EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

Brussels, 25 May 2021

COST 041/21

DECISION

Subject: Memorandum of Understanding for the implementation of the COST Action “Plastics monitoRIng detectiOn RemedIaTion recoverY” (PRIORITY) CA20101

The COST Member Countries will find attached the Memorandum of Understanding for the COST Action Plastics monitoRIng detectiOn RemedIaTion recoverY approved by the Committee of Senior Officials through written procedure on 25 May 2021.

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MEMORANDUM OF UNDERSTANDING

For the implementation of a COST Action designated as

COST Action CA20101
PLASTICS MONITORING DETECTION REMEDIATION RECOVERY (PRIORITY)

The COST Members through the present Memorandum of Understanding (MoU) wish to undertake joint activities of mutual interest and declare their common intention to participate in the COST Action, referred to above and described in the Technical Annex of this MoU.

The Action will be carried out in accordance with the set of COST Implementation Rules approved by the Committee of Senior Officials (CSO), or any document amending or replacing them.

The main aim and objective of the Action is to develop a collaborative and multi-disciplinary network of international scientists and experts with competences on issues related to micro and nanoplastics (N/MPs), with specific targets of health and environmental concerns. This will be achieved through the specific objectives detailed in the Technical Annex.

The present MoU enters into force on the date of the approval of the COST Action by the CSO.

OVERVIEW

Summary
The "Plastics monitoRIng detectiOn RemedIaTion recoverY - PRIORITY" Action aims to develop a research network focused on developing, implementing, and consolidating strategies to tackle the global challenge of micro- and nano-plastics environmental pollution.

The Action will create a broad and skilled transdisciplinary network to establish a 360-degree view combining the partners' expertise in chemistry, physics, life science, engineering, standards, economy, and law. This network will maximize the European competitiveness in creating 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 remediation and recovery of the environment. The scientific community, economy and all the European citizens will benefit from the outcomes of the activities.

One of the targets is the harmonization of the European regulation associated with microplastics related issues. The Action will then support European Commission regulations organisms in critical aspects of environmental and ecosystems protection, food safety, and life science.

Areas of Expertise Relevant for the Action	**Keywords**
● Environmental engineering: Water pollution ● Earth and related Environmental sciences: Environment chemistry	● microplastics ● nanoplastics ● monitoring ● detection ● remediation

Specific Objectives
To achieve the main objective described in this MoU, the following specific objectives shall be accomplished:

Research Coordination
● Sharing the state-of-the-art based on the competences and know-how of the participants about the multifaceted N/MPs issues, as monitoring, sampling, extraction, analytical protocols, studies of the interactions with biome, definition of remediation and recovery strategies.
● Coordinating inter-laboratory studies and joint projects involving European and International researchers of representative critical classes of materials/goods with relevant interest for the stakeholders (for example: fractions of fragments, specific matrices, etc.).
● Comparing and to assess models for experimental data fitting simulations to understand the crucial factors and their effects on the analysis results, and assessment of the related software/algorithms used for data analysis; exploring the possibility to exploit chemometrics tools and machine learning algorithms.
● Assessing sampling, extraction and sample preparation methodologies and protocols, highlighting advantages, disadvantages, and possible applications in the different environmental compartments.
● Coordinating the European Expert:
- to establish a reference Committee to assist decision-makers, stakeholders, citizens that face N/MPs

issues;
- to improve theoretical and practical knowledge;
− to favor access to available EU infrastructures and eventually to propose new specific facilities;
− to collaborate with experienced research groups and companies.
● Supporting the Standardization Bodies and the Metrological Institutes in the identification of the most critical issues and to the development of standard and technical reports.
● Favoring the cooperation among the private and public organizations to foreseen novel solutions for the plastic removal.
● Collecting the scientific results related to N/MPs and organizing them in an open access database, and disseminating research achievements and the Action activities to the general public
● Promoting the participation of the European Infrastructure to the research.
● Promoting the development of protocols and standards to support the normative of the EU Countries related to N/MPs issues

Capacity Building
● Training of European stakeholders to lead a homogeneous approach to MPs issues, to assess and improve the knowledge and standardized the methodologies and the techniques for monitoring, sampling, extracting and detecting N/MPs, to define efficient strategies for N/MPs removal and recovery.
● Training of European public and private stakeholders to establish a shared analytical pathway for the NPs issues, through the use of reliable reference materials, to develop new extraction techniques and to assess ecotoxicology tests.
● Acting as a stakeholder platform at the trans-national level on the topic, to critically analyse the scientific literature and know-how about N/MPs, in environmental, biological, and life science fields, and act as a reference point for infrastructures, research groups, manufacturers, decision-makers and the general public.
● Increasing capability in European and selected developing countries in the study of N/MPs environmental pollution, by fostering the knowledge exchange and the development of a joint research agenda around the most scientifically and socio-economically relevant topics of N/MPs.
● Connecting and strengthening collaborations among outstanding European and international scientists and experts, not only chemists, physicists, engineers and life scientists, but also economists, lawyers and communicators to achieve a joint research agenda and create a consortium with transversal competences in which interdisciplinary research can be designed.
● Involving in this Action COST ITC, newly established research groups, teams from countries with less capacity, and assuring the gender balance, enabling a uniform access to scientific and technological knowledge, to address vulnerabilities, and enhance knowledge sharing.
● Support ECIs, women and researchers from ITC by enabling them to take leading roles within the Action and the research framework. A network will be created where interdisciplinary collaborations and working opportunities can be developed.

TECHNICAL ANNEX

1. S&T EXCELLENCE

1.1 Soundness of the Challenge

1.1.1 DESCRIPTION OF THE STATE-OF-THE-ART

The production, demand and waste of plastics has grown exponentially starting in the last century. Owing to factors such as light weightiness, high strength to weight ratio, low-cost and durability, plastic, until now considered bioinert and harmless, has displaced and replaced many conventional materials like glass, wood, paper, or stone, leading to rise in its production from 1.7 million tons in 1950 to 359 million metric tons in 2018. Europe accounts for 17% of the total plastic production and this number is expected to double in the next ten years [1]. Only a small percentage (~9%) of the total production is recycled and the rest ends up as trash [2]. Plastic waste is discarded either in water bodies, natural environments, open landfills or dumps. The worldwide coronavirus emergency will make it even worse. Indeed, the international press has outlined the dramatic impacts of the protective equipment, as disbanded gloves and masks.

