

PRIORITY · COST ACTION CA20101

## Plastics Monitoring Detection Remediation Recovery

LAYMAN'S REPORT

### **ACTION DETAILS**

TITLE: Plastics Monitoring Detection Remediation Recovery

**DURATION:** 19<sup>th</sup> October 2021 – 18<sup>th</sup> October 2025

**EU FINANCIAL CONTRIBUTION**: 801,832.49 €

**ACTION CHAIR: Stefania Federici** 

**ACTION VICE CHAIR:** Aleksandra Tubić

**PARTICIPANTS**: over 560

**MEMBER COUNTRIES: 53** 

PRIORITY includes researchers, experts, and stakeholders from across disciplines – chemistry, biology, environmental sciences, engineering, toxicology, social sciences – and from all sectors, including academia, policy, industry, and civil society.







PRIORITY stands for 'Plastics monitoRIng detection Remediation recovery'. PRIORITY is a science and technology research network focused on developing, implementing, and consolidating strategies to tackle the global challenges of micro- and nanoplastics in the environment.

This COST Action combines expertise in chemistry, physics, life science, engineering, standards, economy, and law. The network creates a robust infrastructure for scientific communication, exchange, and collaboration to foster new research activities and citizen science.

PRIORITY aims to enhance the technical standards for sampling and analysis of micro- and nanoplastics in the environment, to develop a more reliable assessment of exposure and biological effects, and to advance activities in terms of environmental remediation and recovery.

The Action will support the harmonization of European regulation associated with microplastics. It will assist the European Commission in critical aspects of environmental and ecosystems protection, food safety, and life science.



The overarching aim of PRIORITY is to create and coordinate a transnational and multidisciplinary team of scientists and experts to address the challenges in the field of environmental nano- and microplastic pollution. This aim will be achieved through collaboration, sharing of know-how, discussions and training activities. The Action has a total of 17 specific objectives divided into 10 objectives on research coordination and 7 objectives on capacity building.

### PRIORITY is organized in seven specific while highly interconnected Working Groups (WGs), with clear objectives and activities.







### WG1 – Impacts and risks on human health and environment related to N/MPs

Objectives: To identify, develop and hence increase the capability of European and other countries to have standardized hazard testing methods N/MPs for different environmental matrices.



Mónica Amorim



Gabriela Kalcikova VG1 co-leader

### WG2 – Monitoring and sampling MPs

Objectives: To help European and developing Countries to assess harmonized monitoring methods and sampling procedures for the different compartments and environmental matrices.





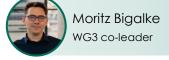
Zahida Ademovic 'G2 co-leader



### WG3 – Instrumentation, modelling, data evaluation, software, and analytical procedures

Objectives: To understand the potentiality of the tools available for the analysis, to help European and developing Countries to assess harmonized methods, to facilitate and encourage access to the EU research infrastructures and facilities.





### **WG4 – Nanoplastics**

Objectives: To define suitable and validated analytical methods for detection and quantification of NPs; To produce hazard and fate data accounting for toxicity aspects and interaction of NPs with biomes.



Denise Mitrano



Nanna B. Hartmann WG4 co-leader



#### WG5 – Remediation, recovery and development of sustainable alternative to plastic materials

Objectives: To identify reuse, recycling, and recovery alternatives for environmental plastics; To define technological approaches for new recycling and recovery alternatives.



Mariacristina Cocca NG5 leader



Jean-Marie Raquez WG5 co-leader

#### WG6 – Metrology and standardization

Objectives: To validate protocols for sample preparation, both in the range of N/MPs, by means of interlaboratory studies and comparison with different independent techniques.



Thomas Meisel



Denise Mitrano WG6 co-leader



Joydeep Dutta WG6 co-leader



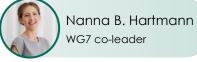


### WG7 – Develop new strategies to increase the synergies with society and education

Objectives: To develop tools to increase awareness in society and education about the environmental issues in particular related to N/MPs.



Milica Velimirovic F.





