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### Background

River flow is one of the major pathways of litter into the marine environment. But little is known to quantify the riverine input of litter into the marine environment. There are currently no agreed monitoring methodologies available at the international level, which is a major hindrance for the implementation of monitoring activities. Consequently, it disables quantification of the riverine litter flows and elaboration of appropriate land based solutions as well as follow up of the effectiveness of undertaken measures. Furthermore, harmonized monitoring would lead to comparable data across river basins and regions, which is needed for good trend analysis and overall understanding of the problem.

This document, prepared by the Secretariat, provides an overview on the knowledge available on the contribution of riverine litter to the marine environment with a focus on the Baltic Sea area.

### Action requested

The Meeting is invited to:

- take note of the information provided;
- exchange views on the need to include various aspects of riverine litter (e.g. compilation of existing data, recommendation on monitoring, suggestion of measures etc.) into the agenda of Pressure Working Group.

Countries may also wish to provide additional information on on-going activities.

## State of the art on the contribution of riverine litter to the marine environment

### Introduction

There are several large river catchments that drain to the Baltic Sea. The rate of water circulation between the Baltic and the adjacent North Sea is extremely low, due to it being almost entirely land-locked (HELCOM, 2010). This means that litter transported to the Baltic Sea can be expected to remain there for a long time. Litter of all size fractions from urban areas, such as cities is transported by run-off and ends up in streams and rivers and subsequently the marine environment.

### Relevant studies

At EU level, a technical report on riverine litter monitoring elaborated by JRC was published in 2016 (JRC, 2016). The report compiles the options for monitoring riverine litter and quantifying litter fluxes, focusing on anthropogenic litter. It includes the current scientific and technical background regarding litter in river systems, their flow regime and basic properties. The document aims to provide recommendations for monitoring approaches and methodologies. It also provides indications on the issues which need to be further developed in a collaborative approach.

Linked to this work there is the [RIMMEL project](#) (October 2015–October 2017), which stands for ‘Riverine and Marine floating macro litter Monitoring and Modelling of Environmental Loading JRC exploratory research project’. Within the project an observation network was established. Currently, of the 48 rivers that belong to the network, there is only one draining to the Baltic Sea, the Vistula River (see Figure 1)<sup>1</sup>.



Figure 1. Riverine Litter Observation Network (image taken from a JRC presentation conducted during the OSPAR Riverine and Marine Litter Work Session, 27-28 June 2017, Bonn, Germany).

There is an overview of European monitoring studies on plastics in freshwater environments included in the Conference on Plastics in Freshwater Environments (Annex 3 of the document, 2017); however, none of the

<sup>1</sup> Please note that information on the call made as part of the RIMMEL project to be part of the Riverine Litter Observation Network was circulated via e-mail to the HELCOM EN-Marine Litter (11.4.2017).

studies referred to address rivers draining to the Baltic Sea. There is, however one study which includes the monitoring of meso- to micro-sized floating litter items in the Dalälven River which discharges to the Baltic Sea (Eunomia, 2015). This river belongs to the group of important European rivers with respect to discharges. A sampling location was chosen on a dominant branch in a river delta, within approximately 50 km of the mouth and, where possible, downstream of the last urban area and sewage treatment plant and downstream of the last tributary. The sampling was done in one two-week sampling period with the Manta net used as a sieve to sample 5000 L of water pumped up from the river (pump-manta net method). On average 4.5 microparticles per m<sup>3</sup> were calculated for the Dalälven River. Estimates based on results from the project show that even this relatively clean river still transports about 50 billion (5E+10) microplastic particles annually.

It is also envisaged to gather more knowledge on the methodology to monitor litter in rivers in the Baltic Sea through the on-going [BLASTIC project](#).

