SFRA0025: Identification and Assessment of Riverine Input of (Marine) Litter.

1st Progress Report for the European Commission DG Environment under Framework Contract No ENV.D.2/FRA/2012/0025

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1.0 Introduction

This progress report is the first deliverable of the project SFRA0025: Identification and Assessment of Riverine Input of (Marine) Litter for the DG Environment of the European Commission. The project falls under the Framework Contract Emerging Pressures, human activities and measures in the marine environment (including marine litter) (ENV.D.2/FRA/2012/0025).

In this first progress report, the period covered is from November 2013 to March 2014.

1.1 Project Objectives

The main objectives of this project are:

1. Identify existing monitoring programs on river litter in the EU and propose and apply a common approach to monitoring and analysis of plastic particles in different EU rivers;
2. Establish connections and communication with river authorities and include them in the process of monitoring;
3. Assess the amount of small and micro-sized litter transported to the marine environment via rivers through cost-effective monitoring in 4 European rivers;
4. Identify the distribution of different fractions of riverine litter, their main sources and associated chemical compounds;
5. Identify the largest sources of riverine litter within the investigated river basins;
6. Disseminate project results to relevant stakeholders and provide them with recommendations for continued monitoring; and
7. Link regional marine litter features with the results from riverine litter assessment of the river flowing into the regional sea.

Progress report 1 includes:

- A summary of the theoretical background of the applied monitoring method;
- Description of chosen approach to monitoring and data analysis;
- Selection and application of criteria for identification of monitoring sites; and
- Description of the monitoring sites selected.

2.0 Theoretical Background

2.1.1 Existing Litter Monitoring Programmes

The literature review is an on-going process, developed in two stages. First we gathered existing literature and then we prepared a literature summary with the main points from the literature that will guide our work in determining the sampling methodology and analysis. We also expect that our liaison with local River Authorities can provide additional information on river litter monitoring.

A short literature review has revealed that there are no long-term monitoring programs in place on small litter items in the riverine environment. There are, however, scientific studies conducted by researchers in and outside of Europe.

Although much of the literature addresses land-based sources of what eventually becomes marine litter, there appears to be relatively little published literature describing riverine input of plastics to the marine environment.[1] Nevertheless the literature recognizes the importance of rivers as a major input of litter into the marine environment. For larger litter items (macrolitter) a study has been conducted in the River Thames, where the amount of litter transported along the river bed was monitored [2].It was observed that the locations where the most litter was found were in the vicinity of sewage treatment plants. Significant quantities of litter, especially plastics, are moving down the Thames and are thus providing a major input of such debris to North Sea [3]. It is thus anticipated that in the absence of mitigation measures, any region with large rivers entering the sea will see inputs of large amounts of litter into the coastal system from source. However, the scale of such input remains to be systematically quantified[4].

There are also some studies on microsized litter in rivers. A recent publication from Austria for example, related the amount of fish larvae caught in the Danube to the amount of microplastics found [5]. One of their main findings was that there are more litter particles observed than fish larvae. A critical note to this paper is that the amount of fish larvae present in river systems is seasonal and dependent on local circumstances, making the relationship with litter items hard to establish.

In freshwater lakes in the USA, a study revealed that the highest numbers of microplastic particles were found downstream from large cities. This phenomenon is related to the use of micro beads in consumer products such as cosmetics [6].

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[1] Morritt, D., Stefanoudis, P. V., Pearce, D., Crimmen, O. A., & Clark, P. F. (2014). Plastic in the Thames: A river runs through it. Marine pollution bulletin, 78(1), 196-200.

[2] Morritt, D., Stefanoudis, P. V., Pearce, D., Crimmen, O. A., & Clark, P. F. (2014). Plastic in the Thames: A river runs through it. Marine pollution bulletin, 78(1), 196-200.

[3] Morritt, D., Stefanoudis, P. V., Pearce, D., Crimmen, O. A., & Clark, P. F. (2014). Plastic in the Thames: A river runs through it. Marine pollution bulletin, 78(1), 196-200.

[4] Williams, A. T., & Simmons, S. L. (1996). The degradation of plastic litter in rivers: implications for beaches. Journal of Coastal Conservation, 2(1), 63-72.

