity in institutions located in widening countries. Similarly, research findings related to agricultural plastic degradation may provide valuable insights for farmers and food manufacturers concerned about plastic contamination in soils and food production systems.

Policymakers and environmental regulatory bodies may benefit from the scientific evidence generated within the project, which can contribute to the development of monitoring strategies and environmental regulations addressing plastic pollution. At the same time, dissemination activities targeting the general public can increase awareness about the environmental and societal implications of micro- and nanoplastics pollution.

The relationship between stakeholder groups and the main project results can therefore be summarised through a structured mapping that highlights how different actors may benefit from the knowledge generated by the project. This mapping also helps the consortium prioritise exploitation actions and identify opportunities for collaboration with external stakeholders.

The table below provides an overview of how the needs of different stakeholder groups are addressed by the main project results.

Table 2: Linking stakeholder needs to project results

Stakeholder Group	Identified Needs	Relevant Project Results	Potential Use of Results
Farmers, processors and food manufacturers	Understanding the environmental and food safety implications of plastic use in agriculture	Research protocols for plastic degradation, scientific studies on micro- and nanoplastics impacts in agricultural systems	Improved agricultural practices and risk assessment related to plastic contamination
Scientific community, research institutions and academia	Access to advanced analytical methodologies and specialised training	Analytical methods for micro- and nanoplastics detection, training	Scientific research, academic training, development of new research projects

		workshops, collaborative research activities	
Industry and technology experts	Knowledge supporting the development of improved monitoring technologies and analytical instruments	Methodological developments in micro- and nanoplastics analysis, datasets and scientific findings	Development of new analytical technologies and environmental monitoring tools
General public	Reliable information on environmental and health impacts of plastic pollution	Scientific publications, public dissemination activities, outreach materials	Increased environmental awareness and informed public discussion
Policymakers at different governance levels	Scientific evidence supporting environmental policy development and monitoring frameworks	Research findings, datasets, and analytical methodologies generated within the project	Evidence-based policymaking and development of environmental regulations

By linking stakeholder needs with the concrete outputs generated during the project, the consortium ensures that exploitation activities remain closely aligned with the interests of potential users. This approach also facilitates the identification of opportunities for collaboration with stakeholders who may contribute to further developing or applying the project results.

5. Initial Exploitation Pathways

The exploitation of results generated within the InPlasTwin project is expected to occur through several complementary pathways that collectively support the long-term impact of the project. Given the nature of the project as a Horizon Europe Twinning Coordination and Support Action, the primary exploitable outcomes are knowledge-based and capacity-building results rather than market-ready technologies. Consequently, the exploitation strategy focuses on maximising the scientific, educational, societal and policy value of the knowledge and expertise generated during the project.

At this stage of the project, the exploitation pathways described in this deliverable represent the initial framework on how the consortium intends to ensure the long-term use and impact of project results. This document constitutes the first deliverable specifically addressing exploitation pathways and intellectual property management within the project. As such, the approaches and actions described here should be considered as a preliminary framework that will be further refined and updated throughout the project's lifetime. As new results emerge and additional insights are gained through project activities, the exploitation strategy will be continuously reviewed and adjusted to reflect evolving opportunities for the utilisation of project outputs.

One of the most important exploitation pathways within the InPlasTwin project is **scientific exploitation**. The project generates new knowledge and analytical methodologies related to the detection, characterisation and understanding of micro- and nanoplastics in environmental and agricultural systems. Scientific publications in peer-reviewed journals will therefore represent a key mechanism for disseminating project results within the international research community. In addition to journal publications, the presentation of research findings at international conferences, workshops and scientific meetings will facilitate knowledge exchange and support the broader uptake of the methodologies and insights developed during the project. Through these activities, the project

contributes to strengthening the scientific knowledge base on micro- and nanoplastics and supports further research initiatives in this rapidly evolving field.

Educational exploitation represents another important pathway for ensuring the long-term impact of the project. One of the central objectives of the InPlasTwin initiative is to strengthen research capacity through knowledge transfer and training activities. The training materials, methodological guidelines and expertise developed during the project can therefore be integrated into university curricula, doctoral training programmes and specialised workshops targeting researchers and laboratory professionals. Academic institutions participating in the project may incorporate the newly developed knowledge into teaching activities, thereby contributing to the education of future scientists working on environmental pollution and analytical chemistry. In addition, training workshops and exchange programmes conducted within the project provide opportunities for early-stage researchers and technical staff to develop practical skills related to micro- and nanoplastics analysis.

A further exploitation pathway relates to **policy support and evidence-based decision-making**. Micro- and nanoplastics pollution represents a growing environmental challenge that requires informed policy responses at multiple governance levels. Policymakers and environmental agencies increasingly rely on scientific evidence when designing regulatory frameworks and environmental monitoring strategies. The analytical methodologies, datasets and scientific insights generated through the InPlasTwin project may therefore contribute to informing policy discussions related to plastic pollution, environmental monitoring and food safety. By providing robust scientific data and methodological advancements, the project can support policymakers in developing more effective environmental policies and regulatory approaches.