# Impacts and risks on human health and environment related to Nano- and Microplastics

### Subgroup 1 – Human health

**Leader**: Amedeo Amedei, Florence University, Italy Manosij Ghosh, KU LEUVEN, Belgium



**Leader**: Janeck J. Scott-Fordsmand, Aarhus University, Denmark

### Report

### Impacts and Risks Analysis with Mitigation Strategies

Comprehensive survey among PRIORITY members to assess the perceived impacts and risks of micro- and nanoplastics (MNPs) on human health and the environment. The analysis highlights growing evidence of inflammatory, oxidative, and metabolic effects in biological systems and the disruptive influence of MNPs on soil, water, and air ecosystems. Respondents emphasized key exposure routes, vulnerable compartments, and the need for standardized methodologies, biomonitoring, and policy actions. This collective effort demonstrates the pivotal role of COST Action PRIORITY in connecting scientific expertise, fostering harmonized research, and supporting evidence-based environmental and health protection policies.

### Round table

Round table organized "A one-health approach for risk assessment of micro and nano-plastics". This was organized as a meeting of three projects related to MP/NPs (Papillon-Minagris-PRIORITY) as a hybrid event and was held at the end of the AGRIFOODPLAST Conference 2023.

Session 1: Presentations from MINAGRIS and PAPILLON EU project and COST Action PRIORITY

Session 2: Scene-setting: A roadmap for micro and nanoplastics risk assessment and Standardisation of methods, with presentations from Ettore Capri and Margherita Ferrante

Session 3: World café discussion: research, policy, public; interactive open discussion



Research

Policy



Public



exchange perspectives

identify knowledge gaps

integrated risk frameworks for human, animal, and environmental health



### Monitoring and sampling of Microplastics

### Subgroup 1 – Water

Leader: Carlos Marques, Universidade de Aveiro, Portugal

### Subgroup 2 – Soil / sludges / sediments

**Leader**: Teresa Serra, Universitat de Girona, Spain

### Subgroup 3 – Biological samples

**Leader**: Serkan Gül, Tayyip Erdogan University, Turkey

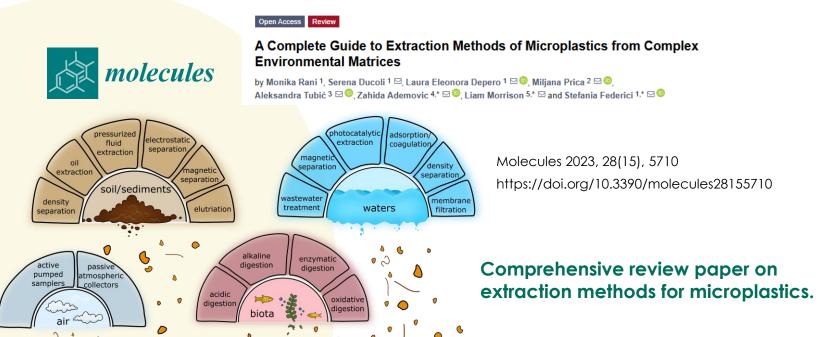
### Subgroup 4 – Air

Leader: Eion McGillicuddy, Technical University Dublin, Ireland

### Subgroup 5 – Food

**Leader**: Javier Borges, Universidad de la Laguna, Spain

### Review article



Critical overview of the various techniques used to isolate microplastics from environmental samples, highlighting their strengths, limitations, and the need for standardized approaches.

### Follow-up paper – in progress

Follow-up paper about the challenge of contamination issues in microplastic research. Contamination is a significant barrier to achieving reliable and reproducible results, and this paper will explore strategies for minimizing contamination during sample collection, handling, and analysis.

This ongoing work underlines the importance of methodological advancements in ensuring high-quality, comparable data across studies and is a key area where collaboration within PRIORITY is driving progress.



# Instrumentation, modelling, data evaluation, software, and analytical procedures

### Subgroup 1 – Microscopy (optical, fluorescence)

**Leader**: Inta Dimante-Deimantovica, Agency of Daugavpils University "Latvian Institute of Aquatic Ecology", Latvia

### Subgroup 2 – Microscopy (nanoscale)

**Leader**: Gregor Hlawacek, Helmholtz-Zentrum Dresden-Rossendorf, Germany

### Subgroup 3 – Spectroscopy (IR/Raman)

Leader: Maria Laura Santarelli, Sapienza Università di Roma, Italy

### Subgroup 4 – Pyrolysis and GC/MS

**Leader**: Laurent Lemee, Institut de Chimie des Milieux et Matériaux de Poitiers [IC2MP], France

### Subgroup 5 – Modelling & Data Evaluation

Leader: Arianna Varrani, Institute of Geophysics Polish Academy of Sciences, Poland

