

PLASTICS IN OUR OCEAN: a micro or macro challenge?

CIC nanoGUNE, Donostia-San Sebastián, Spain /1-2 October 2019

Summary

The participatory event organised at nanoGUNE, San Sebastián, Spain, on 1 and 2 October 2019, focused on understanding the societal challenge of reducing and preventing the presence of plastics and microplastics in our ocean. The event harnessed the collective intelligence and wisdom of a heterogeneous group of 17 participants with complementary profiles from across Europe. People were organised in 4 thematic groups according to their expertise: Education and Marine Ecosystems (“Edu&Eco”), Water treatment – inland & marine (“Water”), Life cycle/value chain of plastic (“Plastic”), Policy and related (“Policy”).

The participatory process started with the formulation of two triggering questions: “What are the actions needed to reduce and prevent the presence of plastics and microplastics in our ocean?” and “What are the policy sub-challenges related to the event challenge which need to be addressed?” Participants, according to their expertise, reflected upon their corresponding triggering question individually (“at home”) before the face-to-face event.

The day of the event, after setting the right atmosphere at the venue with an introduction, the Officer from DG MARE of the European Commission gave a talk on the hot topic. Thereafter, the participants, arranged in 4 expert groups, to discussed about their corresponding triggering question using the Structure Democratic Dialogue as conducive methodology. This activity generated 4 independent outcomes, each coming for the 4 expert groups. The total of 4 outcomes (3 action-solutions and 1 sub-challenge) were assessed in-depth in the afternoon, in the plenary session, by all the participants organised in cross-cutting groups of 4-5 individuals. This plenary session, which had the main goal of providing feedback to the 4 outcomes, followed the World-Café methodology.

The activity at the first plenary was as follows. Firstly, participants identified problems and barriers associated to the creation of a *mandatory eco-label on plastic package products*, which

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had to be consumer friendly, clear and transparent to inform about the global impact of the package. Secondly, and analogously, participants discussed about the problems and barriers associated to the *use of filtering to capture microplastics from water*. Thirdly, participants enumerated and analysed barriers for the establishment of a *circular economy for packaging plastics* with the final goal of using biodegradable, recyclable and recycled raw materials in the production line – Why to consider plastic a waste instead of raw material to produce new products with value? Finally, participants dug into the data of the EU in relation with the use of plastic products, to formulate *action-solutions which could happen in the following 5 years to reduce, reuse and recycle plastics in Europe*.

The following day, the event continued by analysing in more detail the 4 feedback list generated at the 4 “world café sessions”, in 4 parallel sessions with cross-cutting groups and applying the Structure Democratic Dialogue Methodology. The event continued with a get together at a second plenary to share the outcomes from each second parallel. Thereafter, the event was closed.

During the whole event, the group of participants continuously generated questions, and raise topics and issues which all participants identified as inspiring and others as accomplishable with time, effort and dedication. For everyone's satisfaction, the event was evaluated positively by both organisers and participants. “All participants show great interest in continue collaborating and agreed upon the compromise of giving an answer to the challenge responsibly and collectively for the good of the planet and future generations.”

Finally, this event contributed to disseminate the practice of [Responsible Research and Innovation](#) across Europe and the promotion of the [blue growth](#) strategy of the European Commission. This event also contributed to strengthen democracy in Europe through the practice of a transparent and collective exercise towards solving our own complex societal problems.

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I. Introduction

I.1. About the event

On 1 and 2 October 2019, a participatory event “Plastics in our ocean: a micro or macro challenge?” took place at CIC nanoGUNE, in Donostia-San Sebastián, Spain. The event was organised in collaboration with ZUBIGUNE and financed by the European Commission through the European Project EKLIPSE (Knowledge & Learning Mechanism on Biodiversity and Ecosystem Services) of Horizon 2020 research and innovation programme, under Grant Agreement Number 690474.

I.2. The issue: plastics and microplastics in the ocean

Plastics are useful and versatile materials, which make our life easier, and often cost less than alternative materials. Examples of them can be found everywhere: in clothes, decorative garments, cosmetics, furniture, cutlery, flooring materials, etc. Unfortunately, plastics are very often “thrown away” without control and reach the ocean, contaminating it and us. Amongst all plastics, single use plastics (plastics cups, straws, etc.) and packaging plastics are the ones which are the most common types found in the ocean.

Contamination of the ocean caused by plastics is aggravated owing to the following reasons: (i) plastics persist for long periods of time in the ocean, (ii) some plastics contain hazardous chemicals which are released progressively into the ocean contaminating it further, (iii) plastic items with densities above that of the ocean water sunk into the ocean and cannot be recovered (currently, most plastics are under the sea), (iv) most plastics degrade into small pieces with time, i.e. microplastics, which are ingested by sea animals and come back to us through the food chain, or even through drinks (e.g. through the sea salt, desalinated water). Microplastics are very small particles of plastic material (typically smaller than 5mm or even nanosized). Microplastics can also be intentionally added to products (e.g. cosmetics, shampoos) which end up in the ocean. According to the European Commission, microplastics will cause 22,000 million euros of losses until 2030.

The reduction and prevention of the presence of plastics and microplastics in the ocean is, indeed, a complex environmental challenge Europe has to face to preserve the ocean biodiversity and the benefits and functions that natural ocean ecosystems provide to us and our health – the ocean not only provide us with food and medicines but also with a relax environment, a sport zone, etc.

1.3. How to improve the situation?

Thankfully, Europe is not only one of the main world-wide plastic consumers but is also one of the main producers. Therefore, Europe can make a significant positive change at a global scale if seriously works towards reducing and preventing the amount of plastics in the ocean.

One way of achieving such positive change is by harnessing the collective intelligence, wisdom and workforce of Europeans to understand the problem broadly, and together create plausible solutions which can be put into practice and spread them broadly. One of such actions could be the gathering of a heterogeneous group of people face-to-face, in a participatory event. During the event, and by means of a structured methodology, people can work and learn together, listen to each other and co-create. This type of events could be spread across Europe to have a real impact through the whole territory.

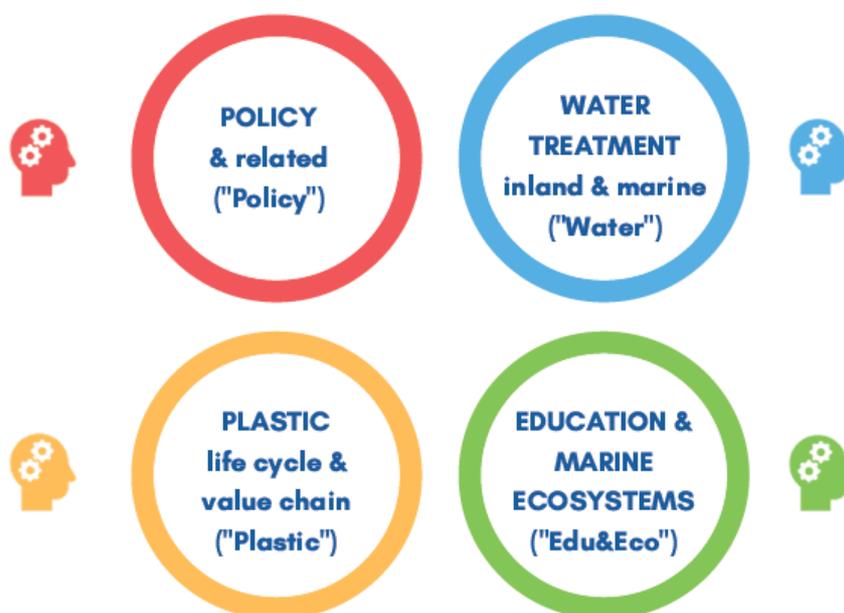
An example of such type of actions was the participatory event organised at CIC nanoGUNE. The event focused on understanding the societal challenge of reducing and preventing the presence of plastics and microplastics in our ocean. For that, the event harnessed the collective intelligence and wisdom of a heterogeneous group of 17 participants with complementary profiles, to learn about the current situation and negative effects of these materials in the ocean, assess the utility of plastics in our daily life, and revise current practices of consumption, use and management of these (a priority very useful) materials in Europe at a societal scale. While doing so, the event delved into the role, science, technology, industry, policy and society could play to accomplish the challenge responsibly in today' s complex scenario.