Discharged plastic litter in the environment is subjected to degradation due to the effect of heat, UV radiation, atmospheric oxidation and mechanical degradation leading to its fragmentation into small particles called microplastics (MPs). MPs formed due to natural weathering processes are termed as secondary MPs, while when these are synthesized in industries in form of microbeads, micro flakes, or nurdles for use in various products such as cosmetics or air blasting technology, they are then called primary MPs. The generation of secondary tiny plastic fragments and human exposure to them is a major cause for concern nowadays, and there is already some evidence of risks for human health [3].

The ubiquitous distribution of plastics and MPs and their resistance to biological and chemical decay has adversely affected the environment, especially marine life. According to a report published by the International Union for Conservation of Nature (IUCN 2018) [4], at least 8 million tons of plastic makes its way into the oceans every year, constituting 80% of the total marine garbage, and marking their presence from limnic waters to deep sea sediments. Out of the plastic litter entering the oceans, the plastic material in the form of MPs is of utmost importance to study, in particular due to the bioavailability of these tiny particles to aquatic animals and their large surface area which facilitate the waterborne pollutants to be adhered to them. Macro sized litter (> 5mm) accounts for a major portion of plastic in the marine environment by mass (kg/km2) but micro sized debris is responsible for a larger proportion by number i.e. items/km2 (GESAMP) [5]. Different studies demonstrated that blue mussels collected in Mediterranean Sea contained 0.2-0.5 MPs/g [6]. The negative effect of MP is not only limited to physical parameters but extends to chemical factors due to their ability to adsorb and accumulate contaminants such as Persistent Organic Pollutants (POPs) through the process of partitioning [7]. Authors reported that plankton mixes with these small particles, thus making differentiation more complex and ingestion possible [8, 9]. A study carried out on birds in China reported that 28 fragments found in the terrestrial birds were that of MP ranging in size from 0.5 to 8.5 mm [10].

The route of degradation of macroplastics debris does not end up at the microscale, but continues down to the nanoscale range. Weathering-related degradation results in a progression of changes: the loss in mechanical integrity, embrittlement, degradation, and fragmentation into smaller pieces. The pathway depicted expects also a further degradation by microbial action, that is termed biodegradation. Once biodegradation is complete the plastic is said to have been mineralized: converted into carbon dioxide, methane, water and other naturally occurring compounds, dependent on the surrounding environmental conditions. In this scenario, another group of plastic debris, called nanoplastics (NPs), has gained attention. The term “nanoplastics” is still under debate, but generally used to indicate plastic fragments smaller than 100 nm; however, some authors prefer to include all fragments below one micrometer.

NPs show characteristics of the nano-size range, meaning the high surface area and enhance reactivity. Interactions and effects on living organisms can be completely different: nanoparticles, as expected, are more toxic to cells, overcoming biological barriers and causing oxidative stress and cell death. It is reasonable to hypothesize that NPs may represent a major concern for the environment and human health. However, there is still poor knowledge on NPs toxicity due to the size that makes their isolation from the environment challenging as well as their characterization.

1.1.2 DESCRIPTION OF THE CHALLENGE (MAIN AIM)

Nano- and microplastics (N/MPs) environmental pollution poses serious challenges. Scientists, risk-managers and, above all, decision-makers and politicians are strongly asked to deal with, while citizens must be aware of the risks for the environment and the human health and, eventually, be protagonists of the required social changes.

In 2011 the United Nations Environment Programme (UNEP) declared plastic a worldwide pollutant. From then on, the number of scientific publications and data have grown exponentially. To understand the real impacts and to validate the alternatives and solutions of the related issues at the European level are mandatory for the decision-makers. The scientific community has the responsibility to furnish homogenous and comparable data, based on harmonized standards and protocols. The only way to achieve this result is through extensive networking among researchers with the involvement of the industrial experts.

Recently, ISO has defined MPs and NPs [11]. However, much work is still required, and researchers of the field urgently need an action where to share and compare their knowledge and findings.

Indeed, the general objective of the Action (“Plastics monitoRIng detectiOn RemedIaTion recoverY - PRIORITY”), is to develop a collaborative and multi-disciplinary network of international scientists and experts with competences on N/MPs issues, with the specific targets of health and environmental concerns. This platform will broadly disseminate gathered scientific knowledge, discuss yet unmet characterization needs, promote innovative solutions via process analytical technologies, design of experiments, and quality by design protocols. PRIORITY will empower the scientists in maximizing the potential outputs in the research on N/MPs not only for scientific or technological purposes, but also for social and economic matters, enhancing European general competitiveness in this very global hot topic.

The support of this COST action is compulsory to foster networking and knowledge sharing, supporting activities such as meetings, training schools, conferences, and workshops, international interlaboratory and proficiency tests, and exchange visits of researchers (Short Term Scientific Missions, STMS).

In this Action, experiences and data will be shared among the European and the International Partners. Based on the interlaboratory tests and the best available know-how, protocols will be assessed and proposed as new CEN or ISO standards. Indeed, standards are needed to collect reliable data and to understand each specific environmental and health issue as well as to assess the most appropriate solutions.

Very important, the know-how shared among the experts will be spread to the European decision-makers and citizens though clear Layman's reports, that will be published periodically and advertised on the website.

The participation of experts from different industrial sectors will allow defining feasible and sustainable solutions to the issues related to MPs as well as to explore new technical opportunities, such as, for example, biodegradable plastics.

1.2 Progress beyond the state-of-the-art

1.2.1 APPROACH TO THE CHALLENGE AND PROGRESS BEYOND THE STATE-OF-THE-ART

The word "plastic" includes a large number of different classes of polymers and additives with dramatically diverse chemical and physical properties as well as unnumbered, too often disposable, goods.

The over 10 million tonnes of plastic that go into the oceans each year are creating a unique environmental emergency. Managing and forecasting the related issues are among the most challenging tasks in our future. The decision-makers urgently need fair metrics to guide and prioritize actions at several levels, from sustainable product design and efficient regional infrastructure to suitable policies and enforcement. Indeed, today they are often making decisions in highly uncertain situations. It should be considered that plastic often presents far more environmental benefits than drawbacks.

Science teaches that we can understand and manage questions only when we can adequately define and measure the proper parameters. Thus, efficient metrics valuing plastic pollution must be identified, and to guide sound eco-design and waste management policies.

In the last few years, a large amount of resources has been allocated to research projects, improving the know-how on the occurrence of MPs in different environmental compartments and preliminary risk assessments have been performed. However, this research area needs specific technological developments since it cannot only be based on traditional approaches. The development of techniques and concepts primarily requires coordination and harmonization among researchers with very different competencies and public and private stakeholders. An important focus will also be the assessment of sustainable and biodegradable polymers with respect to their persistence in the environment.