### Training school

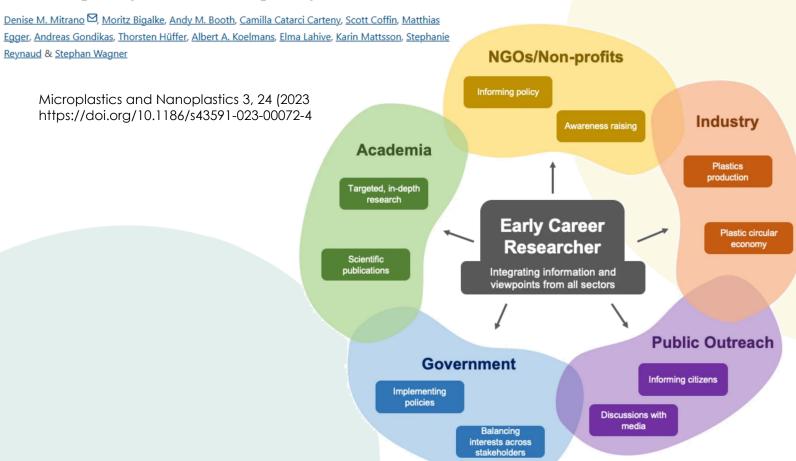
The Training School "Recent Trends in Microplastic Research" 22.-25.5.2023, Leibniz IPHT Jena, Germany had 73 participants, included 12 + 4 lectures and more than 60 poster pitch talks / poster session. Beside on-site lectures/posters/hike, and an excursion to the Research Center Rossendorf / Dresden was organized.





### Perspective paper

Perspective Open access | Published: 01 November 2023 Training the next generation of plastics pollution researchers: tools, skills and career perspectives in an interdisciplinary and transdisciplinary field



### Training school

Training School "Workshop for Early Career Researchers: Best Practices and Expert Insights" – 13-17 June 2022, Athens. The overarching goal of this conference was to increase interaction between students (PhD candidates, early-stage Postdocs) and field-leading experts, through a series of novel and targeted interactive development and break-out sessions, with active participation of a wide variety of scientists from different backgrounds.







## Remediation, recovery and development of sustainable alternative to plastic materials

### Subgroup 1 – Mitigation approaches

**Leader**: Patricia Garcia-Muñoz, Universidad Politécnica de Madrid, Madrid, Spain

### **Subgroup 2 – Detection procedures**

**Leader**: Carlos Espinoza-González, Centro de Investigación en Química Aplicada, Saltillo, México

### Subgroup 3 – Analytical tools

**Leader**: Marco Milanesio – Università del Piemonte Orientale, Italy

### Publications – in progress

- Position paper on the application of the Directive 2018/852 and other legal bodies aiming at reducing the load of plastics leaking to the environment. The idea and the roadmap was from Roberto Rosal, Stakeholders Engagement Coordinator and it was shared with WG5 representatives.
- Open Letter Format in OPEN RESEARCH EUROPE containing the outcomes of the WG5 3rd meeting. The idea and the roadmap was from Carlos Espinoza González.

### Training school

The Training School "Micro and nanoplastic pollution: detection and mitigation, present and future challenges", associated to the 3<sup>rd</sup> International Conference on Microplastic Pollution in Mediterranean Sea, µMED (28-30 September 2022, Naples, Italy), has offered an overview on methods and techniques under investigation to early career researchers, to allow them to develop innovative solutions to detect and mitigate microplastics contamination.