The project also contributes to exploitation through the **development of long-term research networks**. The twinning activities that have and will be conducted within the project facilitate close collaboration between institutions from widening countries and internationally recognised research organisations with advanced expertise in micro- and nanoplastics research. These collaborations create opportunities for sustained scientific exchange and joint research initiatives beyond the duration of the project. The networks established during the project may therefore serve as a foundation for future collaborative research proposals, joint publications and shared research infrastructure initiatives.

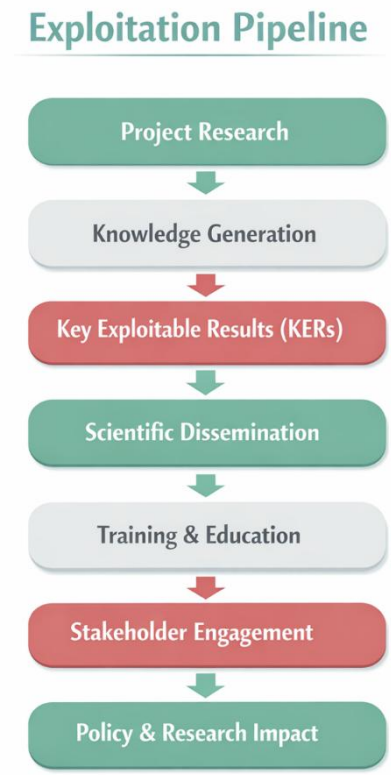

Figure 2: InPlasTwin exploitation pipeline

In addition to these primary pathways, the project may also generate broader societal impact through dissemination activities targeting non-specialist audiences. Public communication activities and outreach initiatives may contribute to increasing awareness of micro- and nanoplastics pollution and its potential environmental implications. Although the general public is not expected to directly apply the analytical methodologies developed within the project, raising awareness about plastic pollution can contribute to more informed public discourse and support broader societal engagement with sustainability challenges.

Overall, the exploitation pathways described in this section reflect the knowledge-driven nature of the InPlasTwin project and its emphasis on strengthening research capacity, advancing scientific knowledge and supporting evidence-based policymaking. As the project progresses and additional results are generated, these pathways will be further developed and refined. Future updates of the exploitation strategy will provide more detailed descriptions of specific exploitable results, stakeholder engagement mechanisms and intellectual property considerations associated with the project outputs.

6. Key Exploitable Results

The identification of Key Exploitable Results (KERs) represents an important step in the exploitation planning process of the InPlasTwin project. KERs are defined as project outputs that demonstrate clear potential for long-term use beyond the project lifetime and that may generate scientific, societal or policy-related impact. These results can include methodological developments, datasets, training materials, scientific knowledge and collaborative networks that contribute to strengthening research capacity and advancing the understanding of micro- and nanoplastics pollution.

In the context of the InPlasTwin project, the identification of KERs reflects the knowledge-driven nature of the project and its focus on strengthening analytical capabilities and research collaboration rather than developing commercial technologies. The results identified as KERs therefore primarily contribute to scientific advancement, research capacity building and evidence-based policy development. The following sections describe the main Key Exploitable Results generated within the project and outline their potential value for different stakeholder groups.

KER1 – Analytical Methodologies for Micro- and Nanoplastics Detection

One of the most significant outcomes of the InPlasTwin project is the advancement of analytical methodologies for the detection and characterisation of micro- and nanoplastics in environmental and food-related samples. The accurate identification and quantification of plastic particles at micro- and nanoscale levels remains a major scientific challenge due to the complexity of environmental matrices and the limitations of existing analytical techniques.

Through knowledge exchange, training activities and collaborative research among consortium partners, the project contributes to the development and refinement of analytical approaches capable of improving the detection and characterisation of micro- and nanoplastics. These methodologies may involve improved sample preparation procedures, enhanced analytical protocols and the optimisation of existing instrumental techniques used in environmental and food safety analysis.

The primary beneficiaries of this result are researchers, analytical laboratories and environmental monitoring institutions working in the fields of environmental chemistry, food safety and environmental toxicology. By improving analytical capabilities, this KER contributes to strengthening the reliability and comparability of micro- and nanoplastics research and supports the development of more accurate environmental monitoring strategies.

KER2 – Training Programmes for Micro- and Nanoplastics Analysis

Capacity building through training and knowledge transfer represents a central objective of the InPlasTwin project. As part of this objective, the project generates a series of specialised training

programmes designed to strengthen the analytical and scientific skills of researchers working in the field of micro- and nanoplastics analysis.

These training programmes include workshops, technical training sessions and knowledge exchange activities conducted among consortium partners. Through these initiatives, researchers and technical staff gain practical experience in applying advanced analytical techniques and interpreting complex datasets related to micro- and nanoplastics detection.

The training materials and expertise developed during the project represent an important exploitable result since they can be integrated into academic teaching activities and future research training programmes. Universities and research institutions may incorporate these materials into graduate courses, doctoral training programmes and professional development initiatives targeting early-career researchers and laboratory professionals.

By strengthening the knowledge and skills of researchers in widening countries, this KER contributes to improving research excellence and promoting long-term capacity building within the European research area.

KER3 – Research Collaboration Network

Another important result of the project is the development of a collaborative research network connecting institutions from widening countries with internationally recognised research organisations. The twinning activities conducted within the project create opportunities for scientific exchanges, joint research initiatives and long-term partnerships among participating institutions.

