Annex 1

Call of Proposal

The FUNDING PARTNERS herewith announce joint call for proposals under the framework of JPI Oceans on

Sources, distribution & impact of microplastics in the marine environment

Contents

1. Introduction

Plastics, synthetic polymers virtually unknown prior to their broad commercialization in the 1950s, are nowadays ubiquitous in the environment, and their production continues to rise. The global production of plastics was 299 million tons in 2013, of which 60 million tons were produced in Europe alone[1]. Plastics are used in a wide range of applications from food packaging, to basic household items, personal care products, agriculture and industry. Other sources are the shedding of synthetic fibres from polymers (for instance, in clothing, textiles and fishing related items) and the rubber particles via roadway runoff.

Plastics in the marine environment have become a major concern because of their persistence at sea, and adverse consequences to marine life. According to estimates from Eunomia (2016) between 27—66.7 million tons of plastic can be found in the world's ocean as of 2016.

To add to that, Lebreton et al. (2017)[2] estimate that between 1.15 and 2.41 million tons of plastic waste currently enters the ocean every year from rivers alone whereas Jambeck et al. (2015)[3] estimate that between 4.8 to 12.7 million tons of plastic enter the ocean annually in total. They are not biodegradable, but undergo weathering that produce increasingly small particles termed microplastics.

[1] The Plastic Industry, 2011
[2] Nature Communications/ DOI:10:1038/ncomms15611
[3] Plastic waste inputs from land into the ocean, http://science.sciencemag.org/ on October 20, 2016

In the last number of years many governmental initiatives have been launched to reduce the input of plastic into the (marine) environment. A ban on microbeads in cosmetics has come into force in many countries. Numerous other initiatives and strategies such as plastic bag levies are also emerging and taking form across the globe, including in the EU. In January 2018, the EU published its plastics strategy that aims to transform the way products are designed, produced, used, as well as recycled in the EU so that the 30% recycling rate can be increased dramatically.

However, plastic pollution of the ocean is not only a European but a global problem. The necessity to tackle the plastics issue was recognized by both the G7 and G20 countries. In particular, the groups of states acknowledge that marine litter, in particular plastic litter, poses a global challenge, directly affecting marine and coastal life and ecosystems and potentially also human health. Accordingly, increased effectiveness and intensity of work is required to reduce the input of plastic litter into the environment. Under the Agenda 2030 for Sustainable Development of the United Nations countries worldwide also pledge to tackle the marine litter issue. With Sustainable Development Goal 14 “Conserve and sustainably use the oceans, seas and marine resources for sustainable development” countries have pledged to “prevent and significantly reduce marine pollution of all kinds, in particular from land based activities, including marine debris and nutrient pollution by 2025”. Better plastic management across the world can make a contribution to the objectives of the 2030 Agenda for Sustainable Development by developing sustainable consumption and production practices, improving waste prevention and recycling and preventing marine litter.

Microplastic particles are a particular aspect of the problem of plastic pollution in the ocean. Microplastics (MP) can be categorized in primary and secondary microplastics with a size smaller than 5 mm. Primary microplastics are high production volume materials applied in a large range of products as plastic granulates, powders or micro- and nano-spheres. Secondary microplastics result from the partial degradation of larger pieces of plastic litter into fragments in the micro-and possibly nano-size ranges, while decomposition is expected to take place over the course of hundreds of years. Therefore now microplastic particles are found in all oceanic gyres, bays, gulfs and seas worldwide. Higher concentrations of microplastics were recently reported from Arctic sea ice, from the deep sea and also marine regions far away from urban areas.[4]

The EU Marine Strategy Framework Directive (MSFD – 2008/56/EC) requires the maintenance or achievement of Good Environmental Status of the Seas and Oceans in order to protect marine species and habitats from human activity. The 2017 Commission Decision 2017/848/EU on the Common Understanding of the Directive replacing Decision 2010/477/EU sets out requirements to develop new criteria and methodological standards and specifications and standardised methods for monitoring and assessment. The Decision requires the development of new mandatory criteria under Descriptor 10 for litter and micro litter in the environment and the impact of the litter on marine species through ingestion and entanglement. This work must be linked to the development of other criteria, threshold values and methodologies for other descriptors for marine biological diversity, seafloor integrity and contaminants in sea food and requires a transdisciplinary European research initiative. Although micro-plastic particles can be reliably quantified and identified by using spectroscopic techniques (e.g. FTIR, Raman) from a particle size of >10 µm. Pyrolysis-gaschromatography (GC) in combination with mass spectrometry (MS) can be used to assess the chemical composition (polymer type) and a quantitative analysis of micro-plastics of entire environmental samples. But the preparation of the samples and the spectroscopic measurements can take a long time. Marine environment managers involved in MSFD and Regional Seas Conventions work on marine litter and its impacts require cost effective, timely and standardised methodologies for sampling, analysis and assessments for European monitoring programs. The development of new methodologies is necessary for standard operation protocols (SOP) for marine micro litter including microplastics.

