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1. Introduction and key data on the workshop

The interregional workshop on urban water management policies and practices to reduce microplastics leakages to the environment took place virtually on Tuesday, 24 November 2020. It was originally planned to be on the 13th of May 2020 in Augsburg, Germany, but was postponed due to the Covid-19 pandemic. The workshop was organised by UCB (Cluster of Environmental Technologies Bavaria).

This report presents the outcomes of the workshop and supports each project partner in assessing the relevance of the topic for its region and in generating ideas on possible actions for the territorial action plan. In this regard, the partners might also consider the distributed input paper on the topic which can be useful for providing basic information on the topic to regional stakeholders.

100 participants were registered for the online workshop (8 from Germany, 11 from Latvia, 8 from Austria, 41 from Italy, 8 from Greece, 14 from Romania, 7 from Bulgaria, 3 from France). 71 participants attended the event in the morning and 42 participants were present during the afternoon session. All eight project partners as well as stakeholders from each country (except France) were represented during the event.

The workshop was carried out by using the software ZOOM and the online-whiteboard tool MURAL. The event was divided into two sections. In the morning, there were six expert presentations with the opportunity to ask questions to the speakers. After the lunch break, the interactive part took place with exchange and discussions in six virtual rooms.

Please find the agenda of the workshop and all expert presentations in the attachment. After the workshop, the participants were asked to fill-out an online survey. The results can be also found in the attachment.

Here is a short summary of each expert's presentation:

- **Microplastics – facts and figures** by Sylvia Schaab (Forum plastic-free Augsburg)
 - The presentation contains general information on microplastics (MP), its definition and sources. In Germany, for instance, the main MP particles are generated from tire abrasion. The importance of consumer responsibility was also highlighted. Different advices like buying cloths made out of cotton instead of synthetic fibres or buying cosmetics and detergents without MP were given.

- **Microplastics in wastewater treatment plants - current situation and state of research** by Prof. Christian Schaum and Natalie Wick (Bundeswehr University Munich)
 - A general introduction on MP in wastewater (WW) was given. Main sources of MP in WW are: cleaning agents, cosmetics, synthetic fibres, hygiene articles and MP in surface and street run-off. In addition, a current research was presented on the question of the comparability of retention of MP in wastewater treatment plants (WWTP). The impact of sampling, sample preparation and method of analysis was analysed within this project PLASTRAT.

- **Ecofario Technology of Microplastics Filtration** by Dr. Sebastian Porkert (Ecofario)
 - The technology of Ecofario was presented. It is a new type of separation process that significantly reduces microplastics and the associated pollutants in waste water. The system is installed as an alternative to the 4th cleaning stage in sewage treatment plants. The ECOFARIO technology works without a filter, based on the principle of the hydrocyclone. This avoids previous procedural and economic disadvantages of microplastics filtration.

- **Wastewater treatment plant (WWTP) in Augsburg: Is microplastic an issue?** by Klaus Stegmayer (City of Augsburg)
 - The presentation contains general information about the WWTP of Augsburg. In addition, the behaviour of microplastic in the plant (during mechanical removal/ sedimentation in grid chamber and preclarifier / adsorption to the activated sludge) was explained. The problems with determining MP were also highlighted.

- **Micropollutants (MPs) in the Water Sector in Lombardy: an overview from a working group within the Lombardy Energy Cleantech Cluster (LE2C)** by Prof. Francesca Malpei (University POLITECNICO, Milan)
 - Since 2018, 3 working groups with 50 participants from 14 institutions gather data and promote a common vision on emerging contaminants and microplastics. The presentation contains survey results among personnel of water utilities as well as recommendations, e.g., to develop guidelines and standards for MP sampling and analyses.

- **Operation Clean Sweep - Programme to avoid the dispersion of plastic pellets in the environment** by Roberto Saettone (PlasticsEurope Italia)
 - Pellet loss is the second largest source of primary microplastics. Therefore, since 2014, PlasticsEurope has the voluntary programme called OCS (Operation Clean Sweep) to avoid the dispersion of plastic pellets to the environment. The objective is a zero pellet/ powder/ flake loss.

2. Results of the break-out sessions

All results from the six break-out sessions can be found in the attachment. Here are some of them summarised and structured:

Awareness raising campaigns for consumers

- Advices like buy washing detergent without MP and clothes made out of cotton instead of synthetic fibres and reduce the turns/minutes of centrifuge during the washing process should be spread to consumers by different type of campaigns
- In general, public awareness on MP is very important and should be increased. However, the current situation differs from each country, e.g., it was said, that Italy already has a high level of awareness; in Greece, it was estimated to be low
- Holistic approach to communicate the complexity of the topic to consumers is need (e.g., recycled PET is often used for clothes; this is a positive aspect as recycled materials are used, but the loss of MP is still existing)
- Awareness actions are even more important than policies (and easier to implement)

Industry initiatives

- France: ongoing MP project piloted by SUEZ to propose a technological offer to local authorities, owners of WWTP and/or sanitation systems, operators and designers of WWTP
- Germany: different companies try to avoid MP by using more natural ingredients
- Different industry initiatives to avoid MP in cosmetics exist

Research activities

- Austria: new research studies on MP in the environment in Styria; researches about MP inlet and outlet started; more emphasis on hormones and drugs; many articles in the press about MP; federal environment agency has started a measurement campaign about MP in sludge; results will be presented in March 2021; studies on MP sources started 2/3 years ago
- France: ongoing research for the quantification of MP in WW and rainwater
- Italy: financial call (Lombardy) for studies on MP; many researches on MP to collect more data on the current situation
- Bulgaria: marine litter along the Bulgarian coast has been monitored under the national monitoring program (also included beach/shoreline and floating and seafloor litter <5 mm)
- Latvia: LHEI is conducting research on MP; Interreg Baltic Sea Region Project [FanPLESStic](#) – initiatives to remove microplastics before they enter the sea
- Germany: many different research projects on MP exist
- Many projects on MP in the Danube (e.g. [MicBin](#), Interreg DTP project [Tid\(y\)Up](#))

Policy development

- France: From 2025, all new washing machines must have a filter that retains MP, so that they do not end up in the WW; several working groups set up in 2020 to make progress on the subject (associations, local authorities, researchers, etc.)