This collaborative network facilitates knowledge sharing and enables researchers to access advanced expertise, analytical equipment and specialised training opportunities. By establishing close working relationships between institutions with complementary expertise, the project contributes to strengthening the European research landscape in the field of micro- and nanoplastics analysis.

The network established through the project may continue to operate beyond the project lifetime and may serve as a foundation for future collaborative research proposals, joint publications and shared research infrastructure initiatives. In this way, the research collaboration network represents an important long-term outcome that supports the sustainability of the project's impact.

KER4 – Agricultural Plastic Degradation Protocols

Agricultural systems represent an important source of plastic pollution due to the widespread use of plastic materials such as mulching films, irrigation components and protective coverings. Understanding how these materials degrade in soil environments and contribute to the formation of micro- and nanoplastics is therefore an important research challenge.

The InPlasTwin project contributes to addressing this challenge by developing research protocols that support the investigation of plastic degradation processes in agricultural environments. These protocols include experimental procedures for analysing soil samples, evaluating plastic degradation mechanisms and identifying microplastic particles generated through agricultural plastic use.

This result is particularly relevant for stakeholders involved in agricultural production and food processing, as it contributes to improving the understanding of how plastic materials behave in agricultural systems and how they influence soil quality and crop production. Researchers and

policymakers also benefit from these protocols when designing environmental monitoring programmes and assessing the environmental impacts of plastic use in agriculture.

KER5 – Environmental Monitoring Datasets

Scientific datasets generated during the project represent another important exploitable result. These datasets include analytical measurements, experimental observations and environmental monitoring data related to the occurrence and behaviour of micro- and nanoplastics in different environmental contexts.

By documenting the presence and characteristics of plastic particles in environmental and agricultural samples, these datasets contribute to expanding the scientific knowledge base on plastic pollution. The availability of high-quality data is essential for supporting further research activities, validating analytical methodologies and informing environmental policy development.

Where appropriate and in accordance with data management policies, the datasets generated during the project are and will be made available through open data repositories. This approach supports the principles of Open Science and allows other researchers and institutions to utilise the data for further research and analysis.

KER6 – Scientific Publications

Scientific publications represent one of the primary mechanisms through which the knowledge generated within the project will be disseminated and exploited. The research conducted during the project is expected to result in several peer-reviewed publications (≥5) that contribute to advancing scientific understanding of micro- and nanoplastics pollution.

These publications will present the analytical methodologies, experimental findings and scientific insights generated during the project and will make them accessible to the international research community. By publishing the results in recognised scientific journals, the consortium ensures that the knowledge generated within the project contributes to the broader scientific literature and supports the development of future research initiatives.

KER7 – Guidelines for Sustainable Agricultural Practices Another important result of the InPlasTwin project is the development of guidelines promoting safer and more sustainable agricultural practices. Plastic mulching materials are widely used in agriculture due to their benefits in improving soil conditions and crop productivity. Plastic mulches of varying compositions (including conventional or biodegradable plastics) may degrade at different rates, potentially contributing to the accumulation of micro- and nanoplastics in agricultural soils, and leading to long-term environmental impacts.

Based on the scientific insights generated during the project, the consortium will develop guidelines intended to support local decision-makers, agricultural authorities, and other relevant stakeholders in encouraging the adoption of mulching materials with lower environmental and food-related negative impacts. These guidelines will summarise the knowledge gained regarding plastic degradation processes in agricultural environments and provide practical recommendations that support environmentally responsible agricultural management.

The recommendations developed within the project are also aligned with broader European Union policy priorities related to plastic pollution reduction, soil protection, and the promotion of sustainable agricultural systems, as well as with global sustainability goals addressing responsible production and environmental protection.

6.1 KER – Stakeholder Mapping

Following the identification and description of the Key Exploitable Results, it is important to analyse how these results relate to the needs of different stakeholder groups and which partners within the consortium contribute to their development. This mapping exercise allows the consortium to better understand the potential pathways through which each result may generate impact and ensures that exploitation activities remain aligned with stakeholder interests.

Linking each KER to the relevant stakeholder groups allows the consortium to also determine how project outcomes may be utilised in practice. Different stakeholders may interact with the project results in different ways. Researchers and academic institutions may further develop the analytical methodologies and scientific knowledge generated by the project, while policymakers may use the research findings as evidence to support environmental regulation. Similarly, agricultural stakeholders may benefit from improved understanding of plastic degradation in agricultural environments, while industry and technology experts may explore opportunities to integrate analytical approaches into technological solutions.

The mapping presented below illustrates the relationship between the Key Exploitable Results, the stakeholders who may benefit from their application, and the partners responsible for their development.