### Metrology and standardization

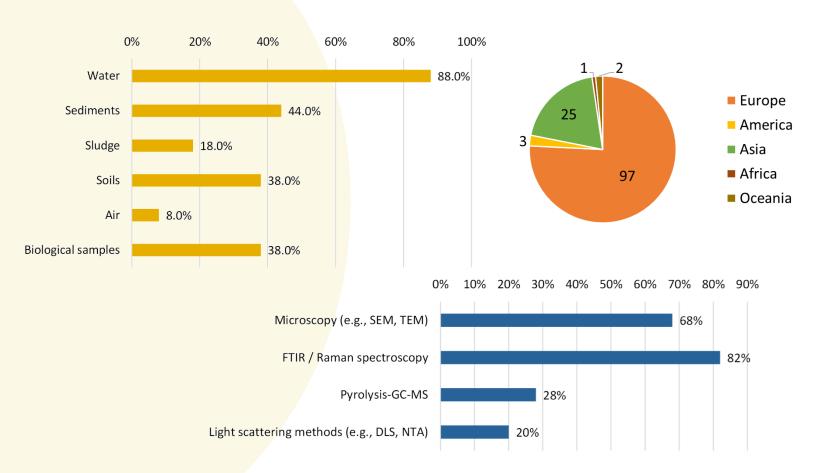
### Round Tables on Microplastic Standardization

Organization and participation in two round tables between PRIORITY and representatives of national metrological institutions (NMI) and other international standardization bodies with the aim of harmonizing the activities of PRIORITY and NMIs' projects. The two meetings took place at INRiM (Italian National Metrology Institute, Turin, Italy, 10/2022) and BAM (Federal Institute for Materials Research and Testing, Berlin, Germany, 05/2023), respectively.



### Survey on Interlaboratory studies

Survey among PRIORITY participants, gathering insights on past, ongoing, and future perspectives on interlaboratory studies (ILSs).



### Perspective paper – in progress

Perspective letter outlining recommendations for designing new interlaboratory studies. This publication will aim to address the existing challenges in harmonizing measurement techniques and provide guidance for future studies, helping ensure more robust and reliable data across the field of microplastics research.

### Microplastic Days

### MICROPLASTICDays – 1st edition

Faculty of Chemistry and Chemical Technology, Ljubljana (Slovenia), 16-18 April 2024

The event began with a training day focused on the basic concepts of metrology and standardization, specifically designed for young researchers. The second day featured a seminar on metrology and standardization, both sessions co-organized by the COST Action PRIORITY. The third day was dedicated to a seminar on current trends in microplastic research.

MICROPLASTICdays 2024 was held in a hybrid format, bringing together approximately 70 in-person participants and 200 online attendees from over 30 countries.



### MICROPLASTICDays – 2<sup>nd</sup> edition

Faculty of Chemistry and Chemical Technology, Ljubljana (Slovenia), 25-27 March 2025

Three-day event dedicated to fostering collaboration and advancing knowledge in the field of microplastic research. The first day was dedicated to seminar on current and future metrology and chemometrics in microplastics research, co-organized by COST Action PRIORTIY. The second day was time for series of lectures on advances in microplastic research and also opportunity for young researchers to present their research work. On the last day we organized open laboratory day at UL FKKT where different methods for microplastic characterization in laboratory research were demonstrated.

MICROPLASTICdays 2025 was held in a hybrid format, bringing together 110 inperson participants and 250 online attendees from 37 countries.





## Develop new strategies to increase the synergies with society and education

### Subgroup 1 – Boardgames for educative purposes

**Leader**: Ricardo João Ferreira Simões, Faculdade de Engenharia d<mark>a Universidade do</mark> Porto, Portugal

### Subgroup 2 - Science communication group

### Subgroup 3 - Citizen science



Activities with schools

# Frontiers for Young Minds Core Concept Chemistry and Materials Published: October 24, 2024

## Exploring the Tiny World of Microplastics in Your Own "Lab"

Paper in Frontiers for Young Minds

Submit your research



Akshara ? Mahya



Articles

young readers to the science of microplastics through hands-on experimentation and accessible explanations. Written by members of the COST Action PRIORITY, it combines environmental education with citizen science, encouraging children and families to become "environmental detectives." The article highlights key scientific tools, such as microscopy, spectroscopy, and chemical analysis, while promoting awareness of plastic pollution and its global impact. By fostering curiosity, collaboration, and responsibility, this outreach initiative reflects the Action's commitment to open science, inclusiveness, and the engagement of future generations in tackling environmental challenges.

This article introduces



Engage the public in scientific research,

gathering data in a way that is

accessible and

impactful.

Plogging with kids

## NINA: The Catrina Made from Domestic Dryer Lint

The Catrina is one of the most iconic figures in Mexican culture. She was first drawn by José Guadalupe Posada, a Mexican printmaker and cartoonist, to criticize people who adopted European styles while ignoring local roots and social inequality. Later, the muralist Diego Rivera dressed her in elegant clothes in his artwork Dream of a Sunday Afternoon in the Alameda Central, transforming her into a national symbol of Mexican identity and reflection.