2. Hands-on workshop tailor-made for participants

The event was thought as a hands-on workshop in English, tailor-made for participants, seeking co-learning and co-creation. Its activities were designed to ensure individuals filled knowledge gaps, produced proposals of realistic actions to take home, got feedback on shared ideas, reached consensus while their voice was heard, and networked.

3. Participants

The event gathered a heterogeneous group of 17 people coming from across Europe (Portugal, Spain, France, Italy, Slovenia, Germany and Greece). During the whole duration of the event, the 17 participants were treated as “content experts”. All of them had very different professional profiles (Education, Policy, Industry, Research), expertise (education and/or marine ecosystems, water treatment – inland & marine, life cycle/value chain of plastics and policy and related) – and were coming from different European institutions.



People were organised according to their expertise in 4 thematic groups (thematic pillars of the event): Education and Marine Ecosystems (“Edu&Eco”), Water treatment (“Water”), Life cycle/value chain of plastic (“Plastic”), Policy and related (“Policy”). The 17 participants were distributed in these four thematic groups as per Tables below.

Expertise/thematic group: Policy & related (“Policy”)		
Name Family name	Country based at	Organisation Professional profile related hobbies (if any)
Maris Stulgis	Belgium	Directorate General for Maritime Affairs & Fisheries (DG MARE) Policy Officer
Siegfried Anton Schmuck	Belgium	SCIAENA, environmental NGO Policy Officer lobbying at EU Institutions for environmental legislation on plastics & microplastics.

Expertise/thematic group: Education & marine ecosystems (“Edu&Eco”)		
Name Family name	Country based at	Organisation Professional profile related hobbies (if any)
Alexandra Maria Viana Silva	Portugal	Associação The K-Evolution, NGO for sustainable development through education Educational Director
Carolina Batista Galván	Spain	Public (State) Secondary School History & Geography teacher (environmental activist)
Francesca Ronchi	Italy	ISPRA Ambiente Biology researcher and scientific outreach
Maraja Riechers	Germany	Leuphana University Social/Environmental Sciences researcher (diver)
Lucia Fanini	Greece	IMBBC - Institute of Marine Biology, Biotechnology and Aquaculture Ethologist and marine biologist researcher
Tania Pereira	Portugal	CIIMAR - Interdisciplinary Centre of Marine and Environmental Research Marine Biology researcher

Expertise/thematic group: Water treatment – inland & marine (“Water”)		
Name Family name	Country based at	Organisation Professional profile related hobbies (if any)
Begoña Espiña	Portugal	International Iberian Nanotechnology Laboratory Water Quality researcher (Group leader)
Elise Blondel	The Netherlands	AISEAS Engineering B.V. Engineer
Katja Klun	Slovenia	National Institute of Biology Marine Chemistry researcher
Tristan Keroullé	France	SUEZ Specialist on microplastics & waste water treatment

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Expertise/thematic group: Life cycle/value chain of plastic (“Plastic”)		
Name Family name	Country based at	Organisation Professional profile related hobbies (if any)
Annalisa Apicella	Italy	University of Salerno Materials (for food packaging) researcher
Haritz Sardon	Spain	Polymat Chemistry (plastic recycling) researcher
Ignacio Martos García-Morales	Spain & Portugal	Duni (100% eco single use products) Business sector/Economy/Finance
Pedro Antonio Ruiz Rodríguez	Spain	Nestlé España Environmental Sustainability specialist
Simone Kefer	Germany	TU München – University of Munich (Food Packaging Technology Area) Materials researcher



4. Participatory methodology

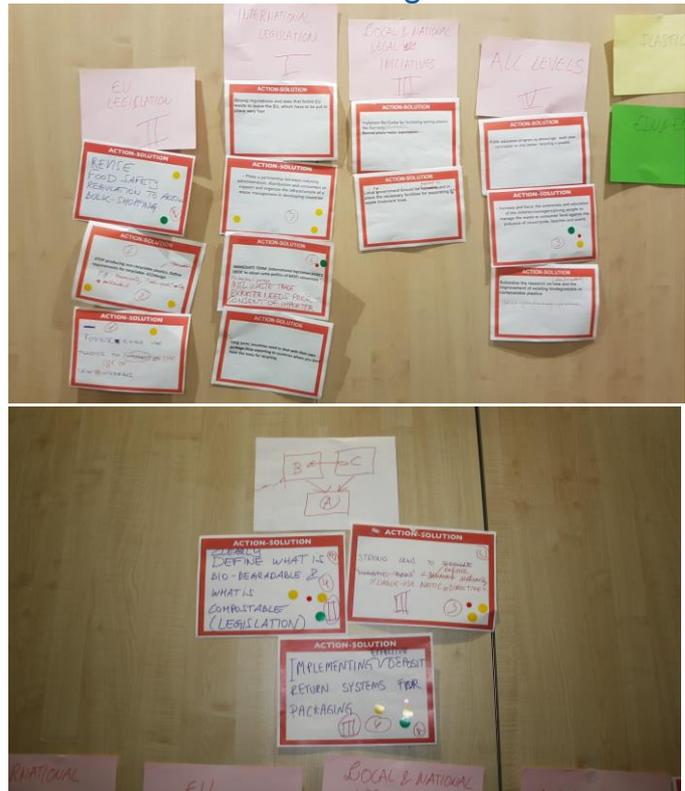
The methodology used in this event applied (i) Structured Democratic Dialogue Process^{1,2} and (ii) World Café (adapted)³ at different stages of the process. Having an event with a structured methodology is key to avoid the classic problems which can arise when no structure is in place: smooth dialogue and results are recorded. A group of 8 facilitators ran the event process smoothly.

Two things are always needed to change the world, and organisation or oneself: (i) a serious desire to change, and (ii) an adequate methodology, e.g. a dialogue, but a highly structured dialogue, which is an attitude, a philosophy, an action plan, a methodology¹.

World Café



Structure Democratic Dialogue Process



¹ Thomas R. Flanagan, Alexander N. Christakis. *The talking point: Creating an environment for exploring complex meaning. A collaborative project of the 21st century agoras.* Information Age Publishing, INC. Charlotte, NC, 2010.

² Alexander N. Christakis and Kenneth C. Bausch. *How people harness their collective wisdom and power to construct the future in co-laboratories of democracy.* Information Age Publishing, INC. USA, 2006.

³ https://en.wikipedia.org/wiki/World_caf%C3%A9

4.1. Structure Democratic Dialogue Process

Structure Democratic Dialogue Process (SDDP) is a dialogic methodology with more than 40 years of history whose goal is to make a heterogeneous group of stakeholders talk and listen to each other to learn together and build a solution to a complex situation within a reasonable time frame.