Table 3: Linking KERs to stakeholder groups

KER	Description	Stakeholder Groups	Partners Involved
KER1 – Analytical methodologies for micro- and nanoplastics detection	Development and refinement of analytical approaches for detecting and characterising micro- and nanoplastics in environmental and food samples	Scientific community, research institutions and academia; industry and technology experts; policymakers	JSI, DTU, VITO, IMR
KER2 – Training programmes for micro- and nanoplastics analysis	Training workshops, technical courses and knowledge transfer activities designed to strengthen analytical skills and research capacity	Scientific community, research institutions, academia; industry, and technology experts	JSI, DTU, VITO, IMR, AUA
KER3 – Research collaboration network	Long-term scientific collaboration between widening institutions and leading research organisations	Scientific community, research institutions and academia; industry and technology experts; policymakers	All partners
KER4 – Agricultural plastic degradation protocols	Research protocols for analysing the degradation of agricultural plastics and the formation of microplastics in soil environments	Farmers, processors and food manufacturers; the scientific community; policymakers	DTU, AUA, JSI, IMR, VITO
KER5 – Environmental monitoring datasets	Analytical datasets and experimental data related to the occurrence and behaviour of micro- and nanoplastics	Scientific community; policymakers; industry and technology experts	JSI, DTU, VITO, IMR
KER6 – Scientific publications	Peer-reviewed publications presenting the scientific results generated within the project	Scientific community; research institutions; policymakers	JSI, DTU, VITO, IMR, AUA
KER7 – Best practice guidelines	Recommendations and guidance for promoting safe agricultural practices	Scientific community; policymakers; industry and technology experts; general public	All partners

The mapping demonstrates that the scientific community represents the primary stakeholder group for most of the project results, reflecting the research-focused nature of the InPlasTwin project. However, several results also have potential relevance for other stakeholder groups, particularly policymakers and agricultural stakeholders concerned with environmental and food safety issues related to plastic pollution.

6.2. Monitoring the Development of Key Exploitable Results

In order to ensure that the Key Exploitable Results identified within the InPlasTwin project are effectively developed and utilised, it is important to establish a structured process for monitoring their progress throughout the duration of the project. Continuous monitoring allows the consortium to assess the maturity, relevance and exploitation potential of each result while also identifying opportunities for further development and collaboration.

The monitoring process is closely linked to the exploitation and intellectual property catalogue developed within the project. This catalogue serves as a central repository for recording information related to project outputs with exploitation potential, including descriptions of the results, the partners involved in their development, the relevant stakeholder groups and potential exploitation pathways. By maintaining and regularly updating this catalogue, the consortium can systematically track the evolution of each Key Exploitable Result and evaluate its potential impact.

Monitoring activities will take place at several stages during the project lifecycle. Project partners will periodically review the identified results in order to determine whether new outputs should be added to the catalogue or whether the description and exploitation potential of existing results should be updated. These reviews will be conducted during internal project meetings and after reporting periods, ensuring that exploitation considerations remain integrated within the overall project implementation.

An important aspect of the monitoring process involves assessing the level of maturity of each Key Exploitable Result. Although the InPlasTwin project does not aim to develop commercial technologies, it is still useful to evaluate the readiness and applicability of project outputs in terms of their scientific development and potential use by stakeholders. Indicators such as the level of methodological development, the availability of datasets, the completion of training materials and the publication of scientific results may be used to assess the progress of each KER.

Stakeholder feedback also represents a valuable source of information for monitoring the relevance and usefulness of project results. Engagement with researchers, policymakers and other stakeholders through common workshops, webinars, conferences and dissemination activities may provide insights into how project outputs are perceived and how they may be further developed or applied. This feedback can help the consortium refine exploitation pathways and ensure that the results remain aligned with stakeholder needs.

The monitoring of KER development also contributes to the identification of potential intellectual property considerations. As project outputs evolve, the consortium will need to evaluate whether specific results require protection through intellectual property mechanisms such as copyright or the protection of confidential know-how. These decisions will be taken in accordance with the project's intellectual property management strategy (see Section 7) and the provisions of the Consortium Agreement.

Since this deliverable represents the first formal document addressing exploitation pathways and intellectual property management within the InPlasTwin project, the monitoring process described here should be considered an initial framework. As the project progresses and additional results are generated, the exploitation catalogue and the associated monitoring mechanisms will be updated to reflect the evolving state of the project outputs. Further updates on the development, refinement and utilisation of the Key Exploitable Results will be provided in the upcoming relevant deliverables (D10.1, D10.2, D10.3).

7. Intellectual Property Management

The effective management of intellectual property (IP) represents an important component of the InPlasTwin project and plays a key role in ensuring the successful exploitation and long-term impact of the project results. Intellectual property constitutes a valuable asset within research and innovation projects, particularly in collaborative environments where multiple partners contribute complementary knowledge, expertise and research outputs. A clear and well-structured approach to intellectual property management is therefore essential in order to facilitate cooperation among partners, protect valuable knowledge generated during the project and support the effective dissemination and exploitation of project results.

Within the framework of the InPlasTwin project, intellectual property management follows the principles established under the Horizon Europe programme and is aligned with the provisions defined in the Grant Agreement and the Consortium Agreement. These principles ensure that the ownership of project results is clearly defined and that all partners have appropriate access rights to utilise the knowledge generated during the project. At the same time, the intellectual property strategy seeks to balance the need for open scientific dissemination with the need to protect valuable knowledge and methodological developments when appropriate.