- Italy: Lombardia has set up a discussion with the plant managers on the topic of management of sewage sludge; since 1 January 2020, ban of wash-off cosmetics and personal care products for exfoliating and cleaning purposes containing plastic microbeads
- MP in cosmetics & cleaning detergents are not included in the EU Single-Use Plastics Directive

Initiatives and policies related to plastic waste reduction without directly focusing on MP

- Austria: "Syrian spring cleaning": Styrian citizens collect plastic waste in nature; a regional waste prevention hub in Styria; deposit for single-use beverage packaging (PET bottles, cans) under discussion; many legislations on recycling
- Romania: Taxes for single-use plastic bags; the government just started to establish legislation for a new deposit-return system for packaging; private clean-up campaigns and awareness campaigns
- Greece: legislations focus on single-use plastics reduction (new law) / plastic bags ban / plastic reduction in touristic places
- Latvia: new Waste Management Plan; tries to include funding and benefits just for packaging that can be recycled; many campaigns on single-use plastics
- Bulgaria: implementation of the EU Single-Used Plastics Directive probably by 2022; high level of recycling of plastics
- Germany: many policies and initiatives exist, e.g., deposit scheme, EPR for packaging, recycling quota etc. and certain cities defined goals e.g., zero waste cities of Kiel/ Berlin
- France: circular economy and anti-waste law to reduce plastic waste; public awareness campaign that "wastewater and rainwater networks are not dustbins"; AMORCE association: territorial plastics management plan (how public water and sanitation services can fight against plastic pollution)
- Italy: ban on single-use plastics at beaches; since 2018, it is compulsory to use only biodegradable and compostable shopping bags

3. Final outcomes and recommendations

Here are some final outcomes of the workshop listed and recommendations drawn on how to utilise them to steer relevant policy implementation.

- The topic of microplastics in general, and in urban wastewater management in particular, is quite a **new subject** on the political and social agenda. It can be summarized that there are only a very few actions currently implemented in the PLASTEKO regions.
- Therefore, the need on **awareness raising** activities on the topic is assessed as very high. This includes awareness raising campaigns to society as well as to policy and industry. Depending on the different region covered by the PLASTEKO partner and its influence on industry / society / national policy level, each PLASTEKO partner need to **individually assess** its way of raising awareness on the topic.
- In any case, an awareness campaign addressing **consumers** should be of relevance to all PLASTEKO partners. If the PLASTEKO partner is not able to manage such a campaign, it is recommended to check if already other organisations / NGOs addressing the topic can be supported.

- In addition, it should be assessed if the topic of MP can be included in already **existing campaigns** on plastic pollution. All project partners confirmed that there are many initiatives on plastic (against littering and against single-use plastics), but without the focus on MP.
- In general, a campaign should inform about the **risks/ problems** of MP as well as its **sources** and **best practices** to reduce MP input to the environment by e.g., buying detergents without MP.
- In addition to awareness raising to the public, information on MP should be provided to **regional wastewater treatment plants** in case there is a lack of awareness. In addition, information about new technologies like from the start-up Ecofario can be provided to plant manager.
- It should be also assessed, if **certain events** have an impact on MP pollution, e.g., in Greece, carnival was proven to be one of the causes for MP pollution in the sea. Therefore, certain restrictions to special events can probably have a high impact.
- Depending on the type of PLASTEKO region, a focus on the **agriculture section** might be of interest, e.g., the topic of usage of sludge contaminated with MP as fertilizer on the field or the reduction of foils in agriculture in order to reduce plastic waste which can result in MP pollution in the soil
- Certain **industries** (e.g., textile, tire, cosmetics, plastics) also have responsibility in reducing MP pollutions, as MP is released by their products. There are several voluntary industry initiatives out there (e.g., by PlasticEurope). However, its success needs to be assessed on **policy level** and obligations need to be discussed at a certain point in time. Depending on the type of PLASTEKO partner, political lobbying might be recommended.
- In general, **regulations for industries** should be ideally decided on EU level. In certain countries, legalisations are already in place to reduce the MP release in WW (e.g., in France, all new washing machines must have a filter that retains MP from 2025; Italy has a ban of wash-off cosmetics and personal care products for exfoliating and cleaning purposes containing plastic microbeads since 1 January 2020). These regulations should be adapted to EU level and other regulations should follow. However, the influence of PLASTEKO partners on EU level might be limited. Nevertheless, political lobbying on national level might be possible.
- **Financial support** to industries for improving their production techniques to reduce MP pollutants and also to WWTP to introduce filter technologies to remove MP might be an interesting tool. However, its feasibility needs to be assessed by each PLASTEKO partner individually.
- Overall, particular **legislations** in the field of MP are lacking. However, many policies in the field of plastic waste reduction are already out there or will be implemented soon because of the EU Single-Use Plastics Directive. The integration of the MP topic to **existing legislation / policy documents** should be possible. This might be also possible on regional level, e.g., in reconstruction plans for sports fields

with **artificial turfs**, it should be included that plastic granulate free options should be preferred, as these granulates are also a source of MP to the environment. However, there is already a discussion on this topic on EU level, it might be also of interest on regional level.

- Many initiatives and policies on reduction of single-use plastics / littering etc. are out there. All these should be further developed and promoted, as these actions also reduce the secondary MP rate (**indirectly reduction effects**). In general, corrective and preventive methods are of high importance.

- However, there is already a lot of **research** on this topic, there is still a lack of knowledge on certain topics and regions, so in general, more research is need. It is recommended that industries who can reduce the input of MP or can provide technologies to remove MP from WW should be more involved in research activities. Certain countries e.g., Greece, still lack of research to quantify the problem with MP. Each partner needs to assess its possibility to increase relevant research activities in case there are lacking.