Briefly, from the participants viewpoint SDDP is subdivided into 5 phases:

- i. Answering the triggering question. Reflecting upon and answering the triggering question of the workshop prior to the face-to-face event.
- ii. Clarification of ideas. On the day of the workshop, ideas are presented to the group one by one. They are understood, contrasted, merged, deleted, and new ones may be created.
- iii. Classification or clustering. The ideas are grouped, classified by comparing them by pairs. In this way, the meaning behind each idea is further revealed to the room. New ideas can be also created at this stage.
- iv. Voting. The ideas are voted to identify the most popular one. Those which has 1 vote or less are discarded.
- v. Mapping. Ideas are ordered in a hierarchical way, by pairing ideas and comparing them against each other: from the most influential to the less. In this way, a tree of influence is built. The most influential idea is the one that should be implement first for the implementation of the next one to be effective

4.2. World Café Methodology

A World Café is a structured conversational process for knowledge sharing in which groups of people of no more than 5 individuals, discuss a topic at several tables, with individuals switching tables periodically, in our case, to discuss a new “outcome”.

5. The process diagram and results

The event was structured following the process diagram below (see figure in next page). The event was divided into 7 phases distributed into 3 blocks, which are explained below.

Block I. Individual work

5.1. Phase I (at home)

Each participant thinks about and defines a maximum of 2 action-solutions⁴ for accomplishing the challenge. If the participants belong to the Policy group⁴ then, they have to think about and define a maximum of 2 policy sub-challenges needed to accomplish the challenge, instead.

Triggering question of Edu&Eco, Water and Plastic groups:

“What are the action-solutions needed to reduce and prevent the presence of plastics and microplastics in our ocean?”

Triggering question of the Policy group:

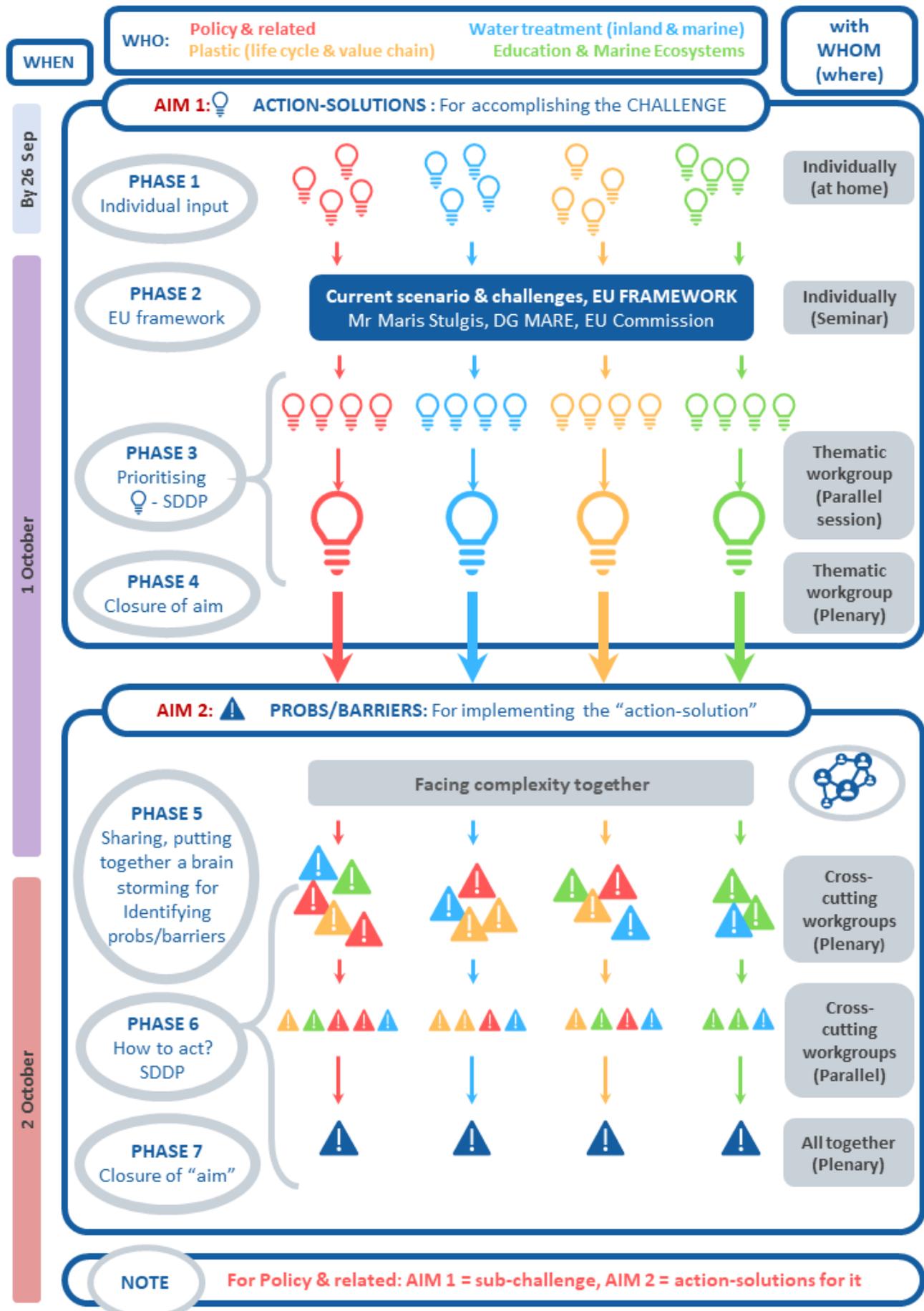
“What are the policy sub-challenges related to the event challenge which need to be addressed?”

5.2. Phase 2 (Seminar)

Talk by EC Officer from DG MARE to provide a general overview on the overarching challenge focus of the event. The seminar paved the way for a wiser discussion during the whole participatory workshop.



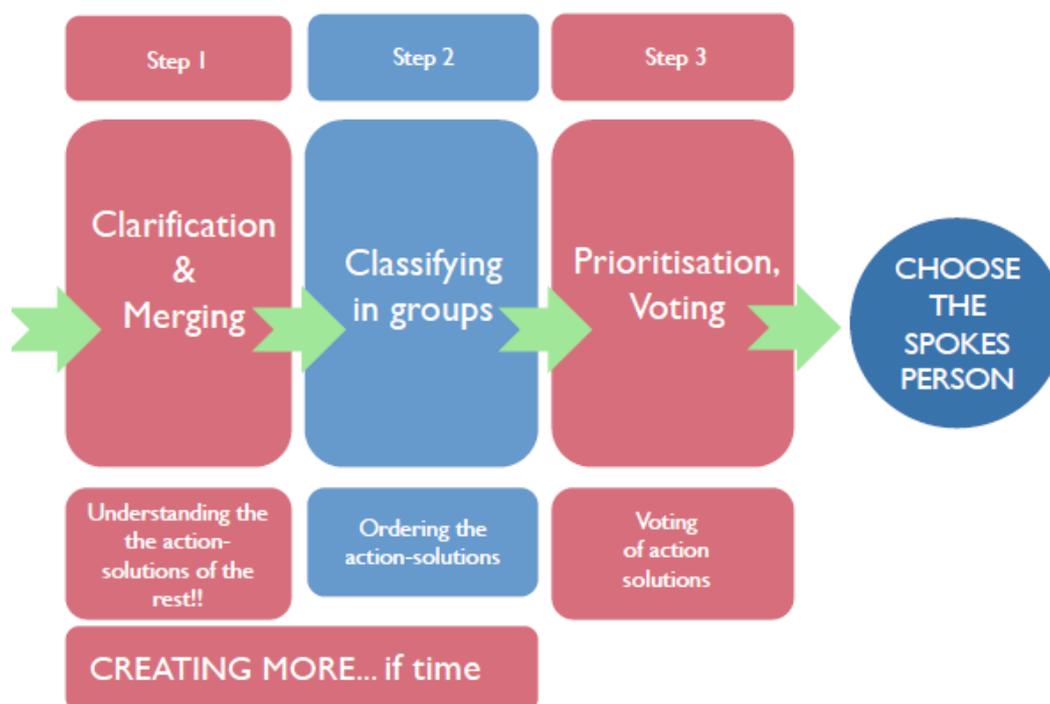
⁴ The compilation of the action-solutions and subchallenges (in case of the policy group) presented by participants has been included in ANNEX I



Block 2. Work within thematic workgroups

5.3. Phase 3 (Parallel sessions - prioritising)

Each thematic group understands the action-solutions (or sub-challenges in case of the policy group) proposed within their own group and prioritise one amongst all. As a result of this phase, 4 thematic outcomes (one per thematic group) are selected to be taken to the next phase. The methodological structure of this phase follows the Structure Democratic Dialogue Process for the first 3 steps, as below:



The classification and the voting results for this phase are missing in some cases, but the outcome.