[5] Lechner, A., Keckeis, H., Lumesberger-Loisl, F., Zens, B., Krusch, R., Tritthart, M., and Schludermann, E. (2014). The Danube so colourful: A potpourri of plastic litter outnumbers fish larvae in Europe's second largest river. Environmental Pollution.

[6] Eriksen M., Mason S., Wilson S., Box C., Zellers A., Edwards W., Farley H. and Amato S. (2013). Microplastic pollution in the surface waters of the Laurentian Great Lakes. Mar Poll Bull 77 (1-2): 177-182

2.1.2 Selection of Four European Rivers to be Monitored

To determine four rivers in which the plastic litter will be sampled, the following criteria were used:

- The four rivers that are selected should discharge preferably in different regional seas of the EU (Atlantic, Baltic, Mediterranean and Black Sea);
- The rivers should belong to the group of important European rivers with respect to river discharges, so small rivers are excluded;
- The rivers should preferably differ in terms of discharges and characteristics of the catchment area;
- There should be sufficient reliable data on the hydraulic key data available; such as water levels and discharges and
- Local authorities should be willing to cooperate with the project in terms of finding suitable monitoring locations, delivering additional services and capacity for example a safe parking place for our equipment, personnel to learn the applied sampling method of plastic litter, etc.

The application of these criteria resulted in five potential rivers suitable for monitoring (see Table 1). The catchments of these rivers are indicated in a map of the river basin districts of all main European rivers, see Figure 1.

Table 1: Potential European rivers suitable for monitoring

River	Average discharge (m^3/s)	Catchment area (km^2)	Reference
Rhine	2378 (1900 Nieuwe Waterweg, 500 Haringvliet) (1700 summer 2750 winter)	200,000	Helpdeskwater.nl Vellinga et al[7]
Dalälven	~380	29,000	wikipedia
Danube	~6500 (6400)	800,000	Alexandracotoi.tripod.com
Po	1470	71,000	Montanari[8]

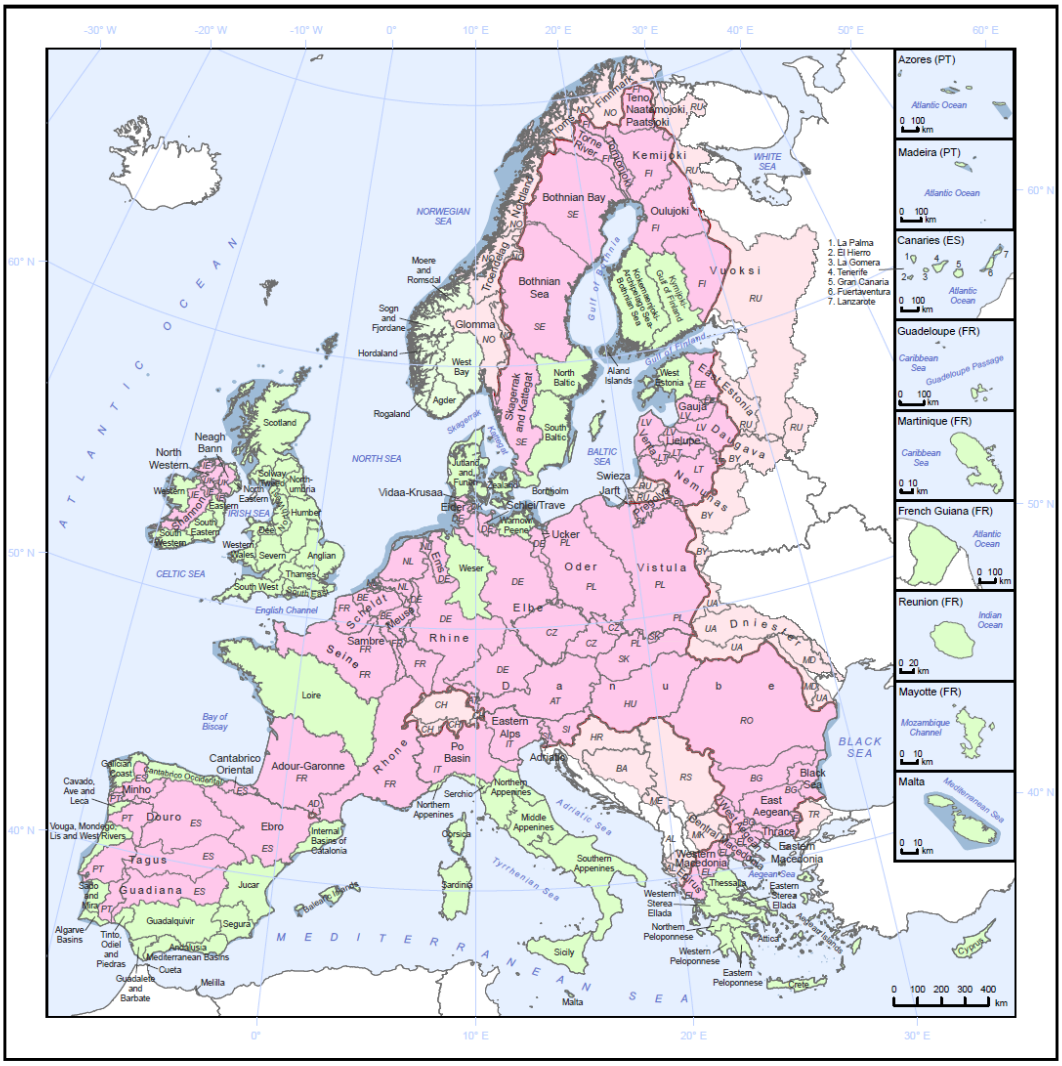
[7] Vellinga T. et al, 2008, Onderzoek naar bovengrensscenario's, September 2008