In PRIORITY we propose to define and appraise the issues related to N/MPs pollution with the final aim of aiding the development of effective mitigation strategies to prevent the related hazards to humans and environments. Indeed, N/MPs can endanger because of their inherent properties (i.e., molecular composition, additives, size and shape, manufacturing processes) or because of environmental factors (temperature, salinity, the presence of other pollutants or microorganisms).

In the last few decades, an impressive number of research papers and reviews have been published regarding N/MPs, mainly:

- to quantify their presence in all environmental compartments;
- to evaluate their effects and risks for aquatic and terrestrial biome;
- to assess their bioaccumulation and the effects of associated chemicals;
- to model their environmental behaviour.

Despite a large number of reports and on-going projects, several gaps and uncertainties exist and, in many cases, this affects the relevance and the reliability of the data. First of all, the lack of harmonization and standardization of sampling and analytical methods makes it difficult to compare different studies. Therefore, even basic information like actual exposure in environmental compartments becomes questionable.

The objective of PRIORITY is to fill the knowledge gaps and to deal with the controversial points related to N/MPs issues based on a clear picture of the research needs and the coordination of the research efforts.

On end, PRIORITY will allow Europe to define appropriate common policies to handle M/NPs issues, increasing the capability to develop risk mitigation measures.

1.2.2 OBJECTIVES

1.2.2.1 Research Coordination Objectives

Through PRIORITY, European and not European research groups working on N/MPs will create one transnational team, thus supporting the sharing of the know-how and the discussion on future challenges in the field of environmental plastic litter. All the following listed specific objectives cannot be achieved without international coordination:

- Sharing the state-of-the-art based on the competences and know-how of the participants about the multifaceted N/MPs issues, as monitoring, sampling, extraction, analytical protocols, studies of the interactions with biome, definition of remediation and recovery strategies.
- Coordinating inter-laboratory studies and joint projects involving European and International researchers of representative critical classes of materials/goods with relevant interest for the stakeholders (for example: fractions of fragments, specific matrices, etc.).
- Comparing and to assess models for experimental data fitting simulations to understand the crucial factors and their effects on the analysis results, and assessment of the related software/algorithms used for data analysis; exploring the possibility to exploit chemometrics tools and machine learning algorithms.
- Assessing sampling, extraction and sample preparation methodologies and protocols, highlighting advantages, disadvantages, and possible applications in the different environmental compartments.
- Coordinating the European Experts:
    - to establish a permanent reference Committee to assist and advise decision-makers, stakeholders, and citizens that face N/MPs issues;
    - to improve the theoretical and practical knowledge;
    - to favour the access to the available EU infrastructures and eventually to propose new specific facilities;
    - to collaborate with experienced research groups and companies.
- Supporting the Standardization Bodies and the Metrological Institutes in the identification of the most critical issues and to the development of standard and technical reports.
- Favouring the cooperation among the private and public organizations to foreseen novel solutions for the plastic removal.
- Collecting the scientific results related to N/MPs and organizing them in an open access database, and disseminating research achievements and the Action activities to the general public.
- Promoting the participation of the European Infrastructure.
- Promoting the development of protocols and standards to support the normative of the EU Countries related to N/MPs issues.

1.2.2.2 Capacity-building Objectives

- Training of European stakeholders to lead a homogeneous approach to MPs issues, to assess and improve the knowledge and standardized the methodologies and the techniques for monitoring, sampling, extracting, and detecting N/MPs, to define efficient strategies for N/MPs removal and recovery.
- Training of European public and private stakeholders to establish a shared analytical pathway for the NPs issues, through the use of reliable reference materials, to develop new extraction techniques and to assess ecotoxicology tests.
- Acting as a stakeholder platform at the trans-national level on the topic, to critically analyse the scientific literature and know-how about N/MPs, in environmental, biological, and life science fields, and

act as a reference point for infrastructures, research groups, manufacturers, decision-makers and the general public.

- Increasing capability in European and selected developing countries in the study of N/MPs environmental pollution, by fostering the knowledge exchange and the development of a joint research agenda around the most scientifically and socio-economically relevant topics of N/MPs.

- Connecting and strengthening collaborations among outstanding European and international scientists and experts, not only chemists, physicists, engineers, and life scientists, but also economists, lawyers and communicators to achieve a joint research agenda and create a consortium with transversal competences in which interdisciplinary research can be designed.

- Involving in this Action COST ITC, newly established research groups, teams from countries with less capacity, and assuring the gender balance, enabling a uniform access to scientific and technological knowledge, to address vulnerabilities, and enhance knowledge sharing.

- Support ECIs, women and researchers from ITC by enabling them to take leading roles within the Action and the research framework. A network will be created where interdisciplinary collaborations and working opportunities can be developed.

2. NETWORKING EXCELLENCE

2.1. Added value of networking in S&T Excellence

2.1.1. ADDED VALUE IN RELATION TO EXISTING EFFORTS AT EUROPEAN AND/OR INTERNATIONAL LEVEL

Several independent initiatives have been promoted at the European and international level facing above mentioned challenges. European SAPEA organization produced a review report about current evidence on health, environmental and societal impacts of N/MPs pollution (SAPEA 2019). The international GESAMP (Group of Experts on the Scientific Aspects of Marine Environmental Protection) non-profit organization conducted a global assessment about the sources, fate, and effects of MPs in the marine environment (GESAMP 2016, GESAMP 2019). JPI Oceans projects are ongoing focusing on plastic research. Specific Horizon 2020 calls have been launched under the Work Program 2018-2020 (Food security and Environment Programmes). Pre-normative and standardization activities have been carried out. For example, a new VAMAS project is dedicated to develop guidelines for defining reference materials for plastic degradation in marine environments. Standardized methods to assess hazard, e.g., OECD guidelines, have been developed for conventional chemicals, which differ substantially from “novel” materials, posing testing challenges and represent a work in progress, where optimization is required. Efforts have been ongoing for materials like nanomaterials, e.g., nanobiomaterials, nanoplastics, where many lessons can be learned from the nanotoxicity area, which conveys materials with a physical dimension. Currently there are a number of recommendations for adaptation of OECD guidelines that can be transferred to the plastics testing. Likewise, the issue of micro- and nano-scaled plastics has also been considered in recent proposals for REACH. Secondary proposers involved in PRIORITY are part of several ongoing projects, including EU-H2020, where state of the art is up to date and can ensure a smooth integration and progress.