5.4. Phase 4 (Plenary- closure of aim)

“Last touch” to the outcome obtained during phase 3, before presenting it at Plenary. The titles of the 4 outcomes per thematic group are collected in the table below. The explanations to each can be read in ANNEX 2.

4 outcomes from first triggering questions (after Phase 3 and Phase 4)⁵

Expertise/thematic group	“What is the action needed to reduce and prevent the presence of plastics and microplastics in our ocean?”
Edu&Eco	Mandatory ecolabels on plastic products packages
Water	Filtering micro-plastics from waste waters
Plastic	Circular Economy of Packaging Plastics
Expertise/thematic group	“What is the policy sub-challenge related to the event challenge which need to be addressed?”
Policy	What are the actions needed in the next 5 years to foster the reduction, reuse & recycling of plastic?

Classification or clustering results from the triggering question

Expertise/Thematic group	Classification, “fronts” of action, clusters
Edu&Eco	<i>Missing info</i>
Water	<ul style="list-style-type: none"> • Education, including ocean literacy • Regulations from producers for the right deposit of plastic bottles • Monitoring and mapping • Treatment
Plastic	<i>Missing info</i>
Expertise/thematic group	Resulting types of subchallenges
Policy	Not applicable (as only 1 sub-challenge was defined)

⁵ Explanations to each outcome can be seen in ANNEX 2

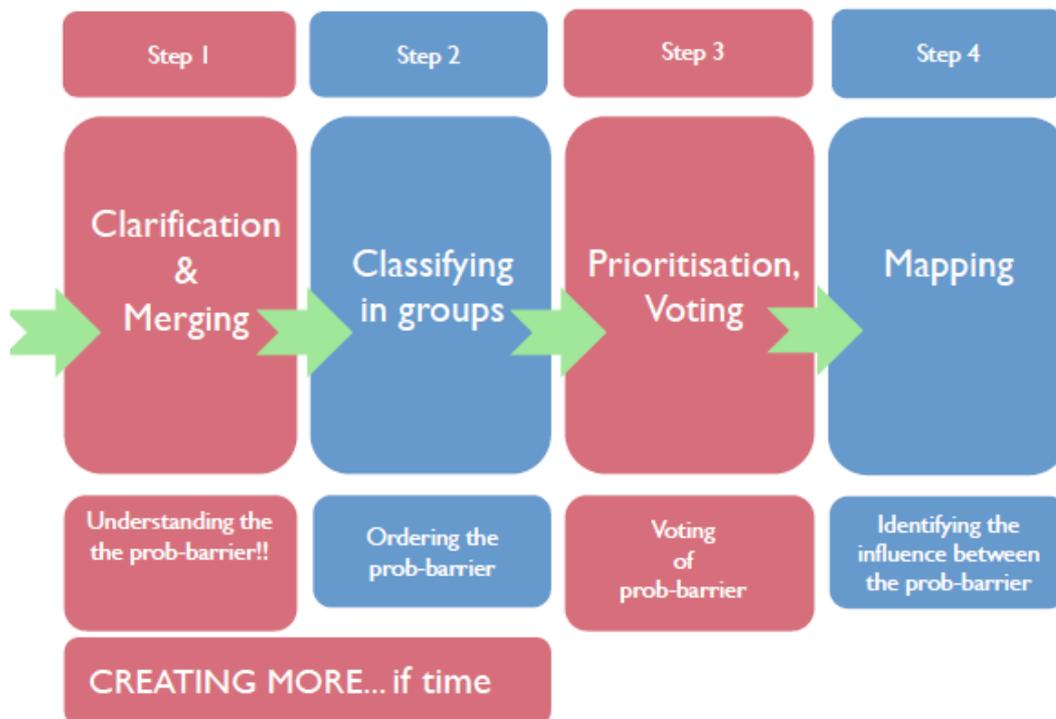
Block 3. Work within cross-cutting (work)groups

5.5. Phase 5 (Plenary - feedback/brain storming)⁶

This phase is divided into 4 sessions of 1 hour. The methodology to be applied in this phase is the World Café. Organised in slots of 1 hour, each the spokesperson of thematic group shares their outcome, obtained during phase 3 and 4, with the rest of thematic groups. This was followed by a brain-storming session which results in a feedback to the outcome of the thematic group. For the brainstorming, cross-cutting workgroups are formed. When giving feedback to the action-solution outcome of Eco&Edu, Water and Plastic, respectively, the participants list barriers/problems for implementing the “outcome” action-solution. When giving feedback to the sub-challenge outcome of the Policy & related group action-solutions are listed instead. In summary, as a result of this phase, the outcome of each thematic group gets a "feedback list" of items.

5.6. Phase 6 (how to act?)

Part 1. Plenary-workgroups: Cross-cutting groups are formed to tackle the "feedback list" for each thematic outcome. A poster session triggers the formation of the groups.



⁶ The feedback list for each outcome has been compiled in ANNEX 3

Part 2. Parallel-strategy: Each cross-cutting group, now working for a specific outcome, revises the feedback list, understanding it deeper, and working to identify which "feedback item from the list" is the most "influential". The most influential is the one which should be implemented first for the implementation of the rest to be more effective. The methodology applied for that purpose is the Structure Democratic Dialogue Process as depicted above. Unfortunately, part of the results from this phase are also missing (see ANNEX 4).

5.7. Phase 7 (Plenary - closure)

Each cross-cutting group shared their results at the Plenary.

GENERAL: at the plenaries (& occasionally at the parallels), "info expert points" were created following certain rules to guarantee an ordered process. Since the input/knowledge of another person in a different room or table could be requested for clarification of concepts, experience, data. In this way, a continuous flow of information in all directions was guaranteed, and the impact of the contributions maximised.

6. Event objectives vs achievement

6.1. Primary objectives

The primary event objectives were achieved. The event was thought as a hands-on workshop in English, tailor-made for participants, seeking co-learning and co-creation. Its activities ensured individuals filled knowledge gaps, produced proposals of realistic actions to take home, got feedback on shared ideas, reached consensus while their voice was heard, and networked.

6.2. Benefits for participants

According to the feedback provided informally by the participants at the event, the seven benefits envisaged during the event were achieved:

- i. Identifying capacities and filling knowledge gaps in the subject.
- ii. Exchanging useful knowledge about the challenge proposed, the value of plastics and the consumption, use and management of these materials in Europe.