[8] Montanari, 2012, A Changing pattern in Po River discharge, HESSD pp 6689 – 6713

Figure 1: Map of National and International River Basin Districts

Map of National and International River Basin Districts

Version 29 October 2012



National and International River Basin Districts

International River Basin Districts
Compiled from data reported to WISE by EU Member States

Approximate extent of International River Basin Districts outside of the EU
Compiled from data reported to WISE by AD, CH, LI MC and NO, supplemented with CCM2 Seaoutlets and ICPDR data

EU27 extent

National River Basin Districts
Compiled from data reported to WISE by EU Member States

National River Basin Districts outside of the EU
Compiled from data reported to WISE by NO

Coastal waters

Country borders

Map produced by WRc plc on behalf of the European Commission©, DG Environment, 2012

Footnotes

1) The boundaries of the National River Basin Districts are displayed using version 1.5 of the Water Information System for Europe (WISE) River Basin Districts dataset available from the European Environment Agency: http://www.eea.europa.eu/data-and-maps/data/wise-river-basin-districts-rbds-1. This dataset is based on data reported to WISE by EU Member States, Andorra, Switzerland, Liechtenstein, Monaco and Norway.

2) The boundary of the Mayotte RBD (France) is displayed using the country border dataset.

3) The boundaries of the International River Basin Districts are derived from the WISE River Basin Districts dataset.

4) Country border data was provided by Eurostat and is derived from EGM at a scale of 1:3 million.

5) The international river catchments outside of the EU are displayed using data from a number of sources:
- Data reported to WISE by Andorra, Switzerland, Liechtenstein, Monaco and Norway.
- Seaoutlets data from the Catchment Characterisation Modelling (CCM2) database developed by the Joint Research Centre to show the approximate extent of international catchments in Belarus, Moldova, Russia, Ukraine, Macedonia, Albania and Turkey.
- Data provided by the International Commission for the Protection of the Danube River to show the extent of the Danube International River Basin District in the Balkans.

6) Coastal waters are defined in the Water Framework Directive as extending 1 nautical mile from the coastline. Some Member States included a larger part of their coastal waters within their River Basin District boundaries.

The contacts with river management authorities have resulted in the final selection of the Rhine, Danube and Po Rivers. No final decision has been made yet on the fourth river.