NINA – our handmade Catrina – carries a new message. Just like the original, she reveals injustice: this time, environmental injustice. Made from dryer lint, she shows how everyday pollution from homes with greater access to technology can affect communities near landfills, and eventually, the environment we all share.

Created by Carlos Espinoza-González

Hat — "The Elegance of Ignorance"

A fashion symbol for those who wanted to appear wealthy. In NINA, it symbolizes those who have more: access to tumble dryers, fast fashion, and convenience – but often ignore the pollution left behind.

Bones — "The Ones Who Bear the Weight"

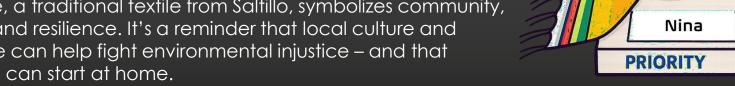
Her bones are shaped from plastic and lint, representing communities who suffer the most: people living near landfills, rural areas, or polluted zones. They are exposed to microplastics in the air, water, and food – despite contributing the least to the problem.

Dress — "The Threads of Consumption"

Made entirely of dryer lint, her dress shows how everyday choices – washing synthetic clothes, using dryers – release microplastics into the environment. It's beautiful, but it's also a warning: what looks harmless can be harmful.

Sarape — "The Shield of Identity and Resistance"

Her sarape, a traditional textile from Saltillo, symbolizes community, heritage, and resilience. It's a reminder that local culture and knowledge can help fight environmental injustice – and that awareness can start at home.





PRIORITY



### Diversity, Equality, and Inclusion Group

The primary objective of the DEI (Diversity, Equality, and Inclusion) group is to promote diversity, equality, and inclusion within the COST PRIORITY framework.

The inclusion policy of this project unfolds along three key dimensions of diversity:

- Geographical distribution;
- Career stage: involvement of young researchers;
- Gender balance.

Equality Manager: Mariasole BANNÒ

Equality Advisor: Camilla Federici

### Subgroup 1 – Network facilitation

Subgroup 2 – Research enrichment: through awareness-raising and educational activities on diversity, equality, and inclusion

Subgroup 3 – Communication and dissemination: through the creation of a Newsletter and useful content to be published on the website

### Newsletter "Small Particles, Big Issues: PRIORITYze DEI"



The Diversity, Equality, and Inclusion (DEI) aroup launched a series of 42 short newsletters, titled "Small Particles, Big Issues: PRIORITYze DEI" aimed at raising awareness on inclusiveness and equity in scientific research. Distributed regularly to all Action members, each issue highlights specific topics such as gender balance, geographical representation, and career-stage diversity, providing evidence-based insights, reflections, and practical recommendations to promote a more inclusive research culture. This initiative has fostered dialogue and self-reflection among researchers, supporting the Action's broader commitment to fairness, openness, and diversity in science.

## Workshops "Diversity Equity and Inclusion in research: a COST Action workshop for strategies in STEM disciplines"

1st online workshop: 22 January 2024

2<sup>nd</sup> online workshop: 23 July 2024





## Full Action Meetings

### 1st Full Action Meeting

University of Brescia, Italy, 4-6 July 2022



### 2nd Full Action Meeting

Brussels, Belgium, 19-21 September 2023



### 3rd Full Action Meeting

University of Novi Sad, Serbia, 18-21 June 2024



### Grants

### Short Time Scientific Missions (STSMs)

Short Term Scientific Missions (STSM) are exchange visits aimed at supporting individual mobility, strengthening existing networks and fostering collaboration between researchers.

- To consolidate existing networks and to create new ones, through joint research, submission of collaborative proposals, writing of manuscripts, organization of conferences/workshops or schools, etc.
- To facilitate the transfer of knowledge and the training to new techniques, research equipment, etc.
- To provide opportunities for career development for Researchers, through their mentoring by qualified researchers.

During the four years of PRIORITY, a total of 77 STSM grants have been awarded.

# Young Researcher and Innovator Conference Grants

YRI Conference grant funds a presentation by a Young Researcher and Innovator in a high-level conference fully organized by a third party, i.e. not organized nor co-organized by the COST Action.