PRIORITY will benefit from the experience, knowledge and know-how of the established networks gathering them to fulfil the objectives, some bridges will be built between these networks, e.g. to facilitate standards and good laboratory procedures via targeted methodologies needed by domains of applications. The integration of active participants of already existing networks in this Action will allow for rapid exchange of the state of the art, immediate operability, and will define both the common and separated challenges which can be tackled by the most relevant experts in the consortium. The interaction among Working Groups (WGs) will therefore be ensured at the early beginning of the action, emphasising the complementarity of approaches and activities.

The networking tools of PRIORITY, such as WG meetings, STSMs, training schools, and open access publications, will facilitate the progress and development of new knowledge and research exchanges, enabling the former targeted activities to truly develop and achieve maximum effectiveness and providing a boost for new ones. All the participant countries will take advantage of the knowledge and experience of the PRIORITY network individually but also as a whole, being composed by several participants with experience in different topics. The open, bottom-up and inclusiveness character of the participation framework offered by COST will allow to run PRIORITY in an effective way. This specificity also allows a wide participation of Academia, Metrology institutes and industries, which will enhance European research and innovation capacities to achieve.

2.2. Added value of networking in Impact

2.2.1. SECURING THE CRITICAL MASS AND EXPERTISE

The network of the 85 proposers of this Action is mainly made by Higher Education & Associated Organisations (91.8%), followed by Government/Intergovernmental Organisations except Higher Education (4.7%), Business enterprise (2.4%), and Standards Organization (1.2%). A total number of 78 fully or mostly public Higher Education & Associated Organisations participate, both research oriented (37) and education oriented (41), with 16 different Field of Science: Mechanical engineering (1), Materials engineering (7), Biological sciences (12), Earth and related Environmental sciences (12), Chemical sciences (20), Chemical engineering (7), Environmental engineering (4), Nano-technology (1), Health Sciences (2), Physical Sciences (4), Interdisciplinary (2), Other engineering and technologies (2), other medical sciences (1), Agriculture, Forestry, and Fisheries (1), Clinical medicine (1), and Industrial biotechnology (1). Two large companies in the market sector of Professional, Scientific And Technical Activities. Four Government/Intergovernmental Organizations except Higher Education, three of which are Local Government, and one is Central and Federal Government Organizations. One Standards Regional – non European Organisation with no government membership.

Core Expertise of Proposers is wide, distributed in 6 Sub-Fields of Science: Chemical sciences (23.5%), Earth and related Environmental sciences (18.8%), Biological sciences (16.5%), Materials engineering (8.2%), Chemical engineering (7.1%), and other (26.1%). The network of proposers brings together an international and multi-disciplinary team of highly educated people, with 12 early career investigators. A good gender balance is achieved with 54.1% Males and 45.9% Females.

The geographical distribution and the expertise of the participants are wide, and the large participation of the experts with different backgrounds guarantees that the most appropriate solutions will be identified for all the multifaceted issues previously mentioned. Overall, the proponents are young, confirmed scientists as well as established mature experts. Then, the network can benefit from fresh approaches and, on the other side, from sound experiences regarding the interactions of MPs with all the environments and biomes.

NPs are an emerging and very challenging research topic that requires a genuine interdisciplinary approach. This Action aims to involve the competences from academia, industries, public and private organizations to achieve the most crucial goal of the coming years: to build a sustainable, knowledgeable, and inclusive society.

The majority of the proposers are involved in research activities on N/MPs and many of them are already leaders of international activities. These broad experiences will ensure the proper exchange and synergy within the Action network, and it will allow the consortium to keep abreast of all the significant technological developments and scientific challenges, notably in life and environmental sciences. Geographically, COST has no specific limit as it will support all institutes dealing with N/MPs. Moreover, the action will canvass ITC with less organised networks to help young promising scientists to deal with the environmental challenges related to N/MPs. The competitiveness of EU companies and industries will be boosted by this COST Action, which may result in novel technological approaches.

A wide geographical distribution of Affiliations is present with 21 COST Country Institutions from Albania, Austria, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Ireland, Italy, Malta, Montenegro,

North Macedonia, Norway, Poland, Portugal, Serbia, Spain, Sweden, Switzerland, Turkey, including 52.4% of COST Inclusiveness target countries, 1 Near-Neighbour Country (NNC) Institutions, and 3 International Partner Country. All the participating countries have a stake in the Challenge participating in the network. COST Member Countries have different stakes. Some Countries, that have well-assessed laboratories, aim to improve their cross-national and international collaborations, while others want to improve their scientific and technological knowledge, also having access to instrumentation and high-capacity facilities available in the Consortium.

2.2.2. INVOLVEMENT OF STAKEHOLDERS

The stakeholders include private and public laboratories, equipment manufacturers, environmental protection agencies, NGOs, food producers and consumers associations, cosmetics and pharmaceutical industries, national and international standardization bodies and metrological institutes, European RTDs, the overall scientific community and decision-makers.

The internal network information flow will be considered as a priority; communication among partners will be made easy by the website platform and the use of social networks. In particular, the PRIORITY website will host a restricted area to easily link the partners. WG leaders will address the needs of a specific target and to widen the group to all the potential stakeholders. The website will be a nexus of communication, with user-contributed features ensuring the updating and the feedback of the project activities. To engage end-users, an inclusive approach will be applied. Activities such as workshops and round-robin tests will be organized around the priority challenges defined by the end-users themselves. These activities will evolve during the project, enhancing the collaboration among academia, industry, and regulatory bodies. The continued participation of all the Actors will be actively pursued. The application to STSMs will enable to train, integrate protocols, and harmonize the procedures. The Metrology and Academia Institutes will collaborate developing research through highly multidisciplinary tasks, as well as contributing to the training of the next generation of mindful scientists. On this basis, new project ideas for a future better EU society, more conscious of the environmental issues, will arise and grow in the consortium.

2.2.3. MUTUAL BENEFITS OF THE INVOLVEMENT OF SECONDARY PROPOSERS FROM NEAR NEIGHBOUR OR INTERNATIONAL PARTNER COUNTRIES OR INTERNATIONAL ORGANISATIONS

The Russian Federation participates through a young talented researcher of the Institute of the Earth's Crust, Siberian Branch of the Russian Academy of Science, with experience in chemical and microelement composition of rocks, sediments, and soils, who has just been involved on MPs issues. His main interest is to participate at the training courses and inter-laboratory studies, to exchange the experiences and know-how about environmental concerns related to N/MPs.

India participates through the Centre for Nanobiotechnology, which has recognized experts in MPs exposure issues. In June 2020, the Centre organized the Microplastics 2020 web conference with more than 800 participants from all over the world. The network will highly benefit from its expertise in particular for topics related to the new-born field of nanoplastics and the interaction with the biome.

Mexico participates through three researchers, two professors with strong experience in polymer science and nanomaterials, and one young talented researcher in the field of nanoscience.