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- iii. Getting ideas for realistic actions to take home and their planning, considering the complexity of the challenge and scenario
- iv. Assessing actions and approaches against the existing obstacles and barriers
- v. Making their voice heard amongst and getting feedback from a heterogeneous group of people which aims at reaching consensus
- vi. Creating a network of key and engaged stakeholders from science, industry, policy and society from across Europe
- vii. Aligning better the actions to accomplish the challenge with the needs and expectations of society

6.3. How to achieve an event of maximum impact?

With the aim of hosting an event of maximum usefulness and impact, the questions addressed encompassed general issues of concern for society, as well as more specific issues pointed out by the participants upon filling in an application form prior to the event (see ANNEX I).

Facilitators work to ensure that during the whole event participants were engaged in the discussion and that the process was clear.

6.4. Final goal

The organisers are happy to say that the event harness the collective wisdom and brainpower of participants to propose realistic actions to accomplish the challenge, which can ensure environmental and economic sustainability, welfare and richness to all - in the quest for building a more responsible society and preserving our planet.

7. Best practices and lessons learnt

7.1. Best practices

During the event, facilitators ensured that everybody was making progress towards the design of the solutions and that the atmosphere within the group was one of humility, empathy and equity.

7.2. Lessons learnt

We believe is a compendium of several things what made the event attractive, some of them also acknowledged by the participants. There were also errors:

Participants' selection criteria:

- Organisers went through the answers of the participant, understanding if they got the “aim” of the event clear, so the event fitted their interests.
- Organisers went through the applications to see if participants put care in the writing of the application and were interested in the topic.
- Participant's background and hobbies were also taken into consideration, so to ensure their contributions at the event were going to be complementary, with the intention to covering the “challenge”, so participants could get interesting info during the workshop from other colleagues, and *vice versa*.
- Based on this, organisers tried to engage other actors who did not online in the first place.

Travel grant:

- Offering a travel bursary to all made them happy and ensured they could come.
- Closure of their “travel expenditure” needs was made via email, so making sure the budget fitted each participant's needs. They appreciated that very much. So this was motivational too.

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- Facilitating their travelling providing a travel guide with general tips – they found this useful.

During the event:

- Some of them already declared that the presence of the European Commission at the event was very important for them to feel inspired.
- Treating all the participants as experts was an important piece of the puzzle...
- Nice and healthy food, inviting the group for dinner...
- The plenary session of 4 hours in the afternoon of 1 October was too intense. We had to work on the policy sub-challenge in the morning of the next day, as we were all saturated and tired.
- During the plenary there was an overloading of information
- “Listing forms” were not “participant friendly”

Data recording:

- In the future, put more care in the visual documentation of the results, as the Structure Democratic Dialogue Process results but the outcomes have been lost in most of the cases.

8. Final note

This event contributed to disseminate the practice of [Responsible Research and Innovation](#)⁷ across Europe and the promotion of the [blue growth](#) strategy of the European Commission. Finally, this event contributed to strengthen democracy across Europe through the practice of a transparent and collective exercise to complex problem solving in our society.

⁷ This type of event is part of a series of events promoted by the European Commission in research and innovation which has as objective to find ways to tackle current societal challenges to construct solutions which are better aligned with the needs and expectations of Society.

9. Acknowledgements

The organisers thank EKLIPSE EU project of Horizon 2020 research and innovation programme under GA No 690474, for selecting “Plastics in our ocean: a micro or macro challenge?” in the “2nd call for organising Capacity Building Events”, and the European Commission for being represented at the event and financing this event through the EKLIPSE EU project. Special thanks are given to Oriol Villar for sharing their two videos from Estrella Damm Advertisement with us, and Luis Echarri Prim for very useful comments in the elaboration of the event process programme. The organisers acknowledge the knowledge, and positive inertia which the 17 participants shared, built and created at the event.



ANNEX I. Input from participants before the face-to-face event

The starting point of the workshop were the action-solutions/sub-challenges submitted by participants to accomplish the challenge of reducing and preventing the presence of plastics and microplastics in the ocean. All those are collected below.

<p>Alexandra Maria Emídio Viana da Silva Association The K-Evolution, NGO, Portugal</p>	
<p>Action-solution 1</p>	<p>Replacement of plastic packaging by bioplastics/compostable and reusing plastic packaging:</p> <ul style="list-style-type: none"> • Investing in bioeconomy by searching natural resources to replacing the plastics in bioplastics and using them in the essential packaging. Science-Research have a relevant importance in researching natural resources that have good capacities to replace plastic in bioplastics. • All the plastics should be renewable and recovering to produce news products. • Stop produce the new plastic from fossil fuels. • Nature based solutions should be invested to discover new materials biodegradables. • Creating laws to improve the amount of plastic recycled and to incorporate bioplastics as a mailing alternative to the packaging. • Banish to the marketing all the plastics that couldn't be recyclable.
<p>Action-solution 2</p>	<p>Education of the consumer to practice a sustainable lifestyle</p> <ul style="list-style-type: none"> • Bringing awareness, the real status of the quantity of plastic in the ocean. • Training people for smart choices as a consumer, like using reusable materials and biomaterials that can replace the plastics. • Promoting field trip to locals through campaigns of - ground proofing visits– Hands ON. • Art (street art, performative) using awareness of the big problem. • Videos that illustrate the reality and the issues relating with the plastics in the oceans, in the marine organisms and food chain. • Campaigns to the big supermarkets to act in a deep way to reduce the plastics offer. • Dialoging with the designers of the companies to redesign the products and the packing to reduce the quantity of plastics in the way to accomplish an eco-design. • Introduce in the curriculum ocean literacy and the plastic relationship.

<p>Carolina Batista Galván Secondary High School, Spain</p>	
<p>Action-solution 1</p>	<p>Change in habits of consumption</p> <p>People around the world are following consumption habits dictated by companies through their marketing and advertising. Multinationals pretend to create an excess of needs to increase profits, while exploiting natural elements and developing countries societies. However, many groups are taking action locally and globally to provoke a restructuration of those conventions. All of this brings us a new hope. Now, it is time to rethink what we buy, use and throw away as garbage. Meanwhile, youth movements to care of the planet are expanding everywhere, claiming for urgent actions to avoid climate change, pollution, water contamination, deforestation and many other environmental and social issues related aspects.</p> <p>Governments and companies cannot keep blind to these popular actions on the streets of the principal cities. Changing consumption habits that destroy our planet will be a way to communicate to governments and companies that everybody is responsible for the damage we are causing.</p> <p>Education (formal and no-formal, academic and non-academic) must be one of the central investments. Overall, public Primary and Secondary schools all over the states.</p>
<p>Action-solution 2</p>	<p>An optimal control of plastic production and plastic use for companies, forced by an all around the world countries laws agreement</p> <p>All the governments of the world should sign a formal treat about serious matters, such as plastic production and use for companies to invest in non-contaminant and easy-decomposable materials. It is necessary to move next step towards a sustainable economy and an equalitarian society, respectful with our planet if we want to survive and give children a future. There are many examples: banana leaves or corn starch. Even paper or cardboards are a better option rather than plastic. The question is, why are we so dependent of these materials, when science is going to create primitive ways of packing with lower cost for all of us (economic, environmental, etc.)?</p>