In the joint transnational call “Ecological aspects of microplastics in the marine environment”, launched under the framework of JPI Oceans, four projects were selected for funding from January 2016 for a

[4] Marine Anthropogenic Litter: Bergmann, Gutows, Klages

three year period. The project BASEMAN is focused on first steps for defining environmental baselines, as well as the development of measurement methods and standards for microplastics analyses in European waters - especially for the particle fraction higher than 300 µm. EPHEMARE studies biological effects of marine pollutants at molecular, cellular, physiological and organismic levels through the implementation of several experiments in partner laboratories, to allow for detection of effects of microplastics across the main phyla of marine organisms from bacteria to fish covering most of the trophic levels. PLASTOX investigates the ingestion, food-web transfer, and ecotoxicological impact of microplastics (MPs), together with the persistent organic pollutants (POPs), metals and plastic additive chemicals associated with them, on key European marine species and ecosystems. WEATHER-MIC assesses how microplastic weathering changes its transport, fate and toxicity in the marine environment. In the oceans, microplastic particles are exposed to factors including UV light, physical stress and biofilm growth on their surface.

Through these research projects the knowledge about the analysis, weathering and, ecotoxicological effects of microplastics in the marine environment has been substantially improved. But not all relevant questions have been addressed in the four projects and the knowledge and understanding about smaller microplastic particles (from 10 µm to very small particles - nanoparticles) is in particular limited.

One new aspect that just recently started to be addressed is the use of satellite images to directly or indirectly observe and reduce uncertainty of the numerical models for identifying and quantifying the sources, distribution patterns and sinks of plastics and microplastics in the ocean and in the shorelines. Significant progress has been made on remote sensing technologies and some encouraging new results have been presented and discussed to advance the global detection of floating marine debris and its relationship with microplastics global mapping. But still several relevant questions have not been addressed.

Following on from the success and findings of the four projects funded under the first joint transnational call of the JPI Oceans microplastic initiative, several funding partners decided to announce a second funding opportunity to submit joint international proposals. In view of the global nature of the challenge, JPI Oceans is explicitly inviting other international partners to join this initiative. Thereby JPI Oceans is aiming to promote transatlantic and global cooperation on the issue, and contribute to the Regional Seas Conventions, G7, G20 and UN aims of reducing (micro-) plastic pollution in the ocean.

JPI Oceans is an intergovernmental strategic process that focuses on solving the societal challenges related to our seas and oceans that cannot be solved solely on the national level. In JPI Oceans national ministries and agencies responsible for research funding seek to define common long-term strategic priorities for marine and maritime research and technology development as a basis for strengthening cooperation and coordination of national investments in these fields.

2. Scientific Framework

Building on the results from the joint transnational call “Ecological aspects of microplastics in the marine environment” and recent scientific findings this joint transnational call intends to increase the knowledge about the the relevant sources of microplastics, analytical methods for identifying smaller micro- and (nano-)plastics, monitoring their distribution and abundance in marine systems and their effects thereon as well as concepts to reduce inputs of plastic into the marine environment. This call comprises four main themes:

- **Identification, characterisation and quantification of the major microplastic sources, especially mechanisms and time scales of macroplastic fragmentation**

- **New sampling and analytical methodologies - focusing on the smaller (nano-)particles and *in situ* measurement methods for all matrices (water, sediment, biota)**

- **Monitoring and mapping of microplastics in the marine environment including its effects on the marine environment**

- **Concepts to reduce inputs of plastics into the marine environment including through new recycling methods, raising public awareness, promoting behavioural change, socio-economic analyses**

i. Identification, characterisation and quantification of the major microplastic sources, especially mechanisms and time scales of macroplastic fragmentation

Microplastic particles of different size fractions can be found in the marine environments where they undergo processes of weathering and biofouling. Several key knowledge gaps remain that prevent a true understanding of the persistence of plastic in the marine environment. All the established degradation mechanisms for plastic in the marine environment share a common issue: they are extremely slow processes. The specific degradation rate of a plastic item depends on many factors, including polymer type, the presence of additive chemicals, environmental conditions, seasonal differences etc. There is very limited information about the different particulate and chemical degradation products that may be formed and about their potential transport, behaviour, fate and impacts on the natural environment.