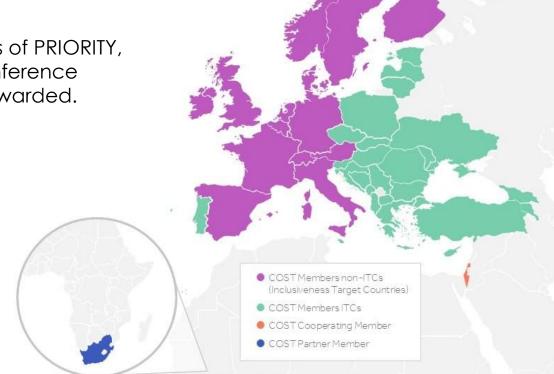
 To support Young Researchers and Innovators to establish a strong network and increase their visibility in the research community through sharing their work and to gain knowledge.

### ITC Conference Grants

ITC Conference Grants aim at supporting Action Participants affiliated to a legal entity located in an Inclusiveness Target Country (ITC) or Near Neighbour Country (NNC) to attend and present their work within the scope of the Action in international science and technology related conferences not specifically organized by the COST PRIORITY, specifically with an oral presentation.

- To support Action Participants affiliated in an Inclusiveness Target Country (ITC) or Near Neighbour Country (NCC) to establish new contacts for future collaborations.
- To support them to develop a strong network and to increase their visibility in the research community through sharing their work and to gain knowledge.

During the four years of PRIORITY, a total of 51 ITC Conference grants have been awarded.





### **Dissemination Conference Grants**

Dissemination Conference Grants support the participation of Action participants to high-level conference to present the work of the Action.

- To increase the visibility of the Action in the research community, and to contribute to increasing visibility of the presenter.
- To attract additional participants and stakeholders by facilitating the dissemination of Action results to relevant end-users at high profile Conferences in the field on a topic relevant to the Action.

During the four years of PRIORITY, a total of 7 Dissemination Conference grants have been awarded.

### Virtual Mobility Grants

Virtual Mobility Grant is a financial contribution of up to €1,500 for virtual collaboration within a COST Action to exchange knowledge or learn new skills.

- To support capacity building and transfer of knowledge through bilateral/multilateral collaborations;
- To support specific / general topic that can help achieving the Action MoU objectives and deliverables (research coordination);
- To establish new collaborations or reinforce existing collaborations across disciplines and different sectors.

During the four years of PRIORITY, a total of 6 Virtual Mobility grants have been awarded.



## **Training Schools**

 Micro and nanoplastic pollution: detection and mitigation, present and future challenges

Partenope Congress Centre Naples (Italy), 28-30 September 2022

This School offered an overview on methods and techniques under investigation to detect and monitor the presence of microplastics in all environmental compartments to early career researchers, to allow them to develop innovative solutions to detect and mitigate microplastics contamination.



### 2. Recent Trends in Microplastic Research

Leibniz Institute of Photonic Technology, Jena (Germany), 22-26 May 2023

The School is framed in PRIORITY Working Group WG3, dedicated to instrumentation, modelling, data evaluation, software, and analytical procedures.

### Scientific topics:

- Experimental design
- Fluorescence microscopy, development of staining protocols
- Vibrational spectroscopy
- Advanced Imaging
- Automated data analysis

Extra activities: Poster sessions, Lab tours, Mindfulness Training, Excursion to Dresden, Networking activities



### 3. Chemometrics for microplastics detection and monitoring

University of Brescia, Brescia (Italy), 16-18 June 2025

This training school introduces chemometric techniques for microplastic research, equipping participants with essential tools for data analysis and interpretation.

#### Scientific topics:

- Introduction to Chemometrics, Data Structure, Data preprocessing, Principal Component Analysis (PCA)
- Hyperspectral imaging (HSI), Supervised quantitative modelling (regression)
- Partial Least Squares (PLS), Supervised qualitative modelling (classification)

Extra activities: Elevator Pitches, Networking activities



## 4. Micro and nanoplastic pollution: detection and mitigation, present and future challenges

Athens (Greece), 13-17 June 2022

### Scientific topics:

- Key-note lectures by experts highlighting the state of the art in the field
- Interactive sessions between students and experts for more in-depth scientific discussions and increased networking amongst participants
- Student development sessions, where lectures are given to help students have the information and tools they need to work in the field of academic science.