Nigeria participates through a senior researcher active in the field of environmental pollution in air. The network will benefit from his expertise, as it is imperative to extend the efforts in all the environmental compartments to evaluate the N/MPs specific risks.

3. IMPACT

3.1. Impact to Science, Society and Competitiveness, and potential for Innovation/Break-throughs

3.1.1. SCIENTIFIC, TECHNOLOGICAL, AND/OR SOCIOECONOMIC IMPACTS (INCLUDING POTENTIAL INNOVATIONS AND/OR BREAKTHROUGHS)

Close interdisciplinary cooperation among physics, chemistry, biological, medical sciences, together with social, behavioural and regulatory disciplines is the only way for addressing the thorny issues of N/MPs. Indeed, the lack of strong evidence and quantification of the N/MPs risks does not allow us to reach any reliable conclusions. However, potential negative impacts are huge. Thus, we urgently need a better understanding of the interactions, the distribution to assess the risks in each specific environmental compartment and for the public health. As socio-economic developments increase all over the world, and, as a consequence, the plastic wastes grow further, it follows that the associated potential risks will concurrently increase. It will be essential to implementing both agreements and legislation to handle the risks, to focus on emission reduction, to promote the use of less hazardous materials. The Action will give the decision-makers able to protect the resources, such as waters, air, food products, and soils, that is to say, the environment and humans' health.

It has also been observed in the past that legally binding rules can be beneficial also for the economic systems since they may create new markets for innovative solutions on a circular economy approach. PRIORITY will focus on a broad dialogue with industry public and private organisations to review in more detail the various policy measures and legislative instruments that are in place, underdevelopment or potentially needed, based on shared scientific evidence.

On a scientific basis, PRIORITY will produce clear results about controversial points that still exist about N/MPs concerns, such as, among all, the mandatory need to harmonize the protocols and analytical techniques towards a sustainable and safe management of plastic materials and, in particular, N/MP fragments.

More specifically, PRIORITY proposes to drive the efforts through:

- the development and optimization of standard protocols for sampling, measuring and analysing N/MPs;
- the software assessment and design of new workflows;
- speeding up tasks and ensuring higher confidence;
- the implementation of new methodologies of sample preparation;
- the assessment and validation of robust procedures for quantitative analysis by inter-laboratory studies;
- definition of novel removal and recovery strategies.

The entire chain through N/MPs environmental pollution, from the monitoring to the removal and recovery challenge, requires the development of reliable and sustainable technological solutions. All efforts will focus on spreading shared technologies to provide open access for as wide a circle of European researchers, technicians, laboratories, agencies and industries by:

- the identification of needs and entry barriers related to cost and performances;
- the modification and/or improvement of existing instrumentation;
- the development of new and dedicated sample preparation tools and devices;
- the validation of standards and reference materials (biodegradable and persistent ones);
- the definition of the EU roadmap for N/MPs issues.

In social and economic terms, PRIORITY will lead to:

- trans- and inter- disciplinary exchanges among stakeholders, who will benefit and contribute to the mutual growth;

- dissemination of protocols and techniques in Europe, especially in less favoured or trained regions;
- strengthening links of industry, academics, decision-makers and general public.

Risk is lowered by the high motivation expressed by the network of proposers, some of them being EU key players in the field of N/MPs. Dissemination, workshops, and round-robin tests as well as STSMs will be the warrant of the active involvement of Early Career Investigators (ECIs) from all the sectors/topics involved in PRIORITY. These activities will ensure mobility, professional and scientific development thus implementing good practices, ethic, and forefront knowledge exchange across Europe.

In light of the evidence, it is necessary to flag several potentially relevant areas which could guide to suitable policy measures, from waters to air, from sludge to soils. Legislation tends to be seen as the definitive way to bring about the changes required. However, considerations of human behaviour may mean that legislation is not always enough. Beyond regulations, fees, bans, N/MPs pollution mitigating measures must include voluntary agreements and softer awareness-raising, communication, and education actions. Indeed, behaviours can change fast in response to new circumstances or media communications. People and organizations will change their behaviour if there are motivation, feasible alternatives (e.g., evaluation of biodegradable materials) and supportive conditions.

From a global governance perspective, the discussion on MP pollution is like that of climate change. It would be appropriate to build international consensus based on the scientific data and, on this evidence, to reach concrete agreements to how to handle the N/MPs pollution issues. PRIORITY will help to reach these targets by sharing the research results, helping to develop public awareness and education, and exchange of information. Such features, as well as generation and access to standardized MP pollution data, could be part of such an international agreement on MP pollution.

Altogether, global efforts would benefit significantly from a scientific platform for plastic pollution.

All these activities will contribute to scientific, socio-economic, and technological innovation breakthroughs, with low risks, considering the networking nature of the project.

The intellectual property rights will also be considered. Agreements will be signed to ensure productive and trustworthy dialogue among the participants. This will allow emerging novel concepts, methodologies, procedures, and technological solutions, whilst minimizing the risks of information abuse.

3.2. Measures to maximise Impact

3.2.1. KNOWLEDGE CREATION, TRANSFER OF KNOWLEDGE AND CAREER DEVELOPMENT

An important measure of success of PRIORITY will be the number of participants and the involvement of the EU and no-EU researchers working in N/MPs issues, thereby forming a worldwide community to support policy and decision-makers, industry, researchers in all the scientific areas, and society in addressing MP environmental challenges.

COST is the suitable organized structure, in which members can share information and experience, improve, and synthesize their knowledge, and exchange ideas. The structure will be organized to provide inputs for problem-solving, being aware that critical thinking and innovation are crucial to envisioning novel solutions.

PRIORITY will support to prepare the future generations to redesign a resilient and changing society and to rethink progress no longer solely measured by economic growth. Instead, the study of the complexity determined by the interrelations among technological progress, availability of natural resources, health and quality of life, environmental safeguard must be central. Also, in the context of university education, the theme of sustainable development and environmental protection is a challenge as it requires innovative projects to go beyond the traditional, too specialised and disciplinary approach

to prepare for current challenges and to build a compelling connection among different skills using highly heterogeneous languages and methods. The training of undergraduate, graduated and PhD students, young scientists, and technicians will be performed by interdisciplinary courses and Summer Schools, organized and hosted by the participants and promoted by all the members to ensure the widest audience. Webinar Series targeting scientists and a wide audience will be organized to reach a broader audience than those attending the summer courses. There will be a specific focus on good practice guidance and tools. The lectures will be recorded and used as e-learning material freely available on PRIORITY website.