In addition to analytical methods, mathematical methods and models are necessary for a better understanding of the fragmentation and aggregation of microplastic in the marine environment. Possible proxy functions of "a certain size class" which could potentially be used to predict the occurrence of other particles should be explored. However, possible “mathematical links” between larger microplastic and smaller particle size are still largely unknown. Similarly, knowledge on the extent microplastic particles tend to exist as single free floating particles in the water or tend to form larger aggregates (e.g. marine snow) is limited. This could have implications for trophic upgrading of microplastic but also, in general, for the sedimentation of micro-plastic in aquatic systems.

The following objectives should be addressed by submitted proposals and are required for a better understanding of the occurrence and spatial variability of micro-plastics in marine systems:

- Fragmentation, aggregation, sedimentation and deposition characteristics of plastic in order to understand the fate of microplastics in the marine environment;
- Identification, characterization and quantification of microplastic particles before and after weathering in marine systems;
- Investigation of ingested microplastics inside marine organisms - description of residence times, degradation and release of degradation product.

ii. New sampling and analysis methodologies - focusing on the smaller (nano-)particles and *in situ* measurement methods

Microplastic particles can be reliably quantified and identified by using spectroscopic techniques (e.g. µFTIR spectroscopy and Raman spectroscopy). Current methods for detecting and quantifying microplastics in the laboratory can however be very costly, time consuming and resource-intensive. In addition, the cost of purchasing the instrumentation required for such analyses often prevents standardised monitoring and analysis. The development of alternative technologies for analysing and

characterising microplastic should be considered a research priority and solutions may well come from outside the existing research community working in this field. Furthermore, it is suggested that the development of methods and technologies to detect, characterise and quantify microplastic remotely in the field should have a focus in future research activities. There are promising methods based upon silhouette/ holographic imagery and satellite imagery that could be developed and optimised further.

Results of the projects from the first JPI Oceans joint transnational call demonstrate, that the low micron-sized plastic particles (<300 µm) are the dominant fraction in the marine environment. Concentrations of particles smaller than 10 µm and nanoplastic particles in the marine environment are virtually unknown at present. This means that we are potentially missing data and knowledge about the bulk of the particles in the marine environment. For the ecotoxicological aspects and the impact of the marine organisms the smaller particles are very important. Whilst there is increasing evidence that microplastics are unable to transfer across biological membranes and barriers due to their size, nanoplastic particles appear to be sufficiently small to undergo this process. This mobility within organisms significantly increases the risk of nanoplastic uptake and accumulation and, consequently, the increase of adverse effects at cellular and molecular levels. Therefore analytical methods are necessary to identify and quantify such smaller particle sizes.
There are now first studies on the sources of nanoplastic and microplastic litter that give a good indication about what the main sources of this pollution are (e.g. car tyres, microfibres from textiles). However, a number of these microplastic materials are not amenable to the techniques developed for polymere microplastic particles. It would therefore be necessary to encourage projects that include defined cases studies (e.g. car tyres or textiles) where the necessary methods are developed (or existing methods are modified) to facilitate an investigation of their transport routes, environmental sinks and environmental behaviour.
Therefore, we are explicitly calling for proposals for development of new analytical *in-situ* and field methods and improvement of established methods:

- For in-situ and field method for routine analysis of microplastic particles > 10 µm
- For the quantification, identification and characterization of microplastic particles < 10 µm (incl. nanoplastics);
- For the quantification, identification and characterization of car tyres, microfibres by using spectroscopic techniques
- For the simulation of accelerated macroplastics degradation pathways so that degradation mechanisms can be studied within a realistic timescale within the laboratory.

iii. Monitoring and mapping of microplastics in the marine environment including its effects on the marine environment

In the first call “Ecological aspects of microplastics in the marine environment” research focused on the development of measurement methods for microplastic in the marine environment. This method development should form the basis for baseline studies and risk-based monitoring, allowing to estimate - in combination with ecotoxicological studies - the risks for marine environments and marine organisms associated with plastics. In this new call more field measurements to identify and quantify microplastic particles in the ocean and shorelines.
There is an urgent need for a comprehensive and systematic picture of distribution of plastics, especially microplastics, in the ocean. The degradation of macroplastic is the dominant source of microplastic in the oceans. Therefore the mapping of macroplastics in the oceans is necessary to understand the generation, distribution and fate of microplastics. Remote sensing, aerial and in-situ observations and advanced numerical models combined together can significantly contribute to advance the understanding of the sources, circulation patterns and fate of microplastics in the ocean and shorelines. Several projects aiming at the direct or indirect observation of marine litter have been

developed by space agencies and initial results are very encouraging and they will certainly contribute to a better global mapping to assess and monitor the quantity of floating plastics, including microplastics, and its correlation with immersed microplastics life cycles and circulation patterns.