<p>Francesca Ronchi ISPRA – Italian National Institute for Environmental Protection and Research, Italy</p>		
<p>Action-solution 1</p>	<p>Sustainable de-growth. A massive behavioural and market change, leading from single use plastic items and packaging to re-use and bulk sales</p> <p>Our goal as developed countries must not be the substitution of plastic with less durable or degradable products, but a main change in the habits, supported and/or pushed by a change in the market offer, bringing to the switch from single use to re-usable items and to packed items to bulk sales.</p>	
<p>Action-solution 2</p>	<p>Sustainable growth. Stop now single use plastic production and consumption in developing countries</p> <p>Despite the increasing policies to reduce/ban single use plastic, plastics production is constantly increasing every year (299 million tonnes in 2014, 348 in 2018 worldwide). Developing countries are facing (or will face) the switch from natural product to plastics with a 20/30 years delay in respect to Europe, North America and other developed areas. This means that we could be able to reduce the huge impact that this growth will have on the environment and the resources by regulating single use plastic production and use now. Learning from the experience and preventing the misuse of plastics.</p>	

<p>Maraja Riechers Leuphana Universität Lüneburg, Germany</p>		
<p>Action-solution 1</p>	<p>Focus on the root causes of the plastic problem (system intent)</p> <p>Shifting the paradigm of the current system (which seems to be based on ever growing production & consumption of plastic) through accounting for the comprehensive social-ecological consequences of plastic pollution by focusing on the interactions between parameters and feedbacks (reusable plastic, quota of production) and the design and intent of the system (laws, information and less use, reuse).</p>	
<p>Action-solution 2</p>	<p>none</p>	

<p>Lucia Fanini Tero Single member p.c.; IMBBC-HCMR, Greece</p>	
<p>Action-solution 1</p>	<p>Reinforce the systemic vision in research addressing plastic pollution</p> <p>Currently most research tends to report “quick-and-dirty” observations (e.g. plastic ingestion in single species) overlooking the consideration of the system in which all occurs. It is instead urgent to support a vision addressing those drivers of the system which brought to the patterns (that we measure). Or test the inter-connection between different systems’ components (e.g. different solar radiation – affecting the plastics breakdown on the beach – how broken-down plastics can interact with resident organisms). This will allow to act on critical system features, with actions being more efficient.</p>
<p>Action-solution 2</p>	<p>Securing correct information and tools at the present state, filling gaps in people’ habits and attitudes</p> <p>To avoid a one-size-fits-all approach to the issue of plastic pollution (with a high risk of failure), it is needed a deep understanding of current state, including information available to, attitudes and habits of different people’ groups. In fact, even though there is a relevant amount of information available about plastic pollution, attention should be paid to the way this is vehiculated towards citizens’ empowerment, category by category, touching topics of specific interest / within their range of action.</p>

<p>Tania Pereira CIIMAR, Portugal</p>	
<p>Action-solution 1</p>	<p>Self-sustained compensation program for plastic waste caught at sea</p> <p>Create a connection between sea-users and recycling industry (and/or companies that re-use or use recycled plastic as raw material) to remove plastic from the oceans, compensate the sea-users, and re-use / recycle plastic waste. The sea-users would collect the plastic waste from the oceans (e.g., fishermen would retrieve it from the nets instead of throwing it back) and would be paid according to the amount of plastic water yielded (e.g., kilo). The start of such program could be through a project that would identify the stakeholders, create awareness among sea-users, train them for plastic collection and separate the plastic waste when unloaded in land. After the project, the program would be self-sustained (sea-users / industry connection).</p>
<p>Action-solution 2</p>	<p>Plastic burning for energy production</p> <p>Not all types of plastic are recyclable and even those that are take a lot of effort and information to do. Non-recyclable plastics, or those whose recycling is not economically viable, are either exported to poor countries or end up in landfills. One (arguable) option to deal with this garbage is to burn it for energy production.</p>

<p>Begoña Espiña Barbeitos International Iberian Nanotechnology Laboratory, Portugal</p>		
<p>Action-solution 1</p>	<p>Development and implementation of proper analytical methods for nanoplastics in the ocean</p> <p>During the last decade several studies have demonstrated that the potential of toxicity of the smallest plastics is much higher (nanoplastics) than the intermediate (microplastics) ones. However, limitations in the existing analytical procedures for detecting, quantifying and identifying nanoplastics in real matrix have hindered their proper monitoring. The development of accurate, selective detection and quantification methods for nanoplastics in the ocean, merging the knowledge and technology from microplastics and nanoparticles research communities will help to investigate the potential sources which could help to design the best strategies for minimizing their impact.</p>	
<p>Action-solution 2</p>	<p>Development and implementation of novel strategies for plastics degradation</p> <p>Last year, researchers have demonstrated that an engineered enzyme could help to degrade PET. Those findings, however, provide limited solution to complete plastic particles' degradation as only the surface of the plastic was degraded. Higher investment and knowledge sharing are needed for the design of new sustainable methods for complete plastic degradation. Enzymatic hydrolysis seems to be one of the paths to follow. Once developed, cartridges for wastewater treatment could be designed for degradation of micro/nanoplastics from the treated wastewater as a form of tertiary treatment that could be implemented in the wastewater treatment plants before discharge or reuse.</p>	

<p>Elise Blondel Allseas Engineering BV, The Netherlands</p>	
<p>Action-solution 1</p>	<p>Deposit for plastic bottles</p> <p>In the Netherlands, Germany and possibly in other European countries, deposit for plastic bottles already exists. The plastic bottles are brought back to the supermarket, and the consumer gets some money back. The plastic bottles are then sent back to the producer which is responsible for their recycling/post-processing.</p>
<p>Action-solution 2</p>	<p>Filtering micro-plastics from waste waters</p> <p>In some wastewater treatment plants, installations exist that can filter up to 95% of the micro-plastics found in household waste waters (from washing clothes, using plastic sponges, etc). This could be extended to more WWTP.</p>

<p>Katja Klun National Institute of Biology, Marine Biology Station, Slovenia</p>	
<p>Action- solution 1</p>	<p>Incorporation of microfiber filters in every washing machine</p> <p>In the last decade, a lot of effort has been done in qualitative and quantitative monitoring of microplastic (MP) in the environment and assessing its impact on organisms and ecosystem. As the monitoring should be constantly ongoing, more effort needs to be done in preventing the entrance of MP in the environment. Microfibers coming from washing machines are one of big contributors to microplastic pollution in the ocean. After washing clothes, microfibers are flushed from household directly to wastewater treatment plants (WWTP), which cannot retain 100 % of microplastics from influent. Fibers are still one of most abundant microparticles found in the oceans. Approximately 95 % of MP is retained by WWTP, but still 5 % of MP is released in the oceans and 95 % remains in the sludge (making it difficult to recycle). There is one filter already on the market (Planetcare), which retains 80-90 % of microfibers released after washing. There should be more products like this on the market, end users need to be aware of this, so also awareness raising is very important and finally a legislation should be established, so every washing machine should have this already incorporated, so only cartridge exchange would be needed.</p>
<p>Action- solution 2</p>	<p>Including ocean literacy in national curriculum in Elementary school</p> <p>The increase of ocean literacy is crucial in achieving high awareness and action towards healthy and sustainable marine environment. Ocean literacy is considering different aspects from knowledge about ocean functioning and our impact on it, to public's attitudes toward ocean pollution, sustainable fishery, and climate change... Some studies shown that the degree of ocean literacy in Elementary school is moderate but differs from country to country. By including ocean literacy in (inter)national curriculum in Elementary school a big step toward individual awareness and attitude considering preserving ocean health and promoting its sustainability.</p>