Open access peer reviewed publications will be encouraged, and, if possible, economically supported. A workshop will be organized at least one a year to assess the activities of the WGs. European and international conferences will be employed as platforms to disseminate the Action activities.

End products of the inter-laboratory tests will be the development of guidelines and codes of practice to perform measurements, the realization of reference materials and eventually their certification. Detailed analysis of experimental activities results will be published in international journals and/or presented to Conferences. Implementation and exploitation of results within PRIORITY will help ensure the knowledge generated is applied in a timely manner to increase national, transnational, and international exchange and funding opportunities.

An “Impact Areas and Exploitation Plan” will be prepared which will summarize problems, needs and feedback from the target sectors. It will outline a strategic plan for the use of IP generated in PRIORITY and for liaising with other initiatives to maximize impact. This will include further research areas, promising sectors of application, and post Action flow involving the partners network.

Every year the Action Chair, supported by the Action participants, will issue a progress report summarising the achievements of the network. This may serve as a basis for the evaluation of PRIORITY.

At the end of PRIORITY, i.e., after four years, a handbook will be prepared to contain the advances of the Action. This handbook will mirror state of the art and contain suggestions for future research. It will serve as the starting point for new research activities after the Action has ended.

3.2.2 PLAN FOR DISSEMINATION AND/OR EXPLOITATION AND DIALOGUE WITH THE GENERAL PUBLIC OR POLICY

MP pollution is now in the public domain as an emerging issue of global concern. The conservation of our surrounding environment to mitigate these threats is about people and the choices they make. As a result, we are witnessing increasing demands for a significant shift in the way that society interacts with the environment and there are calls for sustainable management and policy from decision-makers to drive the restoration of the ecosystems. Influencing consumer behaviour is becoming a priority in European environmental policy. Moreover, messages and interventions must be tailored to specific audiences and communities. There is a need to understand public perceptions of plastics in society and their environmental impacts if we are to develop appropriate interventions to reduce the input of plastic waste into the environment. As human behaviour is considered the sole source of plastics, changing perception and behaviour are the keys to handle the problem. Media must play an essential role in alerting the public and policy-makers about these emerging environmental issues. The Action will contribute to this mission by involving sociology and communications experts to simplify the complex scientific issues for the general audiences and provide a “storyline” with which viewers can engage in terms of moral responsibility and interpretation. Specific activities will be conceived for primary, secondary and high-schools students.

The Action members will organize and actively participate in conferences, workshops, trade-shows and courses, also in collaboration with regional, national, EU framework projects and initiatives (clustering activities). Dissemination activities will include raising awareness, training, capacity building, technology transfer, standard formulation, and, last but not least, citizen involvement. During the Action, the planning of dissemination activities will be continuously updated by means of the board of the scientific experts (BSE), that will plan, manage, and monitor the dissemination and exploitation activities and

verify that they are valuable and well timely distributed. Approaches adopted will face the dissemination challenges in an efficient way, including responsible research and innovation (RRI).

Dissemination activities will target a wide variety of stakeholders and delivery tools, to maximize the impact and to meet their expectations. Delivery methods will be matched to the stakeholder target audience and will comprise face-to-face meetings, workshops, training events, Training Schools, preparation and distribution of hard copy and virtual documentation, presentations at scientific meetings, articles and reports in both the scientific and popular press, special events at industry gatherings, training events, WG special symposia, press releases, social media. Surveys will be proposed to the stakeholders before and after the dissemination activities to evaluate their needs and the impact.

A dedicated website will be a reference point for the dissemination infrastructure. The website will serve as a focal point for social media activities and on-line promotion of the Action. In addition, other social media communication tools, such as blogs, Twitter, Facebook, Instagram, Linked-in, a YouTube channel will be set up and managed by a responsible selected by the MC. The electronic annual newsletter will be issued to disseminate the activities and the main results. Advertising material with the unique graphic identity of the Action will be created and updated every year. The Layman's report for each WG will be realized.

Last but not least, PRIORITY aims at delivering science-based policy advice on the health and environmental impacts of MPs. In the EU, addressing plastic pollution is a high political priority reflecting an equally severe and increasing concern among EU citizens.

In terms of policy measures, there is no global approach specifically addressing MPs, even though the issue is partially included in the scope of several international plans. Nationally, policy initiatives focus on the designing of measures to address mainly larger plastic items and, at a lesser extent, a specific type of MPs, such as those present in cosmetics. However, it seems to be a tendency to increase and further specify national measures and initiatives.

PRIORITY will assess the proper instruments for the policy-makers to monitor the different ecosystem compartments by:

(i) the harmonization of monitoring methodologies;

(ii) the quantification of the input of the identified sources of primary and secondary MPs;

(iii) the development of technologies to prevent MPs leakage, both primary and secondary MPs;

(iv) the assessment of the effectiveness of measures to reduce the input of MPs to the different ecosystem compartments.

The development of harmonized monitoring methods for MPs is of high importance in order to better understand the problem. Then, PRIORITY will

- assess harmonized, cost-efficient, and sufficiently robust monitoring methodologies for MPs;
- prevent and reduce the secondary sources of MPs by understanding the behaviour of the product in the environment;
- address the known sources of primary MPs through best available techniques;
- focus the research on the secondary sources that are less known such as the formation process of MPs via fragmentation from macroplastics;
- encourage the research regarding the effects and impacts of MPs on biota.

International interlaboratory studies will also be performed in the frame of VAMAS. This international organization supports world trade in products dependent on advanced materials technologies, through International collaborative projects aimed at providing the technical basis for harmonized measurements, testing, specifications, and standards. In VAMAS, a specific Technical Working Area (TWA), "Microplastics and Environment" has recently been approved. The final target of this TWA is to propose and assess new standards to CEN and ISO related to the N/MPs issues. Correct information and appropriate standards will be valuable tools to help the policy-maker to make the right decisions and legislations.

4. IMPLEMENTATION

4.1. Coherence and effectiveness of the Work Plan

4.1.1. DESCRIPTION OF WORKING GROUPS, TASKS AND ACTIVITIES

PRIORITY will be organised in seven specific while highly interconnected WGs, with clear objectives and activities, namely:

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.

Activities: It is important to shed light on the nature of the N/MPs effects and whether or not any real potential risks exist for these effects to impact negatively on biota and ecosystems, or on human health when MPs enter the body (via inhalation, food ingestion or through the skin). Such research, focusing on the occurrence or absence of negative effects in specific controlled circumstances and field studies, is increasing, but must be coordinated and the results harmonized.