Proposals should address the flowing themes:

- Quantification of microplastic in marine systems (water, sediment, biota) – spatial distribution of microplastic litter, supported by modelling studies
- Assessment of existing technologies for remote sensing and aerial in-situ observation and development of new methodologies for remote sensing (sampling, quantifying, monitoring and identifying) microplastics in the ocean and coastal areas
- Mapping of microplastic distribution in the oceans and shorelines - combining satellite imagery, field data, advanced global and local numerical models to describe the effects on the marine environment
- Development of monitoring strategies and methods for the implementation of the Marine Strategy Framework Directive (MSFD) and UN Sustainable Development Goals (SDG) and liaison with relevant science-policy processes such as the MSFD Technical Subgroup on Marine Litter and GESAMP Working Group 40.

iv. Concepts to reduce inputs of plastics into the marine environment including through raising public awareness, promoting behavioural change, socio-economic analyses

Current evidence does not support the case that plastic pollution in the ocean constitutes a significant risk for the marine environment at large, since effects only occur at very high concentrations that are far above environmental levels; moreover these effects and concentrations are similar to those reported for particulate matter of non-anthropogenic origin. However, due to the persistence, ubiquitous presence and potential indirect effects of plastic particles, they represent a hazard and a potential planetary boundary threat. There is public awareness and political willingness to take precautionary action against plastic. Therefore, it is important to confront our possible ignorance of effects that might make plastic a real planetary boundary threat, and to address knowledge gaps regarding the main sources of plastic pollution so that emissions can be targeted and reduced. The ultimate goal is a circular economy.

Both the recent refusal from China to import and recycle Western waste and the European Strategy for Plastics in a Circular Economy show the pertinence of shifting from the current macroeconomic approaches towards a more circular economy. Proposals should assess and evaluate the life cycle of different polymers, taking into consideration production, supply chains and recycling of plastic materials, and understanding their impact on the EU economy. Analyses should identify best-practice initiatives across Europe in order to raise public and stakeholder awareness – ocean literacy – among different stakeholder groups (from port and waste managers, to fishermen and consumers) and promoting behavioural change.

Proposals should address the following themes:

- Reduction and prevention of plastic inflow into the ocean, e.g. through improved waste management systems or through development of new technologies for recycling of plastics, the adoption of improved practices, circular models and closed-loop supply chains;
- Contributing to ocean literacy by raising of public and citizen awareness about the problem of plastic pollution thereby inducing behavioural change;
- Assessing the life-cycle impacts of specific plastic polymers and identifying most sustainable materials, including alternatives to plastics.

3. Procedures and Criteria

Proposals should address at least one of the four themes in the call text. Applicants are advised to consult their national contact points for this call prior to planning and submitting proposals (contact person see further information).

a) Eligibility

- The call is open to proposals that meet the following criteria:
  - The proposal addresses at least one of the four themes in the call text;
  - The transnational collaboration must have a clear added value for at least one of the four proposed research themes.
  - Researchers who are eligible to apply for financial support from any of the participating FUNDING PARTNERS are eligible to apply for funding within this call for proposals;
  - Researchers from other countries (ASSOCIATE PARTNERS) or ineligible for the participating FUNDING PARTNERS can participate in project proposals on the condition that they provide written proof that their part of the project will be covered independently of this call (*in kind*), however they cannot coordinate a project and their contribution to the project should not be vital;
  - The principal investigator (PI) leading an application must be eligible for submitting funding proposals to one of the FUNDING PARTNERS;
- Number of applicants per proposal:
  - Each application must involve researchers from at least three eligible countries (countries of the FUNDING PARTNERS); no maximum number of partners is specified;
- Funding Period: Project duration should be:
  - Maximum of three years;
  - Projects should preferably start on **01.01.2020** (earliest).
- The maximum requested funding per proposal is **€ 2,000,000**. The maximum budget per partner and/or per proposal is specified in the national regulation from each FUNDING PARTNER.
- The general eligibility criteria specified by the respective FUNDING PARTNERS have to be followed. For details please check the National annex published on the online portal of the electronic submission and/or contacts the national representative(s) for further advice.

b) General Procedure

The following procedure will be applied:

1. Proposals are submitted via a submission platform to the LEAD AGENCY (**Project Management Juelich**) /by the coordinator (principal investigator) of the proposal.