<p>Tristan Keroullé Center Rivages Pro Tech from SUEZ, France</p>	
<p>Action-solution 1</p>	<p>Find accumulation areas of marine litter</p> <p>Use ocean observations and models (including waves, currents, wind, ...) to predict and understand where floating marine litters are accumulating at surface, mid-depth and bottom. This will allow to identify where impacts on biodiversity may be the strongest, as well as to guide more efficient collect actions onshore, nearshore or in rivers. The ultimate purpose is to provide support tools and services for authorities to reduce the amount of plastic in the oceans and on beaches, in order to preserve both environment and attractiveness. It is of course not the long-term solution to solve the issue of plastic pollution in the ocean, but it is a necessary remediation action to remove plastics already present and still released, in parallel to the global effort to reduce sources.</p>
<p>Action-solution 2</p>	<p>Identify main sources of marine litter</p> <p>The idea would be to find the different origins of marine litter and quantify their respective contributions in order to target actions to reduce sources. To achieve such a goal, the idea is to model collected litters and transport them back in time by inverting current, wave and wind directions (backtracking simulation). In this way, it is possible to start from the point where litter are found (a beach, a point at sea) and to move backward along most probable pathways to find potential sources. This would allow to identify sources, quantify their contribution and then target action to suppress it.</p>

<p>Analisa Apicella University of Salerno, Italy</p>	
<p>Action-solution 1</p>	<p>Development and use of “100% mono-materials packaging”, as an alternative to heterogeneous laminated packaging</p> <p>As a matter of fact, functional requirements imposed on packaging are so complex that, especially in case of flexible packaging, multiple material combinations in laminates are usually needed to fulfil them. This approach leads to considerable issues in the post-consumption separation step.</p> <p>On the other hand, the development of new mono-material structures, complying the same functionalities but made up of a single material, significantly simplifies sorting in the recycling phase, increasing the recycling quota and reducing the need for new resources. This strategy also simplifies the reuse of materials during the manufacturing phase, thus making the production step environmentally friendlier and more sustainable.</p> <p>Furthermore, the compelling necessity to satisfy high barrier performance can be thoroughly achieved by development of mono-material active-barrier packages, through the addition of specific oxygen scavengers of polymeric nature, capable to actively and continuously control oxygen permeation, offering the same protection as heavier, more expensive and non-polymeric materials.</p>
<p>Action-solution 2</p>	<p>Development and use of new “100% natural packaging”, as an alternative to petroleum-based materials</p> <p>The use of biodegradable and/or compostable materials, in fact, aims at minimizing the environmental impact induced by post-consumer synthetic plastic wastes.</p> <p>However, green polymeric systems are only used for some specific applications, due to their limiting characteristics, such as high cost and scarce mechanical and thermomechanical properties, with respect to traditional commodity polymers.</p> <p>A challenging opportunity, in this sense, is represented by the development of 100% green and eco-friendly bio-composites, obtained from biopolymers incorporated with natural compounds, deriving from agricultural and industrial waste materials.</p> <p>As an example, vegetable and lignocellulosic fibres can be applied as polymer reinforcements, while bioactive compounds from plants and fruits by-products can be successfully employed in active packaging technologies.</p> <p>The synergic combination of biopolymers with natural additives, therefore, would represent not only a way to improve the packaging’s functionalities and reduce the dependence on fossil fuels, but also allows the valorisation of crop or food-processing waste streams, restoring their economic and commercial value.</p>

Haritz Sardon Polymat, Spain	
Action-solution 1	Circular Economy of Packaging Plastics Not consider the plastic as waste but as raw materials to produce new plastics.
Action-solution 2	Sorting of Plastics Platform for sorting the plastics for recycling

Nacho Martos Duni, Spain&Portugal		
Action-solution 1	Plastic switch What kind of materials do you know to replace plastic in your life? Is it possible to replace plastic products in you day to day life?	
Action-solution 2	End of life solutions How recyclable is plastic? how recyclable are materials?	

Pedro Ruiz Nestle España SA, Spain		
Action-solution 1	Increase de proportion of recycled plastics in the packaging The use of recycled plastics in the packaging should increase the value of the recycled plastics. This value can support an economy to improve the collection of plastic, reducing the risk of the presence of plastics in the ocean.	
Action-solution 2	100% of the plastic packaging reusable or recyclable Working in eco-design. Eliminate from the portfolio all the packaging with difficult structures or components to be recycled.	

Simone Kefer

TUM Chair of Food Packaging Technology, University of Munich, Germany



Action-solution 1

Improve and use biodegradable plastics

In our project we study the impact of microplastics, with almost all implications on the aquatic environment and creatures. We study if using biodegradable plastics are a possible way to prevent new microplastics from entering the environment and if they have impacts on the biota. It can be said that using plastics that degrade into non-toxic particles and monomers which can be returned to the biologic life cycle is a way to reduce the development of new microplastics that will pollute our environment for generations to come. We research numerous ways to assess the potential and danger of biodegradable polymers in regards to microplastic. We are already working on creating a follow-up project to further investigate questions that came up during this project.

Action-solution 2

Improve and expand recycling concepts

This action consists of two parts. In Germany, the recycling rate of single-use PET bottles is 99%, because they are returned to the supermarkets and reach the bottle manufacturers correctly sorted and homogeneous. The first important step, as preparation, is to implement a functioning sorting, return, and recycling system in all, at least European, countries. Now you can start to establish more reverse vending/deposit/ return machines and demand a deposit for all plastic packaging. Sort the packaging by type and polymer mixture. You can already put codes on packaging to identify the polymer type, so there is no need research new technology. In Germany, if you want to return bottles that are still half full or extremely dirty, it is not possible so this would encourage people to properly empty and clean the packaging at least a little. The second part is to get recycling stations to start compost heaps specifically for compostable polymers like PLA. This way the end of their lives will actually happen as advertised and make it more attractive to use.

<p>Siegfried Anton Schmuck SCIAENA Environmental NGO, Portugal</p>	
<p>Action-solution 1</p>	<p>Reduce the production of SUP plastics</p> <p>We need to urge our governments to stop exporting plastic waste both to developing countries and also within Europe. We need to look into ways how to stop this expansion, through a combination between legislative and economic measures.</p> <p>Why is the plastic production increasing? The short answer is that oil and gas prices have halved since 2014 and the industry needs to boost sales, and producing plastic is a good business opportunity. Also, the coming decades hold dim business prospects for petrochemical industry, caused by new restrictions for burning climate changing fossil fuels and by the prospect of new modes of mobility such as electromobility. These factors have forced the petrochemical industry to find new markets: plastic! Worldwide plastic production is set to increase by 40% during the coming decade, an expansion fuelled both by cheap oil and gas and global demand. It's a not possible to figure out how to reduce plastic pollution without looking at production reductions. It is clear the industry strategy to expand the production even more will aggravate the issue.</p>
<p>Action-solution 2</p>	<p>Reduce international plastic waste trade</p> <p>We need to urge our governments to stop exporting plastic waste both to developing countries and also within Europe.</p> <p>It is known that 90% of plastic pollution into our oceans comes from 10 rivers, 8 of them in Asia. What is less known is that the problem is inextricably linked to waste-exports from Western countries. In 2017, altogether 13 million tons of waste, roughly 4% of the plastic produced in that year, were exported. For decades, China imported almost 50% of the plastic waste from all around the world, as it was good and profitable business. Then, in 2018, China finally banned the import. But where does that plastic go now? Not far from China, to countries such as India, Malaysia and Indonesia. There it gets much too often dumped in the environment or burnt in open pits. In 2019, Asian countries started to send back some of the imported waste to its Western origins. Their governments are preparing legislation similar to the Chinese one and that will make it more difficult for the West to dump their unwanted plastic waste.</p>
<p>Note: The Policy group ended up enunciated a subchallenge needed to accomplish the challenge focus of the event!!!</p>	

ANNEX 2. Explanation to outcomes from 1st parallel session on 1 October 2019

Action-solution: Mandatory ecolabels on plastic products packages

Explanation:

Eu commission is already preparing regulation for plastic use and its reduction. We propose creating easily accessible and transparent information to achieve the removal of all the non-recyclable plastic from the industry, and use of only biodegradable, recyclable and recycled plastic.