- The recommended **next steps** to the PLASTECO partners are
 - to assess the relevancy of the topic for its region and
 - to **identify possible actions** related to MP for the action plan
 - in order to do so, the organisation of **intra-organisational meetings** should be organised
 - in addition to an exchange within its organisation, the exchange with relevant regional stakeholders is crucial
 - therefore, the topic and probably already a first idea of an action for the action plan might be introduced and discussed in the next **regional stakeholder meeting**

4. Attachment

AGENDA

09:30 o'clock	Welcome & Introduction & Presentation of the Agenda Christina Zegowitz, UCB (Moderation)
10:00 o'clock	Presentations of Experts with Q&A Session
10:00 – 10:15 o'clock	Microplastics – facts and figures Pia Winterholler (Forum plastic-free Augsburg)
10:15 – 10:35 o'clock	Microplastics in wastewater treatment plants - current situation and state of research Prof. Christian Schaum, Natalie Wick (Bundeswehr University Munich)
10:35 – 10:45 o'clock	Ecofario Technology of Microplastics Filtration Dr. Sebastian Porkert (Ecofario)
10:45 – 11:00 o'clock	Q&A Session on the three presentations
11:00 – 11:15 o'clock	Coffee break
11:15 – 11:30 o'clock	Wastewater treatment plant (WWTP) in Augsburg: Is microplastic an issue? Klaus Stegmayer (City of Augsburg)
11:30 – 11:40 o'clock	Micropollutants (MPs) in the Water Sector in Lombardy: an overview from a working group within the Lombardy Energy Cleantech Cluster (LE2C) Prof. Francesca Malpei (University POLITECNICO, Milan)
11:40 – 11:50 o'clock	Operation Clean Sweep - Programme to avoid the dispersion of plastic pellets in the environment Roberto Saettone (PlasticsEurope Italia)
11:50 – 12:15 o'clock	Q&A Session on the three presentations
12:15 o'clock	Lunch break
13:00 o'clock	Interactive Breakout Sessions <i>These aspects will be discussed:</i> <ul style="list-style-type: none"> • policies/ initiatives on industrial practices and consumer behaviour • policies/ initiatives on solutions to remove microplastics in WWTP • current situation in PLASTECO regions/ countries
14:00 o'clock	Coffee break
14:15 o'clock	Presentation of the Results
14:45 o'clock	Summary & Feedback
15:15 o'clock	End of the Workshop

EXPERT PRESENTATIONS

In case you would like to receive the presentations, please contact christina.zegowitz@umweltcluster.net.

Presentation 1: Microplastics – Facts & Figures

Microplastics - Facts & Figures

Presentation by Pia Winterholler
Forum plastic-free Augsburg

FOCUS PLASTIKFREIES AUGSBURG

MICROPLASTICS - FACTS & FIGURES

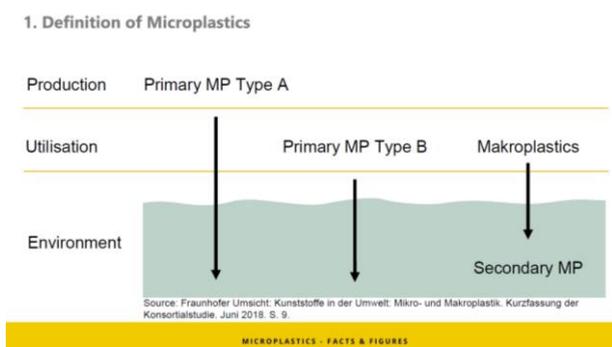
Index

1. Definition of Microplastics
2. Pathways and Amounts of Contamination
3. Mobility
4. Health and Environment
5. Consumer Responsibility

MICROPLASTICS - FACTS & FIGURES

1. Definition of Microplastics

MICROPLASTICS - FACTS & FIGURES



1. Definition of Microplastics

Primary Microplastics	Secondary Microplastics				
<ul style="list-style-type: none"> purposefully manufactured 	<ul style="list-style-type: none"> fragmentation of larger plastics 				
<table border="1"> <thead> <tr> <th>Type A</th> <th>Type B</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> Abrasives Polymer based blasting agents Plastic pellets for industrial use </td> <td> <ul style="list-style-type: none"> Tire particles Abrasion of soles Abrasion of sports fields Emission of MP fibre during laundry Weathering of paint </td> </tr> </tbody> </table>	Type A	Type B	<ul style="list-style-type: none"> Abrasives Polymer based blasting agents Plastic pellets for industrial use 	<ul style="list-style-type: none"> Tire particles Abrasion of soles Abrasion of sports fields Emission of MP fibre during laundry Weathering of paint 	<ul style="list-style-type: none"> material fatigue caused by exposure to UV radiation, salt water, wind, friction Any macroplastic, e. g. bottles, plastic bags, toothbrush,
Type A	Type B				
<ul style="list-style-type: none"> Abrasives Polymer based blasting agents Plastic pellets for industrial use 	<ul style="list-style-type: none"> Tire particles Abrasion of soles Abrasion of sports fields Emission of MP fibre during laundry Weathering of paint 				

MICROPLASTICS - FACTS & FIGURES

2. Pathways and Amounts of Contamination

MICROPLASTICS - FACTS & FIGURES

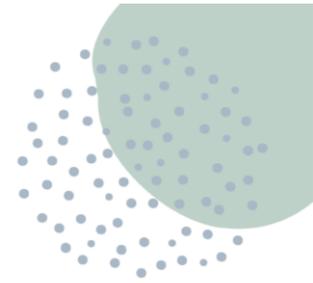


2. Pathways and Amounts of Contamination

- ▶ 446.000 t of plastics are emitted every year in germany
- ▶ 74 % microplastics + 26 % macroplastics
- ▶ Estimated average of microplastics emission per capital/ year in germany = 4.000 g

MICROPLASTICS - FACTS & FIGURES

3. Mobility in environmental Media



MICROPLASTICS - FACTS & FIGURES

3. Mobility in Environmental Media



- Global water network
- Rivers, currents, tides
- Irrigation (agriculture and horticulture)
- Water treatment
- Rain



- Air streams and currents
- Blast
- Weather (wind and storm)
- Atmospheric pressure and thermal



- Agriculture (ploughing, plastic mulching)
- Sewage sludge
- Contaminated compost
- Irrigation
- Water treatment
- Soil organisms

MICROPLASTICS - FACTS & FIGURES

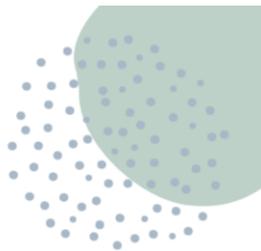
3. Mobility in Environmental Media

Mobility of Microplastics in the Oceans



MICROPLASTICS - FACTS & FIGURES

4. Health and Environment



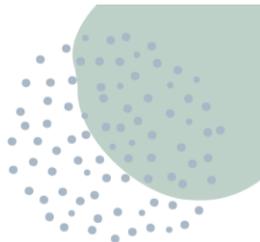
MICROPLASTICS - FACTS & FIGURES

4. Health and Environment

- ☹️ Emission of toxic additives bioaccumulation
- ☹️ Toxicity to reproduction and genetic processes, endocrine disruption, mutagenic, carcinogen pathogenic (additives)
- ☹️ Mobile & highly persistent (no decomposing)
- ☹️ Accumulation in all environmental media
- ☹️ Accumulation in food chain
- ☹️ Mechanical lesion & confusing with foods (animals)