Once a suitable river has been selected, a suitable location on which to install the monitoring equipment is determined together with local authorities. The main scientific criteria for site selection that should be met as much as possible are:

- The location should be selected in a stretch within about 50 km of the mouth of the main branch discharging in a sea;
- The location should be on a dominant branch in a river delta;
- The location should be downstream of the last urban area and sewerage treatment plant and preferably downstream of the last tributary;
- The monitoring should not be hampered by extreme tides and waves; and
- Local authorities must be willing to provide a suitable location for measuring and preferably have local materials available (i.e. electricity, generators, etc.)

These criteria are used to rank potential locations. For a final selection we check if the following practical conditions are fulfilled:

- A safe place (for example surrounded by a fence);
- More or less uniform flow along the bank of the monitoring site; and
- A safe place is needed in terms of vandalism and theft, since our equipment will remain in place for a week (day and night) in order to reduce the time for assembly and disassembly each day, especially the crane.

3.0 Task 1: Identification of Possible Monitoring Sites and Cooperative River Basin Authorities

3.1 Introduction

The identification of possible monitoring sites has been divided into several subtasks:

- Identify possible monitoring sites from aerial photographs. To the extent possible, these sites should fulfil the above-mentioned criteria, taking into account both the scientific and practical issues; and
- Selection of the monitoring sites should be done in cooperation with the local river management authorities or research institutes already active in the monitoring area, as they know the local situation in detail.

3.1.1 Communication with Local Authorities

Through the contact person in the European Commission's Joint Research Centre, Georg Hanke and our own networks, we have made initial contacts with authorities from the selected rivers. To this end we have drawn up a document with a short project description providing information to local authorities on the aims of the project, as well as how they themselves can co-operate with us. This document is in English and can be found at Appendix 1.

The document is adapted according to the target group, meaning for example that more technical details are provided to contact persons in the field, possibly in the local language, whereas more policy-oriented information is provided to contact persons at a higher organisational level.

3.2 Rhine

The river Rhine is the first river in which we will monitor after the first tests with the equipment in the river Meuse. We have contacted River Basin Authorities, and are in touch with representatives from the Dutch Ministry for Infrastructure and the Environment. Together with them, we have identified a suitable location in the river Rhine and plan to start monitoring in the second week of April.

3.2.1 Contact Persons

The following people have aided the project in looking for suitable locations and by supplying capacity:

- Rijkswaterstaat West-Nederland Zuid, part of the Dutch Ministry for Infrastructure and the Environment: Silvana Ciatelli and Simon Mostert

3.2.2 Monitoring Sites

3.2.2.1 Identification of Suitable Sites

As a general rule the stretch of the river where the sampling takes place is ideally located between the last tributary or city and the delta. For the Rhine this is a more complicated situation. The Rhine enters the Netherlands at the Dutch-German border and within a couple of kilometres the Delta starts with the Waal-branch and after 10 km the IJssel branch starts. In the western part of the Netherlands also the Meuse joins the delta. This means that the delta itself is densely populated and therefore a location closest to the sea is chosen (Nieuwe Waterweg).

Table 2: Potentially suitable locations for the planned monitoring in the Nieuwe Waterweg (see Figures 2, 3, 4)

Number	Left or right bank	Description
1	r	Pontoon of ferry Maassluis Rozenburg
2	l	Pontoon of Havenbedrijf Rotterdam
3	l	Quay named Loswal Rozenburg
4	l	Sloped bank is not a quay wall
5	r	Pontoon, frequently used by ships
6	l and r	Quay wall part of Storm Surge Barrier
7	r	Quay wall part of Pilot harbour
8	r	Pontoon has been removed recently

Consultation of the contact persons has resulted in a final selection of the monitoring location in the Nieuwe Waterweg, site 3 in the table above, see Figure 5.