### Identification of gaps

The 'Take-home messages' from the Conference on Plastics in Freshwater Environments (2017) can be considered a preliminary list of identified gaps on riverine litter:

- 1 Plastic pollution of freshwater environments is ubiquitous. Plastic particles are ingested by a wide range of animals and the transfer of these particles to aquatic food webs is of growing concern. Very little is known about the potential toxicity of plastics to freshwater organisms but effect data for marine taxa have been published. The presence of anthropogenic pollutants in the environment should trigger an assessment that includes exposure and effects as well as source identification.
- 2 Plastics are indispensable to society and, by replacing other, less environmentally friendly materials, have the potential to reduce the human environmental footprint. However, the use of plastic products can result in plastic pollution of the environment, especially if adequate waste management and an awareness of the proper handling of plastics are lacking. Both need to be improved in the near future.
- 3 Plastic pollution impacts various areas of both wet and dry policy sectors, including energy, agriculture, transportation and health. Thus, the expertise and perspectives acquired in both are needed to tackle plastic pollution. Cost-benefit analyses should result in realistic estimates of the burden posed by plastic pollution and in an impact assessment that addresses its social, economic and environmental aspects.
- 4 Resource efficiency and the circular economy, which transform industrial processes from linear flows to closed material cycles, are fundamental for solving the challenges posed by plastic pollution. Because they are produced on land, plastic products need to be returned to land-based facilities to be properly disposed of. Better management of plastic waste on land requires an understanding of the entry points of plastic pollution to rivers and the seas.
- 5 Of the many different measures aimed at reducing or removing plastic pollution, some are already being implemented. The choice varies according to the plastic product and its geographical range. Key factors include improved waste management technologies, resource-efficient product design and greater awareness among citizens.
- 6 The roadblocks that prevent these measures from being universally applied must be identified.
- 7 Actions related to plastic waste management and environmental research should be prioritised: Where are there sufficient data to link plastic pollution to its sources? Where are appropriate solutions in place so that actions to combat pollution can be taken with immediate effects? In what areas is evidence lacking and what are the needs of research to fill in the gaps?
- 8 For more accurate exposure data and harmonised data reporting, a validated, consensual approach is needed to avoid conflicting assessments and to allow for evidence-based policy.
- 9 Better networking between European water and environment agencies is needed. These activities should also involve land-based regulation.
- 10 Plastics are not yet part of the Water Framework Directive but they may be addressed in the forthcoming 2019 review.

## Benefitting from cooperation

An OSPAR Riverine and Marine Litter Work Session was held on 27-28 June 2017 in Berlin, Germany. The event was organized in the context of the OSPAR Marine Litter Regional Action Plan, which includes an action (no 41) on riverine litter and the need to cooperate with the (international) river basin commissions. Prior to the work session, OSPAR sent a questionnaire to the river basin commissions in order to find out their (policy) approach to reduce riverine litter in the European rivers. The questionnaire was replied by Portugal, UK and the International River Commissions of the Meuse, Elbe, Rhine, Mosel and Saar and Schelt, therefore the study does not provide information from rivers draining to the Baltic Sea. The results of the questionnaire were summarized in a report (OSPAR RAP action 41, 2016).

The Work Session aimed at exchanging knowledge and best practices and strengthening the cooperation between international river basin commissions, Regional Seas Commission, environment ministries, governmental agencies, scientific institutions and NGOs. The conclusions of the Work Session as provided by the organisers are included as Annex 1 to this document. It is to point out that macrolitter riverine monitoring was indicated as one of the topics to be addressed on the short term (2017/2018).

## Summing up

There are some studies on litter abundance in rivers, although not many when compared to available studies on marine litter abundance. However, the contribution of river litter load to the oceans and its spatial and temporal variance is yet to be quantified by monitoring. Little is also known about how large a pathway rivers are for microplastics (CCB, 2017). And even less is known in reference to litter on rivers in the Baltic Sea catchment area. **There are currently no agreed monitoring methodologies available at the international level, which is a major hindrance for the implementation of monitoring activities** (JRC, 2016). Furthermore, harmonized monitoring leads to comparable data across river basins and regions, which is needed for good trend analysis and overall understanding of the problem (Conclusions of the OSPAR Riverine and Marine Litter Work Session, 2017).