MIKROPLASTIK - UNSICHTBARE UMWELTSÜNDER

5. Consumer Responsibility



MICROPLASTICS - FACTS & FIGURES



- Synthetic & micro fibre
- Outdoor textiles
- Fleece fabric
- Laundry



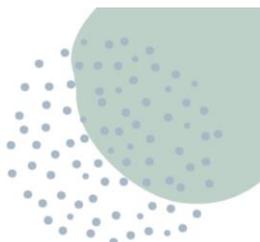
- Cosmetics
- Detergents
- Household appliance



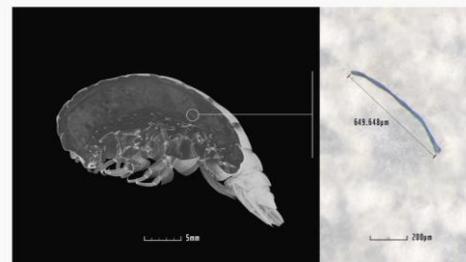
- Fish
- Seafood
- Fruit & vegetables?

MIKROPLASTIK - UNSICHTBARE UMWELTSÜNDER

Why we need to talk about microplastics



MICROPLASTICS - FACTS & FIGURES



Eurythoes plasticus im Scan, wobei die Stelle, an der sich ein Stück Mikroplastik befindet, markiert ist
Quelle: stern.de URL: <https://www.stern.de/panorama/wissen/plastik-im-koerper-bei-neu-entdecktem-tiefsee-krebs-festgestellt-9171560.html>

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MICROPLASTICS - FACTS & FIGURES

References:

- Büks, Frederick/ Kaupenjohann, Martin: Global concentrations of microplastic in soils, a review. Soil Discussions. Open Access. URL: <https://soil.copernicus.org/preprints/soil-2020-50/soil-2020-50.pdf>.
- Fraunhofer Umsicht: Kunststoffe in der Umwelt: Mikro- und Makroplastik. Kurzfassung der Konsortialstudie. Juni 2018. URL: <https://www.umweltsicht.fraunhofer.de/content/dam/umsicht/de/dokumente/publikationen/2018/kunststoffe-id-umwelt-konsortialstudie-mikroplastik.pdf>.
- Liebmann, Bettina: Mikroplastik in der Umwelt. Vorkommen, Nachweis und Handlungsbedarf. Umweltbundesamt GmbH, Wien, 2015. URL: <https://www.umweltbundesamt.at/fileadmin/site/publikationen/rep0550.pdf>.
- Mikroplastik und andere Kunststoffe in Kosmetika. BUND Einkaufsratgeber. URL: https://www.bund.net/fileadmin/user_upload_bund/publikationen/meere/meere_mikroplastik_einkaufsratgeber.pdf.
- <https://www.stern.de/panorama/wissen/plastik-im-koerper-bei-neu-entdecktem-tiefsee-krebs-festgestellt-9171560.html>.

Thank you for your attention!



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MICROPLASTICS - FACTS & FIGURES

MICROPLASTICS - FACTS & FIGURES

Presentation 2: Microplastics in wastewater treatment plants - current situation and state of research

PLASTRAT Universität München

Microplastics in Wastewater Treatment Plants – Current Situation and State of Research

Christian Schaum, Natalie Wick, Steffen Krause
Franziska Kläger, Matthias Labrenz, Franziska Fischer, Dieter Fischer

November 24, 2020

PLASTECO Interreg Europe
European Union European Regional Development Fund

Interregional Workshop on urban water management policies and practices to reduce microplastics leakage to the environment

Microplastics in Wastewater Universität München

- ▶ Cleaning agents
- ▶ Cosmetics
- ▶ Synthetic fibres
- ▶ Hygiene articles
- ▶ Surface / Street run-off

Bundeswehr University Munich | Chair of Sanitary Engineering and Waste Management | C. Schaum, N. Wick et al. | November 24, 2020

Retention of Microplastics in Wastewater Universität München

Sampling? Sample Volume? Particle Size? Sample Preparation? Method of Analysis?

Comparability?

Schaum, C., Kläger, S., Wick, N., München, A. Mikropartikel in der kommunalen Abwasserbehandlung. Schriftenreihe WWAU, Technische Universität Darmstadt 2020, in Press

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Microplastics in Wastewater Universität München

- ▶ Cleaning agents
- ▶ Cosmetics
- ▶ Synthetic fibres
- ▶ Hygiene articles
- ▶ Surface / Street run-off

Sampling → Sample Preparation → Analysis

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Requirements and Development of a Sampling System Avoidance of Contamination Universität München

→ 3.214 particles thereof 57 microplastics

Influence of Lab:
→ Preparation of Equipment
→ Analysis

→ Sampling system made of stainless-steel
→ Silicon and Teflon for hoses and seals
→ Glass-vessels for samples

Sampling → Sample Preparation → Analysis

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Requirements and Development of a Sampling System Representative Sampling Universität München

Conditions:
→ Dry Weather or → Mixed Water

Sampling proportional to
→ Volume or → Time

Accompanying Analysis → TSS

Sampling → Sample Preparation → Analysis

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Development of a Sampling System

Figure adapted from Gujer (2007)

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Requirements and Development of a Sampling System Representative Sampling

Figure adapted from Gujer (2007)

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Requirements and Development of a Sampling System Enrichment of Particles

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Requirements and Development of a Sampling System Pressure Loss of Filter Pore Sizes

Filter Cassette:
Woll Technik
500 m² filter area, Ø 66 mm,
254 mm

→ 50 µm pore size

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Requirements and Development of a Sampling System Sample Preparation

- ▶ Transfer of filter residue into aqueous medium (Ultrasonic bath)
- ▶ Oxidation of organic substances (Hydrogen peroxide)
- ▶ Separation of inorganic substances via density separation (Sodium polytungstate)