### 5. MICROPLASTICDays

1<sup>st</sup> edition, Ljubljana (Slovenia), 16-18 April 2024

2<sup>nd</sup> edition, Ljubljana (Slovenia), 25-27 March 2025

#### Scientific topics:

- Preparation and characterization of micro- and nanoplastics
- Monitoring micro- and nanoplastics
- Fate and impact of micro- and nanoplastics
- Solutions for tackling microplastic and plastic pollution

3<sup>rd</sup> edition, in program, 03-05 February 2026



## Small training days

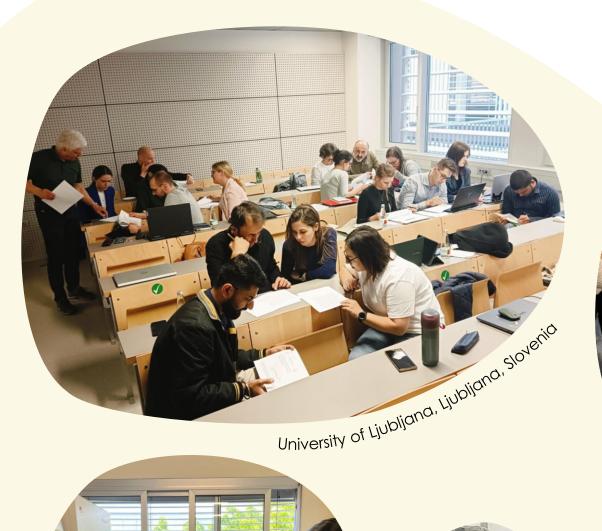
The initiative offered specialized, interactive, and targeted learning opportunities through a series of small-scale events of 1-2 days tailored to the specific needs of each Working Group.

- 13 events successfully organized
- 160 participants in total
- 44 trainers
- 116 trainees

Wide geographical spread across COST countries, reflecting the inclusiveness and diversity of PRIORITY network.

Each event provided a high-impact learning experience, enabling participants to develop new skills, exchange ideas, and build long-lasting collaborations within a focused and interactive environment.









## Networking activities

### Connecting PRIORITY with other MNPs projects consortiums

. PlasticsFatE Round Table

Gabriela Kalcikova
WGs collaboration
coordinator

Road

Frankfurt, Germany, 28.1. 2025

PlasticsFatE

Challenges

Discussion with other project members





Establishment of new scientific consortiums

2. PLASTICS EUROPE, Microplastics Scientific Workshop 2025

Vienna, Austria, 10.5. 2025



3. SETAC – Advancements in Technologies and Reference Materials for Nanoplastic Detection: Innovation and Future Perspectives

Vienna, Austria, 12.5. 2025
Connecting to researchers from PlasticTrace









### Mentor-Mentee Program



Fostering Diversity and Inclusion through a Structured Mentor-Mentee Program

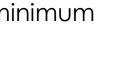
Initiative organized by the Diversity, Equity, and Inclusion (DEI) group.

More than 40 participants.



## Guidelines for publications – in progress

Creation of a committee to establish minimum requirements for publications.



This idea emerged following discussions with several journal editors and reviewers, who raised concerns about the consistency and quality of microplastics research publications.

While some felt that strict publication requirements might be too rigid, there was a shared interest in developing a flexible approach – guidelines that

could serve as recommendations rather than hard-and-fast rules. These guidelines would provide editors and reviewers with a tool to ensure a certain level of consistency and quality in submissions, while also giving them the flexibility to propose these standards to authors.

> The goal is to create a set of minimum standards for publications that editors and reviewers can use as a reference. Rather than imposing these requirements, the guidelines would allow for constructive suggestions, helping improve the overall quality of research outputs while maintaining a collaborative and supportive approach.



## Instagram takeover

An initiative for shedding light on STSMs. The grantees have shared their activities in the laboratory and their experiences at the host Universities on the PRIORITY Instagram page.













nu Kaluc

Inta Dimante Deimantovica Latvian Institute of Aquatic Ecology

Catalan Institute for Water Research (Spain)

## PRIORITY CA Final Conference

Technical University of Leoben – Montanuniversität, Austria, 2-5 September 2025





### More than 140 abstracts received

More than 40 oral talks and 40 posters

Participants from 37 Countries