There is also a need, as part of the **Regional Action Plan on Marine Litter to seek cooperation with the River and River Basin Commissions**, as appropriate, in order to include impacts of litter on the marine environment from riverine inputs ([action RL 13](#)).

## References

CCB, 2017. Monitoring litter in rivers - Sources of litter input to rivers and methods for monitoring micro-litter Available on-line (26.9.2017):

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Conference on Plastics in Freshwater Environments, 2017. Available on-line (26.9.2017):

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González, D., Hanke, G., Tweehuysen, G., Bellert, B., Holzhauser, M., Palatinus, A., Hohenblum, P., and Oosterbaan, L. 2016. Riverine Litter Monitoring - Options and Recommendations. MSFD GES TG Marine Litter Thematic Report; JRC Technical Report; EUR 28307; doi:10.2788/461233. Available on-line (26.9.2017): [http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/MSFD\\_riverine\\_litter\\_monitoring.pdf](http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/MSFD_riverine_litter_monitoring.pdf)

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OSPAR RAP action 41 - Inventory of knowledge and actions concerning riverine litter relevant for the OSPAR area, 2016. Available on-line (26.9.2017): <https://www.noordzeeloket.nl/funcities-en-gebruik/zwerfvuil-noordzee/@171543/ospar-rap-action-41-0/>.

#### Suggested further reading

Deltares, 2013. Summary report Plastic litter in Rhine, Meuse and Scheldt, contribution to plastic litter in the North Sea. Available on-line (26.9.2017): <http://www.kenniswijzerzwerfafval.nl/document/summary-report-plastic-litter-rhine-meuse-and-scheldt-contribution-plastic-litter-north-sea>.

Surfrider Foundation Europe, 2017. Technical report riverine input Adour 2014-2016 - Monitoring of the aquatic macro-litter inputs from the Adour River to the marine environment.

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## Annex 1 Conclusions of the OSPAR Riverine and Marine Litter Work Session (27-28 June 2017, Bonn, Germany)

On the 27th and 28th of June, 2017, the OSPAR Riverine and Marine Litter Work Session took place. Colleagues of international river basin commissions, OSPAR, HELCOM, environment ministries, governmental agencies, scientific institutions and several NGO's, came together to exchange knowledge and best practices and to strengthen the cooperation.

### **Main conclusions**

During this informative and energetic meeting participants agreed that riverine litter as source of marine litter is a problem which should be addressed with monitoring and prevention actions. Setting up a harmonized monitoring system for microplastics and for macrolitter is necessary for closing knowledge gaps and for generating the necessary awareness and political support for addressing the issue. Strengthening the cooperation between the riverine and marine communities (i.e. river commissions and regional sea conventions such as OSPAR) contributes to avoiding double work and to increasing effectiveness (working together from the start, prevents that repair actions should be taken in the future).

A first step for implementing harmonized monitoring of macrolitter could be the consideration of supporting and/or participation in the riverine monitoring project from the North Sea Foundation. For monitoring microplastics, experts from the riverine and marine communities could be brought together in order to identify the best monitoring method and focus. The participants of the workshop also support considering taking prevention actions.

### **Background**

The session was organized in the context of the OSPAR Marine Litter Regional Action Plan ([link](#)), which includes an action (no 41) on riverine litter and the need to cooperate with the (international) river basin commissions. Prior to the work session, OSPAR sent a questionnaire to the river basin commissions in order to find out their (policy) approach to reduce riverine litter in the European rivers. The results of the questionnaire were summarized in a report ([link](#)).

### **Results first day**

OSPAR presented the background of the meeting including the key message that the problem of marine litter cannot be solved without addressing a major pathway of litter: the rivers. A quick overview of the results of the questionnaire was given, as well as the results of the European Conference on Plastics in Freshwater Environments (Berlin, June 2016). The beach litter monitoring system of OSPAR was presented, which contained valuable lessons learned and practical recommendations for the riverine community that is just at the beginning of setting up monitoring activities or networks. Also, the JRC Riverine Litter Monitoring Report of the MSFD Technical Group on Marine Litter and the JRC RIMMEL project were presented, which gave the participants an overview of the options and recommendations for riverine litter monitoring.