For details see: Strohriess et al. (2020)
When every particle matters: A GUTCHERS approach to extract microplastics from environmental samples (MethodsX)

Photos: a) Bundeswehr Univ. (2019) b) BfU Wismar (2019) c) IFF Dresden (2019)

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Requirements and Development of a Sampling System Analysis

► Raman Spectroscopy:

- Identification of polymers
- Counting of microplastic particles
- Information about shape, size colour and particle size distribution
- Automated Analysis „GEPARD“

IR transparent silicon blank: 10 x 10 mm, pore size: 50 µm
→ fixed at 50 µm analysis times are significantly reduced

For details see: Brand et al. (2019)
High-Throughput Analyses of Microplastic Samples Using Fourier Transform Infrared and Raman Spectrometry (Applied Spectroscopy)

Bundeswehr University Munich | Chair of Sanitary Engineering and Waste Management | C. Schaum, N. Wick et al. | November 24, 2020

From Sample to Analysis Result?

Photos: a) Bundeswehr Univ. (2019) b) BfU Wismar (2019) c) IFF Dresden (2019)

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From Sample to Analysis Result?

Sampling → Sample Preparation → Analysis

- Sample Volume
- Pressure Loss
- Organic Substances
- Inorganic Particles
- Particle Number
- Non-Plastics

Contamination

Photos: a) Bundeswehr Univ. (2019) b) BfU Wismar (2019) c) IFF Dresden (2019)

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First Results of Samples and Blank Samples

Retention Rates 99.9% → Comparable to former studies

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Conclusion and Outlook

► Distribution ubiquitously

► Standardized procedures

► Dependencies

► Knowledge of processes at WWTP

► Results of sewage sludge samples for complete balancing of WWTP expected

Sampling → Sample Preparation → Analysis

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Acknowledgement

Universität München

An Initiative of the German Federal Ministry of Education and Research

Plastics in the Environment
sources · sinks · solutions

PLASTRAT

Federal Ministry of Education and Research

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PLASTRAT

Universität München

Microplastics in Wastewater Treatment Plants – Current Situation and State of Research

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November 24, 2020

PLASTEKO
Interreg Europe

European Union
European Regional
Development Fund

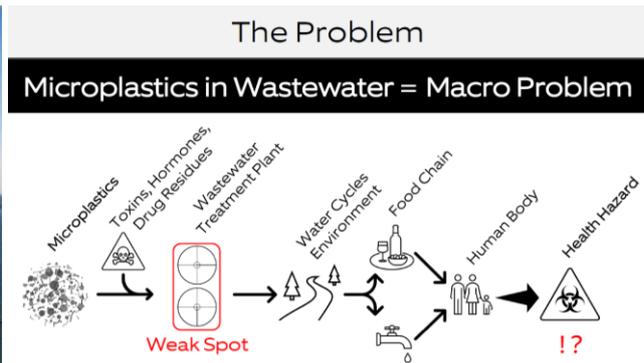
www.unibw.de/wasserwesen/swa
swa@unibw.de

Presentation 3: Ecofario Technology of Microplastics Filtration

ECOFARIO

High-Efficiency Micro Particle Filtration

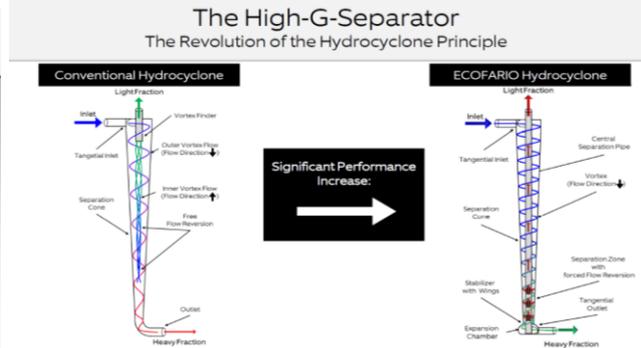
3 Sustainable Development Goals, 6 Clean Water and Sanitation, 9 Industry, Innovation and Infrastructure, 11 Sustainable Cities and Communities, 12 Responsible Consumption and Production, 13 Climate Action, 14 Life Below Water, 15 Life on Land, SUSTAINABLE DEVELOPMENT GOALS



The Solution

The High-G-Separator

Only 9 individual parts!



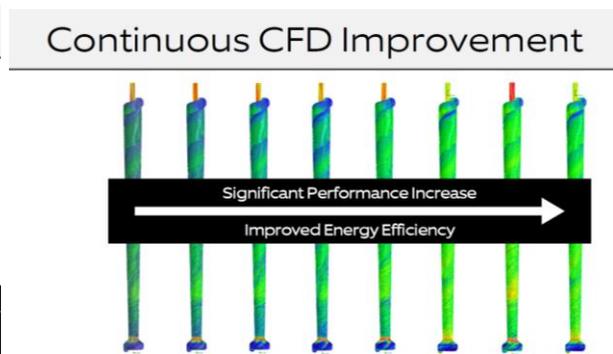
The Solution

The High-G-Separator

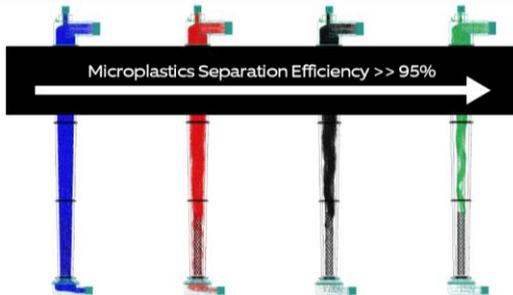
Engineered Simplicity
Patented in GER / Patent published in EU, USA, JP, CN

Simple Design → Perfect Flow → High Efficiency >> 95%

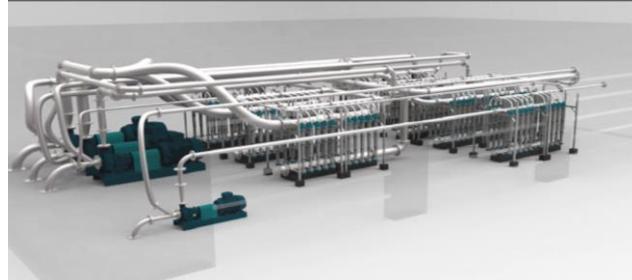
No Filter, „ONLY“ Gravitation and Fluid Forces → **Revolution!**
Performance Increase to State-of-the-Art: **Factor 50!**
TCO Reduction: **60-90%**



Continuous CFD Improvement



The Product



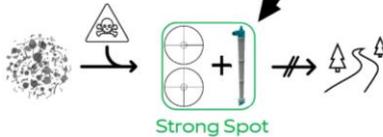
Value Proposition

Supreme Technology for Filtering Microplastics & Pollutants from Wastewater at Very Low Costs.