The intellectual property needs to be managed and used strategically in order to ensure smooth cooperation between consortium partners and maximise the impact of the project outcomes. The intellectual property management strategy developed for the InPlasTwin project, therefore, aims to increase the overall understanding of intellectual property issues among consortium members and to support partners in identifying and protecting valuable knowledge generated during the project. In particular, the strategy is designed to **improve the IP knowledge** of all consortium members, provide a clear **overview of the partners' existing intellectual property**, identify potential **mechanisms for IP protection** and facilitate the **development of a joint IP management and exploitation strategy**. In addition, the strategy seeks **to prevent potential intellectual property conflicts** between consortium members as well as **possible conflicts with third parties**, such as cases of intellectual property infringement. Ultimately, these activities contribute to strengthening the overall Plan for the Exploitation and Dissemination of Results developed within the project.

To achieve these objectives, the InPlasTwin project adopts a comprehensive intellectual property management strategy that operates in close alignment with the exploitation strategy and follows the main stages of the project lifecycle. This structured approach allows intellectual property considerations to be integrated into all phases of the project, from the initial planning stage to the post-project period.

1. The first stage of the intellectual property management process corresponds to the **project planning and proposal preparation phase**. During this stage, consortium partners considered their existing intellectual property assets that might be relevant for the implementation of the project. These assets include both tangible and intangible elements such as scientific studies, analytical methods, research materials, software tools and datasets. Identifying these background assets during the proposal preparation stage allowed the consortium to anticipate potential intellectual property issues and ensure that the necessary knowledge would be available for the successful implementation of the project activities.
2. The second stage of the process takes place during **the grant preparation phase**, when detailed rules related to intellectual property management are formalised within the Consortium Agreement. The Consortium Agreement defines key aspects related to the management of knowledge and intellectual property within the project, including confidentiality obligations, the definition of background and sideground intellectual property, the ownership and joint ownership of project results, the legal protection of results, exploitation rights and access rights among consortium partners. By clearly defining these rules at an early stage, the consortium establishes a transparent framework that supports effective collaboration and reduces the risk of future intellectual property conflicts.
3. The third stage of the intellectual property management strategy corresponds to the **project implementation phase**. During this stage, newly generated knowledge, methodological developments and other innovations are continuously recorded and evaluated to determine their potential intellectual property value. The management of intellectual property during the implementation phase focuses on several key activities.

One of the first activities involves **improving the understanding of intellectual property concepts** among consortium partners. In order to achieve this objective, the project includes a series of intellectual property workshops designed to familiarise project partners with the basic principles of intellectual property management within Horizon Europe projects. These workshops introduce key intellectual property concepts and definitions at the strategic level, discuss the main legal and practical issues related to intellectual property protection and explain the legal framework governing intellectual property within the Horizon Europe programme. The workshops also highlight the relationship between intellectual property management and the exploitation and dissemination of project results. The first workshop took place in M05 of the project and was organised by Foodscale Hub, which leads the exploitation and intellectual property activities within the consortium. The aspects that were covered during this workshop included the general IP considerations that needed to be considered during the implementation of the project, including background/foreground knowledge, access rights, IP protection measures and connections between IP management and exploitation & dissemination activities.

Figure 3: InPlasTwin 1st IP workshop

At least one additional workshop will be organised toward the end of the project when the majority of project results will have been generated and intellectual property considerations will become particularly relevant.

Another important component of the intellectual property management strategy involves the **identification, monitoring and evaluation of intellectual property associated with the project results**. In this context, particular attention is given to the relationship between intellectual property management and the Key Exploitable Results identified within the project. The project's KERs are recorded in the InPlasTwin Exploitation and Intellectual Property Catalogue, which provides a structured overview of the results generated during the project. The catalogue includes information about the nature of each result, its potential applications, the partners involved in its development and the possible intellectual property protection mechanisms that may be applied.

The continuous monitoring of project results allows the consortium to identify newly generated intellectual property at an early stage and to assess the most appropriate protection mechanisms depending on the nature of the result. Possible forms of protection may include copyright for training materials and educational resources, protection of confidential know-how related to analytical methodologies or other intellectual property mechanisms where appropriate. In addition, the catalogue provides valuable input for the preparation of the **Results Ownership List** required for the project's final reporting.

Intellectual property risk management represents another important aspect of the strategy. Intellectual property risks may arise in various forms and may affect the project's schedule, scope or overall impact. For example, risks may include potential conflicts related to ownership of results, unintentional disclosure of confidential information or possible infringement of third-party intellectual property rights. To address these risks, the project includes a structured process for identifying, analysing and evaluating potential intellectual property risks. Once risks are identified, appropriate mitigation measures are proposed to reduce their potential impact. These activities are closely coordinated with the overall project risk management strategy to ensure a consistent approach to risk assessment and mitigation.

In addition to monitoring intellectual property and managing risks, the project also includes **capacity-building activities** aimed at strengthening the partners' ability to manage intellectual property effectively. These activities include the previously mentioned intellectual property workshops, as well as individual mentoring support provided by the exploitation and intellectual property leader. This

mentoring support allows partners to receive tailored guidance on specific intellectual property issues related to their research activities and project contributions.