Figure 2: Potentially suitable sites near Maassluis and Rozenburg

Figure 3: Potentially suitable sites near Storm Surge Barrier in Nieuwe Waterweg

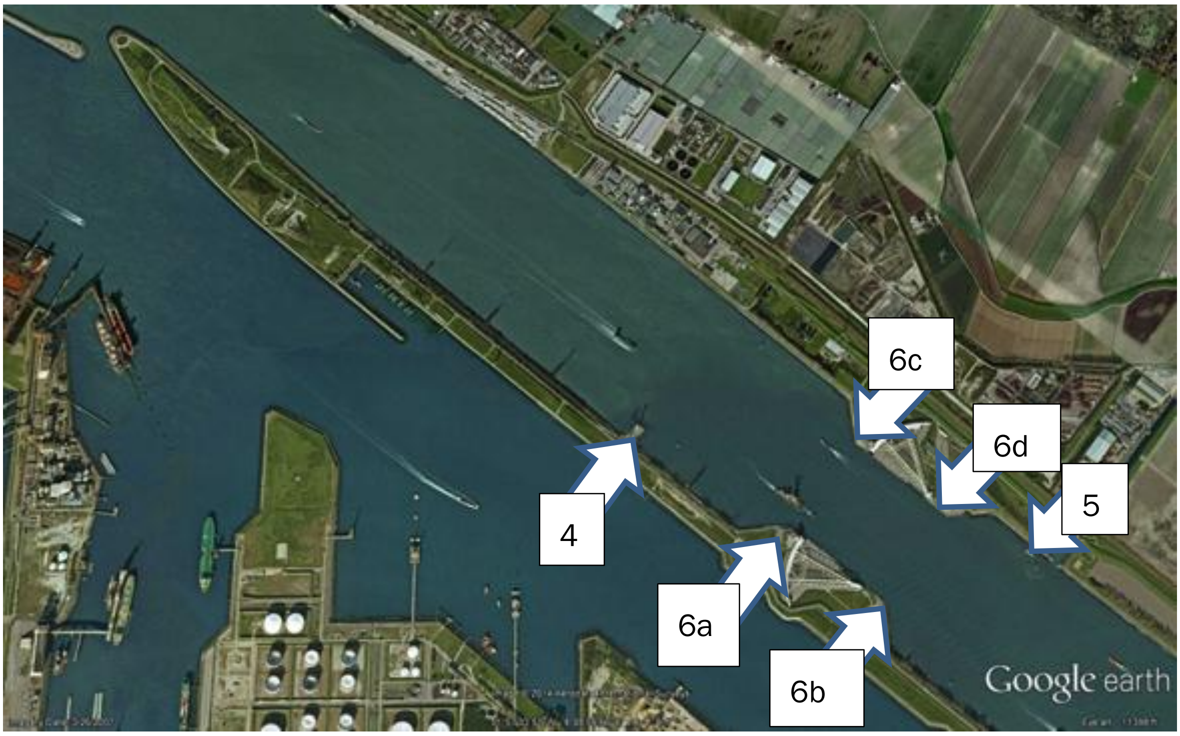
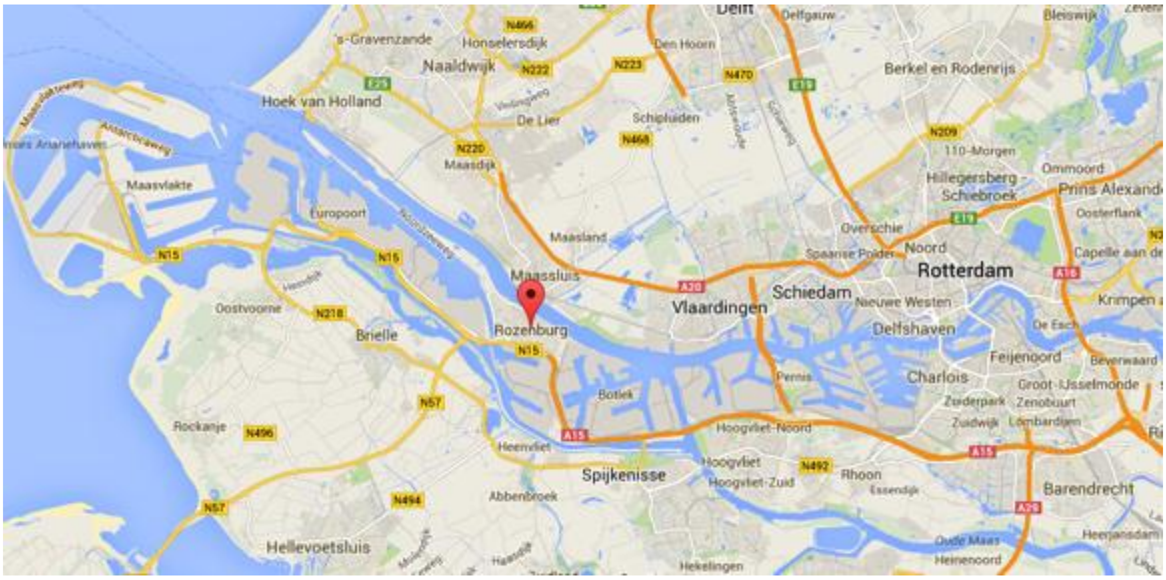