Wastewater:
Positive Impact on the Environment

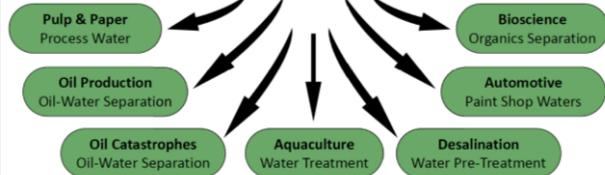
Process Water:
- Quality Increase
- Cost Reduction

Example Plant: ~ 500 l/s

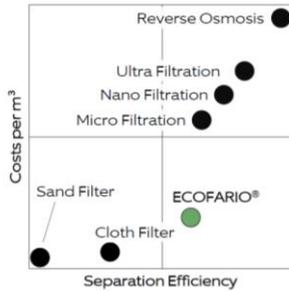


Additional Fields of Application

The ECOFARIO Technology can be used for ANY Separation of Heterogeneous Fluid Mixtures



Competition



ECOFARIO Benefits

- No filter (only gravitation and fluid forces)
- Highly efficient (>> 95%)
- Low total cost of ownership (- 60-80%)
- Very low service costs (no service needed)
- 100% scalable (fits any customer need)
- Low footprint (fits everywhere)
- Very robust (no clogging & cleaning, wear)
- Easy to operate (engineered simplicity)
- Fully automatized and IoT-ready

No Comparable Product on the Market

Pilot Unit / Full Scale



Specifications

Mobile Unit: Stand-alone, or integrable
Control: Process- and Quality Control System, fully automatized and digitalized
Power Connection: 400V / 100A
Capacity: 500-1000 l/min (1 500 l tank)
Operational Pressure: up to 10 bar
Components: only highest quality

Goal:

- Demonstrate technology efficiency
- Elaborate final optimization potential
- Customer acquisition

Patent Situation:

- Active German patent
- European patent (published)
- Chinese patent (published)
- Japanese patent (published)
- US patent (in publication/pending)

Pilot Unit / Scale 1:2,7



Specifications

Mobile Unit: Stand-alone, or integrable
Control: Manual control
Power Connection: 230V / 16A
Capacity: 50-100 l/min (70 l tank)
Operational Pressure: up to 8 bar
Components: only highest quality

Goal:

- Demonstrate technology efficiency (Lab scale/research)
- Finding new fields of application (e.g. Aqua Culture)

ECOFARIO



Awards & Nominations



Cooperations

bayern innovativ



WIPANO



AUTODESK

Grants & Support

Contact:

porkert@ecofario.eco // scholl@ecofario.eco
S. Porkert: +49 176 / 62 83 83 77 // A. Scholl: +49 178 / 8866877

Presentation 4: Wastewater treatment plant (WWTP) in Augsburg: Is microplastic an issue?

Interregional Workshop
on Urban Water Management Policies and Practices
to Reduce Microplastics Leakage to the Environment
Interreg Europe Project PLASTEKO
24th of November 2020

**Wastewater Treatment Plant Augsburg:
Is microplastics an issue?**

K. Stegmayer, Plant Manager



Organisation 1

**Augsburg City Mayor
Construction Department
Civil Department (Roads, Bridges, Traffic, etc.)**

Stadtentwässerung Augsburg
(Waste Water Management Authority, Legal Form 'Eigenbetrieb')

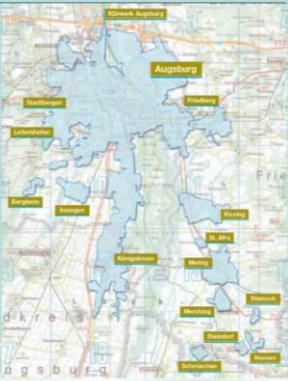
- Sewer Network Subdept. (~ 85 Employees)
- WWTP Subdept. (~ 105 Employees)
- Administration Subdept. (~ 10 Employees)



Sewer Network

Sewer Network

- total length 650 km
- catchment area ~ 2.000 ha
- mainly combined sewer system
- mainly free flow S to N
- maximum flow time 6 h



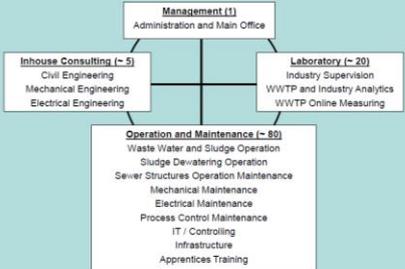

WWTP



WWTP Augsburg



Organisation 2



```

graph TD
    Management["Management (1)  
Administration and Main Office"]
    Inhouse["Inhouse Consulting (~ 5)  
Civil Engineering  
Mechanical Engineering  
Electrical Engineering"]
    Laboratory["Laboratory (~ 20)  
Industry Supervision  
WWTP and Industry Analytics  
WWTP Online Measuring"]
    OandM["Operation and Maintenance (~ 80)  
Waste Water and Sludge Operation  
Sludge Dewatering Operation  
Sewer Structures Operation Maintenance  
Mechanical Maintenance  
Electrical Maintenance  
Process Control Maintenance  
IT / Controlling  
Infrastructure  
Apprentices Training"]

    Management --- Inhouse
    Management --- Laboratory
    Management --- OandM
    Inhouse --- OandM
    Laboratory --- OandM
    
```



WWTP Information 1

General Information:

- startup of the contemporary sewer network 1910
- WWTP startup 1957, since then continuous growth and improvement
- today largest WWTP in Bavaria after Munich and Nuremberg
- ISO 9001 (quality), ISO 14001 (environment) and ISO 45001 (safety) certified
- average annual load 600.000 people equivalent
380.000 inhabitants
150.000 people equivalent pulp and paper mill
70.000 people equivalent industry and commerce
- max. flow rate 5 m³/s, 50 Mio. m³ treated waste water per year