4. The fourth stage of the intellectual property management process occurs during the final phase of the project. As the project approaches its conclusion, consortium partners will be reminded that **certain intellectual property obligations remain in force beyond the end of the project**. These obligations include confidentiality commitments, the protection of results with exploitation potential and the proper management of intellectual property rights associated with project outputs. During the final intellectual property workshop, partners will review the Results Ownership List and confirm the arrangements related to the ownership and potential exploitation of project results.
5. Finally, the intellectual property management strategy also considers **the post-project phase**. Even after the formal completion of the project, certain obligations related to intellectual property management remain active. These obligations may include maintaining the protection of intellectual property rights, managing agreements related to joint ownership or licensing of results and addressing potential issues related to cost and revenue sharing when relevant. By considering these aspects early in the project lifecycle, the consortium ensures that project results remain properly managed and protected after the project has ended.

Overall, the intellectual property management strategy developed within the InPlasTwin project provides a structured framework for managing knowledge and intellectual assets generated during the project. By integrating intellectual property management with the project's exploitation strategy and dissemination activities, the consortium ensures that valuable knowledge is both protected and effectively utilised. This approach contributes to strengthening collaboration among partners, supporting the long-term sustainability of project results and maximising the scientific and societal impact of the project.

8. Sustainability Plan

Ensuring the sustainability of project outcomes beyond the duration of the InPlasTwin project represents a key objective of the overall exploitation strategy. The long-term value of the project lies not only in the scientific results generated during its implementation but also in the continued use and further development of the knowledge, methodologies and collaborations established through the twinning activities. For this reason, the consortium has developed a sustainability plan that aims to preserve and expand the impact of the project results after the formal completion of the project.

The sustainability strategy focuses on **maintaining the scientific collaboration** established among the consortium partners, **continuing capacity-building activities** in the field of micro- and nanoplastics analysis, **ensuring the accessibility and use of project knowledge and methodological outputs**, and **supporting the continued engagement of stakeholders and policymakers**. By integrating these elements into a coordinated framework, the consortium seeks to ensure that the benefits generated through the project will extend beyond the project lifetime and continue to contribute to scientific advancement, environmental protection and sustainable agricultural practices.

One of the most important elements of the sustainability plan is **the continuation of research collaboration** among the consortium partners. The twinning activities that have and will be implemented during the project have created strong scientific links between institutions located in

widening countries and leading European research organisations with advanced expertise in analytical chemistry and environmental monitoring. These partnerships provide a solid foundation for future joint research initiatives. The consortium partners intend to build upon these collaborations by preparing new research proposals within European and international funding programmes – at least 2 joint project applications in EU Horizon Europe calls in 5 years after the project with JSI as coordinator. Future collaborative projects may focus on further advancing analytical methodologies for micro- and nanoplastics detection, expanding research on plastic pollution in agricultural systems and developing improved monitoring strategies for environmental contaminants.

In addition to future research proposals, the **collaborative networks** established during the project are expected to continue through ongoing scientific cooperation, joint publications and participation in international research initiatives. The exchange of expertise and knowledge among the partners will therefore continue to strengthen research capacity and promote innovation in the field of micro- and nanoplastics analysis.

Another important aspect of the sustainability strategy involves **integrating project results into educational programmes and research training activities**. One of the key objectives of the InPlasTwin project is to strengthen research capacity through knowledge transfer and training. The training materials, analytical methodologies and practical knowledge developed during the project therefore represent valuable resources that can be incorporated into academic curricula by JSI and AUA and training programmes.

The knowledge generated through the project can be incorporated into undergraduate and postgraduate teaching activities related to environmental science, analytical chemistry, food safety and sustainable agriculture. In particular, the training materials developed during the project may be used in doctoral training programmes and specialised courses aimed at developing expertise in environmental monitoring and microplastics analysis. By embedding project knowledge within academic education and training programmes, the consortium ensures that the scientific advancements achieved during the project will continue to influence the education of future researchers and professionals.

The sustainability plan also includes **continued dissemination and knowledge sharing with relevant stakeholders**. Throughout the project, engagement with stakeholders has been recognised as an essential component of ensuring the practical relevance of project results. Stakeholders such as farmers, food producers, industry representatives, policymakers and environmental organisations represent important users of the knowledge generated during the project.

Maintaining communication with these stakeholders beyond the duration of the project will support the continued application of project results in practice. For example, the guidelines developed within the project for promoting sustainable agricultural practices through the adoption of biodegradable mulching films may continue to inform local decision-makers and agricultural authorities. Similarly, policymakers may use the scientific insights and datasets generated through the project to support the development of environmental monitoring frameworks and regulatory strategies addressing plastic pollution.

The **continued accessibility of project knowledge** also represents an important aspect of the sustainability strategy. Scientific publications, datasets and methodological guidelines generated during the project will remain available to the research community and other stakeholders. By following the principles of Open Science and ensuring that project results are disseminated through

open-access publications and publicly available research platforms whenever possible, the consortium promotes the long-term availability and reuse of project knowledge.

Another dimension of sustainability relates to the **development of expertise within participating institutions**. Through training activities, research exchanges and collaborative research initiatives, the project contributes to strengthening the analytical capabilities of researchers working in widening countries. The skills and expertise developed during the project will remain within the participating institutions and will support the continued development of research activities related to micro- and nanoplastics analysis. This long-term strengthening of research capacity represents one of the most significant sustainability outcomes of the project.

Finally, the sustainability plan is closely connected to the project's **exploitation and intellectual property management strategies**. The identification of Key Exploitable Results and the structured monitoring of these results throughout the project lifecycle provide a foundation for their continued use and development beyond the project duration. The intellectual property management framework established within the project also ensures that project results are properly managed and protected when necessary, thereby facilitating their long-term exploitation.