In this framework we propose the creation of an ecolabel that informs the consumer and makes responsible choices.

This label would inform the consumer about the global impact of the product or package in terms of their sustainability: if they are biodegradable, recyclable, recycled, and their origin, and if the design is efficient in terms of materials used.

This would have a greater impact if applied at the UN level.

Action-solution: Filtering micro-plastics from waste waters

Explanation:

WHAT: WWTP to treat wastewater from:

- Household (fibres, etc)
- Industries,
- Rainwater (tire dust, artificial grass, construction industry, etc)

WHY: Micro-plastics are numerous and are harmful for humans and animals

Once in the environment, they are very difficult to remove

HOW: The technology exists to remove more than 95% of the micro-plastics in waste waters. This could be extended to more WWTP.

Action-solution: Circular Economy of Packaging Plastics

Explanation:

Not consider the plastic as waste but as raw materials to produce new plastics.

Get the monomers back from the plastics in single use packaging and produce the original plastic again. Optimise the process (at the moment, very expensive)

Sub-challenge: What are the actions needed in the next 5 years to foster the reduction, reuse & recycling of plastic?

Plastic data in 2016 in the EU:

- 50 Million tonnes of plastic production
- Of which 35% comes from “packaging”
- 27 Million tonnes Plastic waste collected
- Of which 8.4 Million went to recycling (this means that 17% from production went to recycling)
- BUT of those 3 Million tonnes are sent to countries outside EU.
- Therefore...5.4 Million are recycled in the EU (which is 10% of the total production)
- The rest goes (18.6 Million tonnes) went to incinerators and land-fields in the EU.
- And...3 Million tonnes are exported to developing countries
- !!! It is expected the EU plastic consumption and production will increase in the future

ANNEX 3. Plenary session I October - Feedback to the outcomes from parallel I

Expertise/thematic group	Q. “What are the implementation problems and barriers to these action-solutions?”
Edu&Eco	Mandatory ecolabels on plastic products packages
Water	Filtering micro-plastics from waste waters
Plastic	Circular Economy of Packaging Plastics
Expertise/thematic group	Q. What are the action-solutions to accomplish the policy subchallenge?”
Policy	What are the actions needed in the next 5 years to foster the reduction, reuse & recycling of plastic?

**Outcome from Policy:
What are the actions needed in the next 5 years to foster the reduction, reuse & recycling of plastic?**

Action-solutions

- IMMEDIATE TERM: (international legislation). FORCE OEDC to adopt same politics of BASEL convention
- Long term: countries need to deal with their own garbage. Stop exporting to countries where you dont have the tools for recycling.
- STOP producing non-recyclable plastics. Define requirements for recyclable-ECOdesign
- Put taxes on plastic producers for the amount of plastics they put on the market. Tax proportional to recyclability / plastic producers have to deal with plastic product they put on the market
- Develop Replacement products for plastics. Stop producing plastic
- Press policy makers to make some changes on the products requirements, maybe in some specific market fields you don't need several plastic packages one inside the other
- Adding to the school curriculum the awareness on problem of plastics. How can consumer fight waste production.

Outcome from Edu&Eco: Mandatory ecolabels on plastic products packages

Implementation problems and barriers

- Creating a list by the European Commission; a common language of definition of plastic materials (to be addressed by policy)
- The definition of recyclable according to the ISO standard is not applicable in all the EU countries in a common way (a plastic package can be recycled in a country but not in another one) (to be addressed by policy)
- Lack of space/ many packages are already packed with information, so you need a QR code. ANSWER: I don't care about it; I want to see it graphically. Also, recyclable things are not going to be recycled.
- No trust in recycling: something is recyclable but not recycled: education or policy?
- Industry resistance owing to associated increase of production costs
- Including education in basic school about labelling, quality stamps.
- Difficult to apply to multicomponent materials.
- Certification control. The certification should be mandatory for all the companies. it's not clear how can we manage the labelling and how to control the companies? To know that the industrial process is adequate, people who are interested in the biodegradability of the plastic may want to know if you are using a lot of water during the process.
- Product reflecting how to recycle it after using. The explanation of the labels that we give to the customers has to be clear. To explain to the customers how to manage the garbage. The process must be certified.
- The information in the labels should be regulated clearly
- We need to educate people on the meaning of the labels
- Is biodegradability something good? More analysis needed
- It would be more effective to give eco-labels to companies
- What about the cost of this measure
- We need a legislation tax that back the labels

**Outcome from Water:
Filtering micro-plastics from waste waters**

Implementation problems and barriers

- Law or legislation is required for dealing with the sludge
- So far no legislation/regulations for microplastics in drinking water/fresh water
- Too high costs for installing membranes 'everywhere
- People do not realize that microplastics is a potential health issue
- If manual, clean your filters under the water. Sludge still used in several countries and contains microplastics. 95% microplastic stays in sludges, should be not used. the 5% that remains in the sludge presents high concentrations of microplastics and due to the size is extremely expensive to filter it.
- Micro filtration is expensive. Polyester+nylon they settle during first filtering. PET. Less than micron size is too much expensive. Forget about. So, set worldwide standard.
- Lack of education for the public about microplastics:
 - what is a microplastic?
 - how do we produce microplastics?
 - what can we do against microplastics?
- We need a clear definition and clear ideas about the problem in order to take decisions properly.
- Regulations for the filtered material (filtrate) are needed.
- The process could be expensive.
- Doesn't motivate people to rethink how to reduce the amount of plastic, how to use less plastic, how to recycle it better.
- Difficult, since "macro" plastics will saturate the system
- Scaling up the technology could be a technical challenge
- Lack of legislation for pushing in this way
- Some of the filtering plants do not filter even macro-plastics. We are far

Outcome from Plastic: Circular Economy of Packaging Plastics

Implementation problems and barriers

- Right now, it is not economically viable. Still a lot of research needed.
- Who will make standards/regulations for the chemical process of recycling?
- Unrecyclable or difficult to recycle material; product design should consider recyclability → performance
- Large time to develop cost-effective/ sustainable industrial processes for a circular economy
- Problem related to connection between production of plastics and pollution. It is more important to reduce the amount instead of finding new/recyclable methods that will bring to the same problem again. Answer: with a fully structured industrial process we would have a reduction of wastes. Moreover: monomers:energy dispersive → no high quality products
- The energy consumption could be a problem. Environmental costs- pollution. Possible dangerous waste
- Maybe we don't need so many single use plastic packaging.
- To replace the current packaging multilayer materials are difficult to recycle.
- The industry may not like the process to recycle- more plastic they produce more money they get. Chemical and oil companies may fight back.
- How to motivate people to change.
- There should be transparency about chemical recycling
- Nobody knows about chemical recycling is. It should be defined
- Lack of desire (commercial) to recycle other polymers apart of PET

ANNEX 4. Results from parallel-2 on 2 October. Analysis feedback-list further through Structure Democratic Dialogue Process

Expertise/thematic group	Q. “What is the most influential problem/barrrier?”
Edu&Eco	<i>Missing info</i>
Water	Stablishing a global regulation framework for the presence of microplastics in wastewater
Plastic	More transparency about chemical reclying – this term should be defined
Expertise/thematic group	Q. What is the most influential action solution to the subchallenge?”
Policy	<ul style="list-style-type: none"> • Clearly define in the legislation what is compotable and what is biodegradable • Strong laws to enforce nationally single use plastic directive