WWTP Information 2

Treatment Details:

- conventional three-step design mechanical-biological-advanced
- single step aerobic treatment and anaerobic digestion
- ¼ of the carbon load results from the paper mill -> low N effluent
- no effluent filtering, no micropollutant treatment step
- all legal limits continuously observed
- 650 t rakings and 120 t grit chamber residues annually
- 30.000 t waste sludge production annually
- energetically self sufficient since 2011 (heat 100%, electricity 130%)



Microplastic 1

What Microplastic is there:

1. Common in raw wastewater:
 - matter for abrasive use, e.g. from peelings and toothpaste
 - textile fibers from washing, e.g. Polar Fleece
 - small plastic waste, e.g. hygiene article packings
 - paint, tire and road abrasion particles
 - small plastic waste brakedowns
2. Uncommon in (German) wastewater:
 - large plastic waste, e.g. PET bottles

Preliminary answer: The plant has no issues with microplastics whatsoever



Microplastic 2

What Happens to Microplastic in the Plant:

1. Mechanical removal in the rake:
 - drifting, floating and sinking material > 8 mm and less
 - rake material => incineration
2. Sedimentation in grit chamber and preclarifier:
 - sinking material heavier than water
 - grit chamber material => sanitary landfill or incineration
 - preclarifier material => digestion => waste sludge => incineration
3. Adsorption to the activated sludge:
 - remaining small and lightweight floating material
 - biology excess sludge => digestion => waste sludge => incineration



Microplastic 3

Problems to Determine Microplastic in a WWTP:

1. Sampletaking
 - separation from raw water influent is hardly impossible
 - representative sampletaking even more
2. Measuring errors
 - amounts and concentrations vary with flow rate, daytime and weather
 - any multiplication to a 50 million m³ annual influent contains calculation errors
3. Analytical errors
 - microplastics is not a substance but a conglomerate
 - there are photometric measuring techniques, but unspecific and incomplete
 - so even more calculation errors have to be counted in



Microplastic 4

So How do we Know?

We can just do it by deduction!

Mandatory all year round measured variable per photometer:
SS in WWTP effluent with a German legal limit of 10mg/l

process-related it is mainly washed out biological cell material
increasingly together with precipitation water events

The all year SS average in the WWTP Augsburg effluent is 2-3 mg/l



WWTP Augsburg

Thank you for your attention!

Please keep your questions in mind until before lunchtime...




Presentation 5: Micropollutants (MPs) in the Water Sector in Lombardy: an overview from a working group within the Lombardy Energy Cleantech Cluster (LE2C)



Interregional workshop on urban water management policies and practices to reduce microplastics leakage to the environment

24 November 2020

Microplastics and the Water Sector in Lombardy: an overview within the Lombardy Energy Cluster (LE2C)

Francesca Malpei
Department of Civil and Environmental Engineering DICA,
Coordinator of the MPs Working Group promoted by LE2C Lombardy Energy Cleantech Cluster

Lombardy Energy Cluster (LE2C) – Water Energy Nexus Area

The Regional Cluster for Energy and the Environment is a non-profit Organization active at international level (European Cluster Organization Platform, International Cleantech Network, Vanguard Initiative, etc.)

3 Working Groups, since Feb 2018¹
50 participants from 14 institutions
(Water Utilities, Universities and Research Centers)

To gather data and to promote a **common vision on Emerging Contaminants (2 Groups) and Microplastics**

October 2020: the final Report was released

http://www.energycluster.it/area-di-competenza/water-energy-nexus/progetto-micropollutanti-emergenti/report_inquinanti-emergenti.pdf
¹ With coordination by G. Lestari & G. Berge



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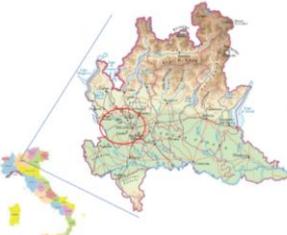
The MPs Working Group



 Antonelli	 Bigna	 Bemasconi	 Binelli	 Depero	 Di Guardo
 Federici	 Gabrielli	 Gatfassi	 Gugliandolo	 Magni	 Malacida
 Miosotti	 Pedrazzani	 Sala	 Stefanoni	 Tosagni	 Villo

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Lombardy Region



Region
Population: 10,600,000
AreaDensity: 421.6 ab/km²

Metropolitan Milan Area
Population: ~ 5,000,000
AreaDensity: ~ 1,930 ab/km²

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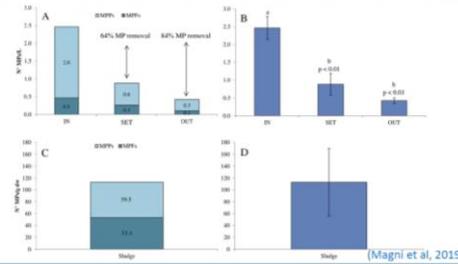
What do we know so far on microplastics in water bodies, potable water and wastewater in Lombardy ?



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WWTP (1,200,000 PE, Milan Area)

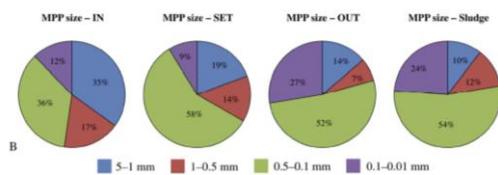
MPP: microparticles (0.001-5 mm); MPF: microfibers
SET: secondary settler; OUT: after sand filtration and disinfection by PAA
pFTIR Spotlight 2000 Perkin Elmer



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WWTP (1,200,000 PE, Milan Area)

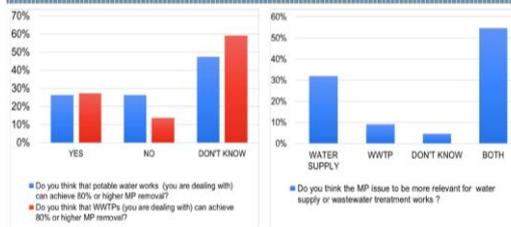
MPP: microparticles (0.001-5 mm); MPF: microfibers
SET: secondary settler; OUT: after sand filtration and disinfection by PAA
pFTIR Spotlight 2000 Perkin Elmer