Figure 4: Potentially suitable sites near Hoek van Holland in Nieuwe Waterweg

3.2.2.2 Selection of the Monitoring Site

The chosen monitoring site is No. 3. The locations near the storm surge barrier (figure 5) are not suitable for safety reasons and the locations near Hoek van Holland are very close to the sea and incoming and outgoing tidal effects might influence the sampling procedure. From the locations presented in Figure 2, location No.3 is on the terrain of Rijkswaterstaat (the Dutch Ministry of Infrastructure and the Environment) and is secured. There is a slight bend in the river which forces the line with highest water velocities closer to the side.

Figure 5: The selected monitoring site near Rozenburg in Nieuwe Waterweg



The orientation of the Nieuwe Waterweg is WNW (300°), meaning that with the prevailing Western or South-western wind, most of the floating debris will be found at the right (northern) bank. The deepest part of the river will be found on the left bank due to the geometry of the river bed, meaning that most of the water will pass on this side. The selected sampling location is on the left bank. Special attention will be taken when the wind shifts to a more northern direction, pushing the floating litter to the left bank. In terms of tidal movement, it is very clear and it can be visually observed when the tides change and lead to an influx of litter items in the river. The samples will be marked for those situations and results will then later be related to tidal movements.

3.3 Remaining Three Rivers

The other rivers are the rivers Po and the Danube and one river has to be selected finally. The sampling locations near the mouth of these rivers are yet to be finally determined. This is not only related to the criteria that we set for the selection of the river or the monitoring location, but also depends on the outcomes of the first tests with the equipment in the Meuse River in April.

We have looked at the options for the rivers Danube, the Po and the Dalälven in Sweden.

For sampling in the Danube the best suited stretch of the river should be found somewhere between the city of Galati and Tulcea in Romania, see Figure 6.

Figure 6: Map of the Mouth of the Danube River

The best suited stretch of the Po river will be somewhere between Ferrara and the little town called Berra in the province Ferrara, see Figure 7.

Figure 7: Map of the Mouth of the Po River

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For the last river, probably the Dalälven north of Uppsala in Sweden, we have not yet identified the most suitable stretch.

4.0 Task 2: Set up Monitoring of Litter in 4 European Rivers

4.1 Introduction

The focus will be on monitoring micro-litter (333µ - 5 mm) and small particles (5 – 25 mm), both floating and suspended in the rivers in those areas identified in Task 1. Use will be made of a standardized trawling net, the Manta trawl, as described in the chapter on microlitter of the Monitoring Guidance by the TSG Marine Litter. Furthermore, Waste Free Waters will use its own bespoke set-up of the equipment (Waste Free Waters sampler).

Task 2 is divided into several sub-tasks:

A) Local cooperation;
B) Monitoring approach; and
C) Sampling procedure and equipment.

4.2 Local Co-operation

Through the contact person at the European Commission's Joint Research Centre, Georg Hanke, and the project team's own networks we have made the initial contacts with authorities from the selected rivers.

4.3 Monitoring Approach

The monitoring approach entails monitoring with a net from a fixed platform, as described in our proposal. The challenge in this project is to have a comparable approach in the four different rivers, whilst retaining a certain level of flexibility to be able to adapt it to the local conditions.

In order to ensure a consistent monitoring approach that is applied by the whole consortium, IWRS will pay a field visit to the Netherlands in March to conduct the first test of the monitoring equipment together. Accordingly, there will be a shared understanding of the methodologies and practical issues associated with the sampling.