Participants exchanged their own ideas and thoughts in plenary and in group sessions. There was overall consensus that monitoring, research and prevention are all essential to tackle this problem and that lack of data is a major challenge. Identification of most important sources, quantifying the contribution of litter entering the sea from rivers and the pathways of litter are the main open questions that should be focused on. Harmonized data are essential in the policy and decision making process. If efforts are jointed, the wheel is not re-invented again, which saves costs and time. Furthermore harmonized monitoring leads to comparable data across river basins and regions, which is needed for good trend analysis and overall understanding of the problem. Together with good communication strategies, this contributes to wider public awareness.

## Results second day

A presentation was given on monitoring activities of microplastics in freshwater environments in South and West Germany. Reports on the results are expected in the coming months.

After that, the participants had their turn to pitch about their own best practices, which gave a very interesting, broad and inspiring overview of the different activities that are already taking place.

During the plenary and group sessions, participants discussed about how we could bring this issue to the next level: what could be the next steps in the process, who should take them and which stakeholders should be involved? Participants were also asked to discuss what we should have achieved by 2021 and beyond. The degree to which the various ideas and conclusions shall be implemented depends on various factors, such as finding an appropriate organisation to lead on them and identifying the necessary financial means. This led to the following main conclusions and ideas:

### What could be done now?

- Keep the network alive. Share initiatives, events and results. Set up core-group and send two-monthly newsletter.
- Take the measures that can already be taken. Cooperate with regional sea conventions that already work on prevention actions such as actions on the issues of microplastics, storm and sewage water discharges and single use items.
- River basin commissions can start pilots, in order to work towards a harmonized monitoring method for macrolitter, based on the OSPAR beach litter monitoring protocol. An option can be to support or participate in the North Sea Foundation project. This project focuses on monitoring macrolitter on the river shores and is based on the OSPAR beach litter monitoring methodology. River commissions will be approached with more information on this project.
- The river basin commissions serve as independent platforms to exchange knowledge and to advance and coordinate the process. They can collect the available data and compare methods and systematically exchange and cooperate with each other and the regional sea conventions.
- Identify and communicate risks of plastics in the environment (work together on different levels).
- Form groups to apply for research funding (scoping studies etc.) and funding for pilots for preventive measures.

### What could be done on the short term?

- 2017/2018: Macrolitter riverine monitoring. Make use of the OSPAR expertise. Link country and NGO initiatives. One of the options can be to support or participate in the North Sea Foundation project.
- 2018: organize workshop
  - On EU level on sampling macro + micro litter in rivers, possibly linked to Technical Subgroup Marine Litter (with the idea to establish a TG Riverine Litter) and/or
  - on microplastics monitoring, organized by river commissions or countries in order to
- define fundamentals of monitoring system
- and do this in cooperation with relevant stakeholders and regional sea conventions (OSPAR has already several litter indicators and is working on an indicator for monitoring microplastics in sediments)
- Make use of the already existing technical groups and processes on this subject. A possibility may be to integrate a Riverine Litter technical group with the Technical Group on Marine Litter, or to start a separate Technical Group on Riverine Litter. Such a group serves as a platform to share results of research, to exchange knowledge and to develop monitoring protocols.
- 2018/2019: organize a high profile conference (150-300 participants). Invite:
  - Industry, science, administrations, NGO's, IGO's, international financial institutions, regional sea conventions etc.
- Create public and political awareness by good communication and use of social media, in order to ensure funding.

**What could we have achieved by 2021?**

- Harmonized monitoring methodology is established for macro- and microplastics and agreed upon by the river commissions
- Common measures to reduce plastics in the environment
- Good estimation of riverine input into the sea
- Strong network of experts and stakeholders

**And beyond 2050?**

- Circular economy
- Zero inputs of macro- and primary microplastics into the environment
- Inclusion of macro- and microplastics in EU legislation for the river environment (WFD).