Overall, the sustainability strategy developed within the InPlasTwin project seeks to ensure that the knowledge, methodologies and collaborations established during the project continue to generate value for the scientific community, policymakers and society at large. By promoting continued research collaboration, integrating project knowledge into education and training activities, maintaining stakeholder engagement and ensuring the accessibility of project results, the consortium aims to maximise the long-term impact of the project and contribute to addressing the environmental challenges associated with micro- and nanoplastics pollution.

9. Exploitation Risk Assessment

The successful exploitation of project results depends on several internal and external factors that may influence the ability of the consortium and relevant stakeholders to adopt, further develop and utilise the knowledge generated within the InPlasTwin project. As with all research and innovation initiatives, certain risks may arise that could potentially affect the effectiveness of exploitation activities and the long-term impact of the project results. Identifying these risks at an early stage allows the consortium to develop appropriate mitigation measures and to integrate risk management into the overall project implementation and exploitation strategy.

Given the nature of the InPlasTwin project as a Coordination and Support Action focused primarily on research capacity building and knowledge transfer, the risks associated with exploitation are largely related to stakeholder engagement, uptake of research outputs, data accessibility and intellectual property considerations. The consortium therefore adopts a proactive approach to monitoring and mitigating potential risks that may influence the successful utilisation of the project outcomes.

One potential risk relates to the **limited engagement of stakeholders** who may benefit from the knowledge and results generated within the project. Stakeholders such as researchers, policymakers, agricultural actors and industry representatives play an important role in ensuring that project outputs are translated into practical applications and policy development. If stakeholder engagement remains limited, the visibility and impact of the project results may be reduced. **To mitigate** this risk, the

consortium places strong emphasis on dissemination and stakeholder engagement activities throughout the project. Workshops, training sessions, scientific conferences and communication activities are designed to facilitate interaction between the project partners and external stakeholders. These activities create opportunities for stakeholders to become familiar with the project's findings and to explore ways in which the knowledge generated during the project may be applied within their respective fields.

Another potential risk concerns the **limited adoption of new analytical methodologies** developed or promoted within the project. Micro- and nanoplastics analysis represents a complex scientific field that often requires specialised expertise, advanced analytical equipment and well-established methodological protocols. Laboratories or research institutions that lack the necessary resources or experience may face difficulties in adopting new analytical approaches. This could potentially slow the dissemination and broader uptake of the methodologies developed during the project. **To address this challenge**, the InPlasTwin project places strong emphasis on capacity building through training and knowledge exchange. Workshops, hands-on training sessions and research exchanges among consortium partners allow researchers and technical staff to gain practical experience in applying advanced analytical techniques. By strengthening the analytical capabilities of participating institutions and sharing methodological expertise, the project aims to facilitate the wider adoption of improved micro- and nanoplastics analysis techniques.

Data accessibility and data management also represent potential challenges for exploitation activities. Scientific datasets generated during the project may contain valuable information that can support further research, environmental monitoring and policy development. However, restrictions related to data sharing, confidentiality obligations or intellectual property protection may limit the accessibility of certain data. **To mitigate** these risks, the consortium follows the data management principles established under Horizon Europe and implements a structured data management plan (D11.1). The plan defines procedures for data storage, documentation, sharing and long-term accessibility, while also ensuring compliance with confidentiality obligations and intellectual property considerations. Whenever possible, research data generated during the project will be made available through open-access platforms, thereby supporting transparency and facilitating further research by external stakeholders.

Intellectual property management also represents an important aspect of exploitation risk assessment. In collaborative research projects involving multiple partners, potential risks may arise related to ownership of results, access rights or the protection of valuable knowledge. Such risks may lead to conflicts among partners or limit the effective exploitation of project outputs. The InPlasTwin consortium **addresses these risks** through the implementation of a clearly defined intellectual property management framework established within the Consortium Agreement. The agreement specifies rules regarding the ownership and joint ownership of project results, access rights for consortium partners, confidentiality obligations and procedures for protecting results with potential intellectual property value. By establishing these rules early in the project, the consortium ensures transparency and reduces the likelihood of conflicts related to intellectual property.

Another potential risk involves the **limited policy uptake of scientific findings** generated during the project. Although the project generates valuable knowledge related to micro- and nanoplastics pollution and sustainable agricultural practices, translating scientific results into policy action can be a complex process. Policymakers may require clear, accessible and policy-relevant information in order to integrate scientific findings into regulatory frameworks or policy initiatives. **To address this challenge**, the consortium aims to communicate project findings in formats that are accessible to policymakers and relevant authorities. Policy-relevant outputs such as guidelines for sustainable

agricultural practices and recommendations related to biodegradable mulching films will help bridge the gap between scientific research and policy development.

Technological and methodological uncertainties may also influence the exploitation potential of certain project results. Research on micro- and nanoplastics analysis continues to evolve rapidly and new analytical approaches are constantly being developed and refined. As a result, some methodologies promoted during the project may require further validation or adaptation before they can be widely adopted by the research community. **To mitigate** this risk, the consortium encourages continuous collaboration among partners and supports the publication and dissemination of research findings that allow the scientific community to evaluate and build upon the methodologies developed within the project.