2. After the submission deadline, all proposals are checked against the mandatory call eligibility criteria by the LEAD AGENCY. FUNDING PARTNERS check the general eligibility criteria specified in the National annex. The national eligibility check will include an ethics screening to ensure that the proposals comply with applicable national rules and regulations.

3. Eligible proposals are sent to independent, international peer referees for assessment.

4. Principal Investigators will have the chance to rebut.

5. An EVALUATION PANEL, consisting of independent, international experts, ranks the proposals based on the results of the peer-review procedure (review reports).The EVALUATION PANEL recommends the top-ranked proposals for funding.

6. The FUNDING PARTNERS jointly decide on a short-list for funding out of the top-ranked proposals based on the recommendations from the EVALUATION PANEL.

The composition of the EVALUATION PANEL will be made public after the funding procedure has been completed. Strict confidentiality is maintained with respect to the identities of applicants and the contents of the proposals throughout the duration of the whole procedure. The list of funded projects will be published on the website of JPI Oceans.

c) Criteria for Evaluation and Selection

Potential applicants are advised to take careful notice of the aims and scope of the call as described above. The following criteria will be applied to assess the quality of proposals:

● Scientific quality, including novelty, originality and innovation of the proposed research
- Relevance to the topics of the call
- Sound concept and quality of objectives
- Innovation level (progress beyond the state of the art)
- Novelty, unique feature

● Quality of applicants and suitability of the consortium, level of integration and collaboration
- Scientific Quality of the consortium
- Interdisciplinarity of the consortium
- International/ European added value
- Management structure and procedure (incl. data management plan)

● Networking and dissemination activities, training opportunities
- Level of integration and collaboration
- Outreach and Dissemination plan, including science-policy interface
- Integration of stakeholder or activities for stakeholder
- Training activities for young scientists or students

● Feasibility of the proposed research, suitability of budget requirements
- Work plan and methodology
- Feasibility of deliverables and milestones

- Suitability of budget requirements

d) Call Structure and Management

The principal investigator (PI) should submit a mid-term report including a publishable summary in English to the JPI Oceans Secretariat and LEAD AGENCY within three months after the mid-term. Furthermore the PI will be responsible to submit a final report to the LEAD AGENCY, in English, within three months after the end of the project. This report should cover the work undertaken by all of the project partners.
Independent of the reporting to the LEAD AGENCY all project partners need to report to their national funding agency in accordance with the relevant national rules of each country.

At the beginning of the projects a joint kick-off meeting with all funded projects will be organised. A joint mid-term meeting will be organised half way through the funding period. A joint final conference will be organized at the end of the funding period. The FUNDING PARTNERS will organise these three meetings in cooperation with the PIs of the funded projects. PIs must include capacity for the organisation of the three meetings in their proposal, Participants of funded projects are expected to participate in the kick-off, mid-term meetings and in the final conference and should include the relevant travel costs in their proposal budgets. FUNDING PARTNERS will cover the other costs for the above meetings.

e) Funding

A total amount of up to **€ 7.9 million** has been blocked by the FUNDING PARTNERS from Brazil, Estonia France, Germany, Iceland, Ireland, Italy, Malta, Norway, Portugal, Spain and Sweden for this call. Each participant in a funded consortium will be funded by his or her national partner organisation (see point g). The FUNDING PARTNERS aim at funding as many top-ranked proposals as possible.

f) Eligible budget items

Eligible costs are governed by national regulations (see National Annex). Specific questions should be addressed to the national partner organisations (see point g), if possible in advance of submitting an application.

g) Further information

Potential applicants are strongly advised to consult the general funding requirements of the national organisations participating in the call and to contact the national contact persons whenever necessary, especially with regard to eligible costs and other country-specific aspects of the call.

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h) Call Secretariat

The call will be run by Project Management Juelich, Div. MGS. The CALL SECRETARIAT is responsible for organizing the evaluation procedure and for all communication with coordinators regarding their applications.

i) Submission of Proposals and Deadline

The language of the application is English. Applications must be submitted electronically to PTJ via the link provided on the website https://epss-jpi-oceans.ptj.de/Call 2018.
The use of the official application form for this call is mandatory. Instructions and guidelines for submitting applications can be found on the website. In case of technical questions, please contact the call secretariat (show website).

The deadline for submitting proposals is **28.02.2019, 12:00 CEST**. Applications received after the deadline will not be considered.