Laboratory experiments have shown that MPs can determine not only biological, but also mechanical and chemical relevant negative impacts on biota. While in such experiments MPs concentrations are higher than those typically measured in nature, the latter may be largely underestimated. Moreover, there are no population-wide studies of health effects on humans from occupational exposure to acrylic, polyester, nylon and polyurethane dust, so the risks for human health is still uncertain and a coordinated international effort is needed to achieve reliable conclusions.

Reference materials will be realized to assess suitable hazard tests and to develop ad hoc new ones to perform the N/MPs hazard analysis. This work will be tightly connected to all WGs, but in particular to WG2 and WG3.

WG2 Monitoring and sampling MPs

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

Activities: To understand the fate and consequences of MPs in the environment, we must be able to reliably measure their full range of sizes and composition. Shared measures that any researcher can apply are urgently needed to achieve a correct view of the problems, also considering the input of WG1. Matrices where MPs reside include water, sediment, biological tissues, soil, wastewater sludge, and air. Approaches to sampling, cleaning, and identifying MPs in these media are still not standardized. Multistep procedures are common in environmental chemistry due to the need to extract the analytes from the bulk matrix and remove interfering materials before final MP detection and quantitation. To date, researchers in the field have utilized different techniques for extraction from environmental matrices and for the characterization. Differences in method effectiveness make comparison of data among studies often impossible.

The WG will develop joint research activities on the identified fields of application, leading also to the improvement of researchers' capabilities. Interlaboratory tests will be organized to compare the most applied methods and to assess harmonized protocols, while proficiency tests will be organized on the standard protocols to help all the laboratories to evaluate their procedures and in line with best practices.

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.

Activities: Several reviews of MP detection methods have been produced. Light microscopy and Fourier-Transform infrared (FTIR) spectroscopy has been widely used. The IR microscopy allows particle chemical mapping limited to particle size >10 µm. Raman microscopy can provide detection down to about 1 µm. However, since MPs may be weathered, the identification of the materials can be difficult. An overemphasis on the abundance of MP particles in samples, in lieu of mass balances, currently exists. In part, this is driven by analytical procedures that are weak in terms of mass quantitation.

Ideally, the detection technique provides both quantitative and qualitative information (e.g., polymer type and quantity, additive content, fragment dimensions, and shape), but harmonized standard methods and reliable databases are urgently needed. Moreover, the development of specific analytical and software tools to handle the data will be of great benefit. The potentiality of automated analyses and the use of chemometric tools and machine learning algorithms will be explored with the aim of reducing the costs and accelerating sample throughput.

Reference materials will be realized to establish a framework and compare the existing techniques and protocols for the various steps of MPs analysis, and per application area, becoming a source for reliable data to highlight the most suitable procedure for standardization purposes.

Finally, the WG will support and facilitate the researchers to share the know-how and to have access to the EU 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.

Activities: NPs represent the major knowledge gap in the general topic of plastics in the environment and they could represent a major concern for the environment and human health. Nevertheless, to date, the information required to support this hypothesis is insufficient. Indeed, there is a lack of information to assess the exposure and effects of NPs and, therefore, to characterise the risk for the environment and human health.

A primary problem is the sources and origins of NPs, that may be emitted as primary (i.e., intentionally produced) or secondary (i.e., non-intentionally produced) particles. To date, no precise data exist on these processes and any quantitative estimate of the possible emissions of primary and secondary NPs.

Another issue is related to the lack of suitable and reliable methods for sampling and analysing these nanoparticles. Currently, there are no standard methods for the detection of NPs in any environmental matrices. Although it is reasonable to suppose that NPs may be present in large amounts in all the environmental compartments, experimental data are needed to confirm.

In addition, several studies have demonstrated that nanoparticle toxicity is extremely complex and the concept of toxicity itself is unclear for insoluble particulate materials.

The tasks of the WG are (i) to define and estimate the emission sources; (ii) to compare and assess the sampling procedures; (iii) to assess the analytical techniques methods; (iv) to compare the studies about their interaction with the biome; (v) understanding the risks for the environment and the human health.

Reference materials will be used to address nanoscale analytical challenges and to study their interaction with other contaminants and the biome.

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

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

Activities: Although many studies have begun to elucidate MP fate, more are needed to prioritize prevention and remediation strategies. We have to understand and to evaluate the capabilities and pitfalls of green chemistry and bioremediation as potential solutions. The most successful solutions to MP pollution must be at the beginning of the lifecycle of plastic goods, since remediating MPs once in the environment will be likely unfeasible. Prevention is best, followed by control and lastly cleaning.

Moreover, the development of "green materials" is promising. However, facile breakdown of the polymer matrix may help the releasing of fragments and enhancing the exposure to potentially toxic additives. The alternative solutions must then verify and properly test. Additionally, plastic waste management and recycling must be improved. Developing countries have recently been identified as an increasing source of marine plastic pollution and thus their participation in this Action is very important. The EU should pioneer strategies for redesign, reuse, and recycling and to share the know-how and strategies.

WG6 Metrology and standardization

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

Activities: The participation of this WG of, at least, one Member from each of the other WG, preferably the WG leader, will be strongly encouraged. Indeed, participants shall be up to date with recent developments of the research activities ongoing in the other WG. The WG leader will review the state of the art related to standardization and present it during the meeting. Discussion during the WG meeting shall lead to a long term program of the four years, and a development plan with definition of roles among participants and an exact timeline for the activities of the next year. Coherently connections with liaison bodies such as standardization entities (ISO, CEN, and corresponding National standardization bodies), regulation entities (European Commission), pre-normative research networks (VAMAS), metrology institutes and stakeholders will be taken and new project for standard development will be proposed. In conjunction with the main dissemination events such as Conferences and training Schools, sessions and workshops dedicated to standardization will be organized. Drafts of standard documents will be prepared in collaboration with expert participants from other WGs.

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

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

Activities: This WG will systematise and elaborate on ideas to raise awareness and to involve the education system, the politics and the general public regarding real risks of N/MPs. Indeed, we are conscious that the contribution of each citizen is relevant for successfully managing these problems.

Scientific communication suffers from few shortcomings. First, it is deliberately detached from emotions and passion. Its search for precision, objective truth and rational explanations, comes at the intentional omission of subjective and personal insights and motivations. Second, scientific knowledge often confuses non-science users (e.g., managers, entrepreneurs, policy makers, and the public). Third, scientists like us study extremely narrow issues in extremely specific methodological approaches. In this pursuit, science and technology are important contributions but by themselves they are lacking.

Cognitive understanding of the research and publishing about N/MPs does little to motivate individuals and organizations to behave sustainably and to know the important correlated aspects. People's behaviour and habits towards sustainability only change with intense emotional and practical experiences. It is passion and emotion (and not cognitive understanding alone) that lies at the core of behavioural changes. Passion, a form of human emotional intelligence, is the key to great accomplishments. Passion can be experienced through the arts.