Overall, the exploitation risk assessment demonstrates that the main challenges associated with the utilisation of project results relate to stakeholder engagement, methodological adoption, data accessibility, intellectual property management and policy uptake. By identifying these risks and implementing appropriate mitigation measures, the consortium aims to ensure that the knowledge generated during the InPlasTwin project can be effectively exploited and continue to generate value for researchers, policymakers and society beyond the duration of the project.

Through the integration of risk assessment within the broader exploitation and intellectual property management strategies, the project adopts a proactive approach to ensuring the long-term sustainability and impact of its results.

10. Monitoring and Next Steps

The monitoring of exploitation activities represents an essential component of the overall exploitation and intellectual property management strategy of the InPlasTwin project. Continuous monitoring allows the consortium to assess the progress of exploitation-related activities, evaluate the development of Key Exploitable Results and ensure that the project outcomes remain aligned with the needs of relevant stakeholders. By implementing a structured monitoring process, the consortium aims to maintain a dynamic exploitation strategy that evolves in parallel with the progress of the project and the emergence of new results.

Throughout the duration of the project, project partners will regularly review and update the exploitation and intellectual property catalogue, which serves as the central tool for recording and analysing the project's Key Exploitable Results. The catalogue provides a comprehensive overview of the results generated within the project, including their description, the partners involved in their development, their potential applications, relevant stakeholder groups and possible intellectual property considerations. Periodic updates of the catalogue allow the consortium to track the evolution of project results and to identify new outputs that may have exploitation potential.

Monitoring activities will take place during the regular internal project meetings and after reporting periods. During these reviews, consortium partners will assess the current status of the identified Key Exploitable Results and evaluate their potential for further development, dissemination and long-term valorisation. These discussions provide an opportunity for partners to exchange information on emerging results and to identify potential synergies between different project activities. In addition, the monitoring process allows the consortium to verify whether the exploitation pathways defined in

this deliverable remain appropriate or whether adjustments are required in order to respond to new developments within the project.

An important aspect of monitoring exploitation activities involves the continuous evaluation of stakeholder engagement. Stakeholders play a critical role in ensuring that the knowledge generated during the project can be translated into practical applications and policy-relevant outputs. Feedback obtained through stakeholder interactions, workshops, dissemination events and communication activities will therefore be considered when assessing the relevance and usefulness of project results. This feedback provides valuable insights into how project outputs are perceived by external stakeholders and may help identify opportunities for further development or application of the project results.

In addition to stakeholder feedback, the monitoring process will also take into account developments in the broader scientific and policy landscape related to micro- and nanoplastics pollution. The field of microplastics research is rapidly evolving and new scientific findings, technological innovations and policy initiatives may influence the relevance and potential applications of the project outcomes. By maintaining awareness of these developments, the consortium can ensure that the exploitation strategy remains responsive to emerging opportunities and challenges.

The monitoring framework is also closely connected with the project's intellectual property management strategy. As new results are generated during the project implementation phase, partners will assess whether these results require specific intellectual property protection or whether they should be disseminated openly in accordance with the project's commitment to Open Science principles. The monitoring process, therefore, contributes to ensuring that intellectual property considerations are integrated into the exploitation planning process.

Since this deliverable represents the first document addressing exploitation pathways and intellectual property management within the InPlasTwin project, the monitoring activities described in this section will support the continuous refinement of the exploitation strategy throughout the project lifecycle. Future updates of the exploitation catalogue and related deliverables will provide additional information regarding newly identified Key Exploitable Results, updated exploitation pathways and potential intellectual property considerations.

Looking ahead, several key actions have been identified as the next steps for strengthening exploitation activities within the project. One of the primary priorities involves **continuing and expanding stakeholder engagement activities**. Maintaining dialogue with stakeholders such as researchers, policymakers, agricultural stakeholders and industry representatives will help ensure that the project results remain relevant to real-world challenges and that opportunities for practical application are identified.

Another important next step involves **strengthening scientific dissemination activities**. The research results generated through the project will continue to be disseminated through peer-reviewed scientific publications, conference presentations and participation in international scientific networks. These activities will help increase the visibility of the project and promote the adoption of the analytical methodologies and research findings developed within the project.

The consortium will also explore opportunities for **future collaborative research initiatives** that build upon the knowledge and partnerships established through the InPlasTwin project. The collaborative research network developed through the twinning activities provides a strong foundation for

preparing new project proposals within European and international research programmes. Such initiatives may focus on further advancing micro- and nanoplastics analysis, developing innovative environmental monitoring approaches or investigating sustainable alternatives to plastic materials used in agricultural systems.

Finally, the consortium will continue to **evaluate the long-term sustainability of the project results**. The integration of project knowledge into educational programmes, training activities and institutional research strategies will help ensure that the expertise developed during the project continues to contribute to research and innovation activities beyond the project lifetime.

Through the implementation of these monitoring activities and next steps, the InPlasTwin consortium aims to maintain a proactive and adaptive approach to exploitation planning. By continuously reviewing project results, engaging with stakeholders and exploring new opportunities for collaboration and research, the consortium seeks to maximise the long-term scientific, environmental and societal impact of the project.