(Magni et al, 2019)

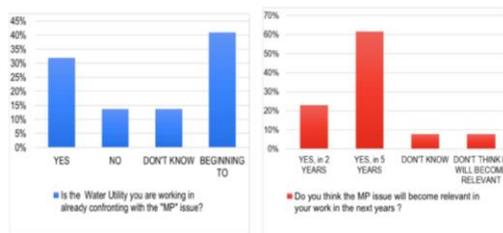
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Survey among Personnel of Water Utilities
Technical aspects



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Survey among Personnel of Water Utilities
Relevance/Mission aspects



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Conclulsion and recommendations from the WG

Knowledge on the MP issue is still very scarce, sometimes contradictory and difficult to compare

WG recommendation:

- ✓ to develop **guidelines and standards for MP sampling, analyses..**
- ✓ to promote **monitoring campaign on water bodies and sediments**
- ✓ to investigate (**more deeply, more cases**) the fate and presence of MPs in water and wastewater treatment works and **provide technical reports/guidelines**
- ✓ to connect to **technical/scientific/political projects and platforms**

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Thank you for your attention

francesca.malpei@polimi.it

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Presentation 6: Operation Clean Sweep - Programme to avoid the dispersion of plastic pellets in the environment



Operation Clean Sweep®: Programme to avoid the dispersion of plastic pellets in the environment

On-line Interregional Workshop on Urban Water Management Policies and Practices to reduce microplastics leakage to the environment – Project PLASTECO
24th November 2020
Roberto Saittone

PlasticsEurope



PLASTICS IN THE MARINE ENVIRONMENT: WHERE DO THEY COME FROM? WHERE DO THEY GO?

12.2 MILLION TONNES OF PLASTIC LITTER ENTER THE OCEAN EACH YEAR

- Pellet loss is the second largest source of primary microplastics
- Around 2% of all plastics litter entering the environment = pellets
- The plastics industry and its value chain has a direct control over pellet loss!

Value chain to take action together via Operation Clean Sweep® PlasticsEurope

- In order to take its responsibility, PlasticsEurope has started to promote OCS in Europe since 2014 with the objective of zero pellet/powder/fake loss!
 - It is a voluntary free initiative aimed at improving awareness, promoting best practices and providing guidance and tools to support its signatories in the implementation of the necessary pellet loss prevention measures.
 - By signing the OCS pledge, each company handling raw materials recognises the importance of preventing spillages into the environment and commits to OCS by implementing the following 6 actions:
 - 1 Improve our worksite(s) set-up to prevent and address spills;
 - 2 Create and publish internal procedures to achieve <zero pellet loss> goals;
 - 3 Provide employee training and accountability for spill prevention, containment, clean-up and disposal;
 - 4 Audit our performance regularly;
 - 5 Comply with all applicable local and national regulations governing pellet containment;
 - 6 Encourage our partners (contractors, transporters, etc.) to pursue the same objectives.
- Operation Clean Sweep® is trademarked by PLASTICS Industry Association
- EU website: www.opcleansweep.eu

Current state of play and achievements in Europe PlasticsEurope

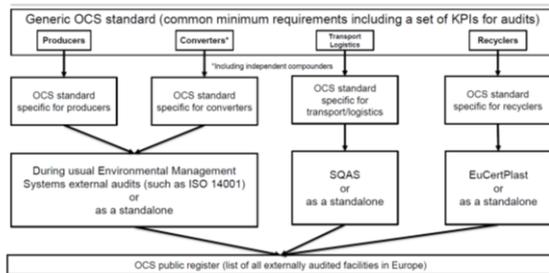


Number of OCS signatories in Europe

COVERS 100% OF PLASTICEUROPE MEMBERS

- PlasticsEurope is the first association in the world to make OCS compulsory for its membership as of 01/01/2020.
- High increase of signatories in the logistics/transport sector due to intensive collaboration and awareness raising
- In addition to Antwerp (BE) and PD Ports (UK), four major European ports handling plastic pellets have recently joined the programme: Tarragona (ES), Cartagena (ES), Felixstowe (UK) and Rotterdam (NL).

Our solution: an OCS certification scheme PlasticsEurope



Sign-up now to the OCS programme !

<http://www.opcleansweep.eu/sign-up/>



SURVEY RESULTS

The participants were asked for their feedback. 30 participants completed the online questionnaires (with 8 questions) generated via SurveyMonkey. Here are the results:

- Overall, how would you rate the workshop?
 - Poor: 0% Average: 10% Good: 90%
- How would you rate the quality of the presentations?
 - Poor: 0% Average: 17% Good: 83%
- How would you rate the quality of the discussions during the workshop?
 - Poor: 3% Average: 21% Good: 76%
- How would you rate the workshop's organisation and facilitation?
 - Poor: 0% Average: 10% Good: 90%

- What was the most interesting information for you during the workshop?
 - Here are some answers listed: methodological approaches, experiences in different countries, information on WWTP solutions, current research on MP, ecofario technology, lack of studies, problems with microplastic from fabrics, main MP comes from tires, Latvia is not on the last place in the world regarding MP, all problems are common, facts & figures on MP, exchange of policies and initiatives between different countries, no policies on MP, but a lot of single-use plastics initiatives & regulations going on → positive trend

- The workshop also aimed to gain knowledge which helps to steer policy planning. Which policy recommendations do you have?
 - Here are some answers listed: increase the monitoring processes, at least ban on single use items and microbeads in personal care cosmetics; filters in washing machines and WWTP, awareness campaign, include in national waste management plans a special chapter regarding MP. In Latvia national plan is under elaboration but without of policies for MP, a purposeful policy for minimizing single use plastics in our daily routine, legal requirements for eco design of products and burn sewage sludge, more research, data still too little

- Do you have any suggestions for future workshops?
 - Here are some answers listed: the WG discussion maybe could be organized before lunch while the majority of participants is attending, overall great job, better Face2Face, better to be live, it was very nice and brave from your side to use so innovative platform as Mural, good job, good practises shown by videos

- At the beginning of the workshop, the participants were asked to find a plastic-free item. The questionnaire asked for it.
 - Here is a selection of answers: bamboo toothbrush, glass bottle refill for olive oil, ceramic flower pot, wool fabric, bee way wrap, aluminium water bottle, flower, ring, my key to the office