This WG proposes to combine science with arts to gain a holistic and passionate implementation of sustainable development, adopting Arts-based methods. Such methods aim to teach and communicate through mechanisms in which the use of art reaches hidden and hard knowledge that is difficult to achieve through logic and simple rational thought. Specific teaching methods will be foreseen for different contexts (e.g., students, politics, general public, etc.). As examples, we will use theatre and storytelling as consolidated art-based methods.

4.1.2. DESCRIPTION OF DELIVERABLES AND TIMEFRAME

Milestones and deliverables are shared through the whole Action.

Milestones:

1) MC meetings once a year;

2) Core Group and WGs meetings every two months;

3) Mid-term reviews after six months from MC meetings.

Deliverables:

1) Launching call for the submission of proposals for STSMs, 2 per year. (M3)

2) Report of individual Working Groups (WGs) Activities on a yearly basis. (M12, M24, M36, M48)

3) Establishment of cross-sectional subgroups to build multi-disciplinary and flexible Working Group activities. (M15)

4) State of the Art definition about nano- and microplastics (NMPs) environmental pollution. (M24)

5) Report of connections with liasoning bodies, such as standardization entities (ISO, CEN, and corresponding National standardization bodies), regulation entities (European Commission), pre-normative research networks (VAMAS), metrology institutes and stakeholders. (M24)

6) Report on impacts and risks analysis with corrective actions and mitigation strategies proposed. (M24 and M48)

7) Draft of approaches to MPs remediation and recovery strategies. (M24 and M48)

8) Draft preparation of standard documents (inputs to standardization) in collaboration with expert participants in all the WGs, on a yearly basis starting from the second year. (M24, M36, M48)

9) Definition of research infrastructure accessibility and eventually proposal for new specific facilities. (M12, M24, M36, M48)

10) Report on the development of datasets and benchmarking data. (M24 and M48)

11) Report on the Involvement of stakeholders, including private and public laboratories, equipment manufacturers, environmental protection agencies, NGOs, food producers and consumers associations, cosmetics and pharmaceutical industries, national and international standardization bodies and metrological institutes, European RTDs, the overall scientific community and decision-makers. (M48)

12) Layman's report of WG activities and the know-how shared among the experts at conclusion of the Action. (M48)

4.1.3. RISK ANALYSIS AND CONTINGENCY PLANS

The success of PRIORITY depends on participants' contributions, their availability, effectiveness and efficiency in developing, coordinating and carrying out the activities. The foreseen risks are listed below and the estimated level is given in brackets. Corrective actions are also proposed.

1) Mitigation measures for COVID-19 spreading: experts' mobility and in presence activities could be strongly affected by countries mitigation actions to slow the spread of the infectious disease (**High**). Organization of virtual conferences, webinar, e-learning classes, and online meetings.

2) Management and coordination costs due to the large participation (**High**). Limited by 1 meeting per year and quarterly video conferences and dedicated thematic online meetings. Assigning more participants per task and pushing local activity (training, seminar, etc.). Find support from companies and public agencies.

3) Difficulty in engaging industry in benchmarking and/or data standardisation (**Medium-High**). Offer technical support following the WG instruction and anonymously participate in the standardisation process.

4) Risk of disengagement of some countries due to lack of funds (**Medium-High**). Organization of local activities in these Countries venues.

5) Delays or low activities of the WGs outside scheduled events (**Medium**). Clear agenda of meeting, milestones and deliverables shared with all the MC members and WG leaders. Regular check of activities progress and effective monitoring mechanisms, compilation of regular reports (progress made, description of issues, action plan to counteract the issues). Fostering online tools, assigning precise and specific tasks, increasing communication between WGs leaders, rotation of the chairs, transfer of tasks to motivated newcomers, newsletters etc.

6) Low participation in interlaboratory tests (**Medium**). Evaluation of the risk starting the test, involving international organizations, as IAEA, VAMAS, CEN, ISO, and asking the support of private and public companies.

7) Long meetings and not delivering anticipated breakthroughs when several experts deal with large data sets (**Low**). Organizing parallel sessions, dedicated courses and training. Providing online platforms in multiple domains such as investigation case, joint team, analysis of work files, etc. upon agreed sub-network (invited members) with password, etc.

8) Expensive WG meeting/dissemination (**Low**). Multi-tasks role of the attendees with interventions as teachers, speakers, learner; search for local and/or industrial sponsorship, minimal fee for attendees as a last resort.

9) Legal and financial risks (**Low**). Definition of agreements featuring potential commercial and/or intellectual properties issues.

10) Conflicts between proposers (**Very Low**). Conflict-resolving mechanism to balance the needs of the proposers.

11) Low participation of proposers (**Very Low**). Most experts participating in PRIORITY are scientists working on environmental pollution of micro- and nanoplastics, whose breakdown is well represented by WGs. All the proposers are interested in the successful development of this Action, being advantageous for their field of interest and/or research.

4.1.4. GANTT DIAGRAM

Description	Task Responsible	YEAR 1					YEAR 2				YEAR 3				YEAR 4			
		1	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
Action management	MC	◆				◆				◆				◆				◆
Setup of WGs	MC		◆															
WG Coordination and development of joint research activities	WGs Leaders		☆		◆		◆ ☆		◆		◆ ☆		◆		◆ ☆		◆	
Involvement of stakeholders	WG1-2-3-4-5 Leaders			◆		◆				◆				◆				◆ ☆
State of the Art definition				◆						☆								
Definition of thematic subgroups				◆		◆						◆						◆ ☆
Definition of research infrastructure accessibility	WG3 Leader				◆	☆				☆				☆				☆
Establishment of cross-sectional subgroups										☆								
Development plan and definition of roles	WG6 Leader			◆			☆							◆				◆
Connection with Liasoning bodies										☆								
Impacts and risks analysis	WG1			◆						☆	◆						☆	◆
Development of datasets and benchmarking data	WG2,3,4 Leaders			◆						☆	◆						☆	◆
Input to standardization							☆				☆				☆		☆	
Approaches to remediation and recovery strategis	WG5 Leader						◆			☆		◆					☆	◆
Identification and assessment of the topics of interest	WG7 Leaders								◆					◆				
Schedule of dissemination activities																		
Development and assessment of effective scouting methods				◆					◆					◆				
Schedule of Short Term Scientific Missions				◆ ☆				☆				☆				☆		◆ ☆

Legend: Milestone ◆ Deliverable ☆
MC - Managing Committee
WG - Working Group

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