The sampling will cover the whole spectrum of litter categories, both microplastics and macroplastics, since these are the items that will be caught in the nets. Restricting the analysis to particles < 25 mm will bias the weight of litter flowing to the seas. Bigger macroplastics, like bottles or larger sheets, fully dominate the weight score compared to the smaller particles. Microlitter will mainly be sampled with the manta net, as the larger particles will be sampled with the WFW-sampler.

4.4 Sampling Procedure

During sampling, the spatial, hydrological and meteorological conditions will be recorded and will be filed in a report containing at least the following fields:

- Historical river discharges in the considered stretch and in the monitoring period;
- Actual discharge at sampling location;
    - These data should be provided preferably by the local water management authorities.
- Water velocity while sampling;
    - To achieve this, a Doppler current profiler (Aquadopp) will be employed. For flexible operation, it will be built into a small float, which can be deployed at the location, see Figure 8.

Figure 8: Example of an Aquadopp Current Profiler

- Duration of sampling;
    - The duration of the sampling is determined by the permeability of the nets. As soon as a net gets clogged, the water will not enter the net and the sampled water volume will not be correctly be recorded. On the basis of experience, the sampling time will be established. A test will be done with a tension indicator in the towing line to assure that at ca. 50% of the maximum towing force, the sampling will be stopped. Time will then be recorded.
- Local prevailing wind direction, actual wind direction and wind strength;

At the sampling location a weather station (Davis Vantage Vue) will be fixed to the fixed to the trailer. The data will be transmitted to a base station in the camper where camper where the data is stored on a small laptop, see

- Figure 9.

Figure 9: Davis Vantage Vue Weather Station

- Meteorological conditions (local temperature and rainfall in the watershed);
  - These data must be provided by the local meteorological institutes
- Wave height and period, water temperature;
  - When discharge is low, the wind driven turbulent flow is dominant in the upper part of the water column. Preferably the flexible items and the small items will be suspended in those conditions. The amount of particles found in the suspension net from the WFW-sampler should in that case not be regarded as representative for the dispersion of particles in the lower parts of the water column.
- GPS location, date and time;
- Names of members of sampling team; and
- Written report on sampling situation and conditions, relevant observations and ideas for potential improvement (illustrated with pictures).

The sampling itself will strictly follow the procedure as outlined below:

- Check condition of the manta net (ruptures, cracks, cleanness, clamps, etc.);
- Check current meter;

- Lower the net in the water, start timing;
- Monitor tension indicator (to prevent sampling with a clogged net);
- Monitor approach of large items;
- When tension > 50%, lift net out of the water;
- Stop timing, collect flow speed data; and
- Lower the net slowly in the large bowl on deck, filled with filtered river water and rinse the net.

4.5 Equipment

4.5.1 Introduction

For representative sampling at multiple locations in Europe, a fully transportable set-up is designed. All the equipment can be loaded into a trailer, and moved by a camper van with sufficient engine power to pull the trailer, even in mountainous terrain. Great care is taken to make the whole system autonomous to have the maximum flexibility in picking the optimal location without running the risk of being limited in selecting the location due to the dependence of utilities. The presence of the camper also makes it possible to supervise the sampling site at all times.

4.5.2 Samplers

Two samplers will be used: The Manta-net and the WFW-sampler.

The Manta-net with a mesh of 500 µm will be used to sample mainly micro-plastics. It is expected that in situations with high turbidity, the Manta-net will probably get clogged rather quickly, so sampling times might be shortened by this phenomena. Careful observation is important in these situations. The caught materials will be flushed from the net in 1 litre containers which will be analysed in Slovenia.

The WFW-sampler is equipped with two nets: the surface net and the suspension net.

Both nets have a width of 1 m and the suspension net has a height of 0.50 m. Related to the water velocity, the surface net takes samples from the water surface, which can be expressed in surface area sample. For example, with an undisturbed approach flow velocity of 1 m/s, 1 m^2 is sampled by the surface net per second.

The suspension net, due to its larger height, also samples the upper part of the water column, which can be expressed in cubic metres/monitoring time. The suspension net has an opening of 0.5 m^2. With an undisturbed approach water velocity of 1 m/s, 0.5 m^3 is sampled per second.

The mesh size of both nets is 3.2 mm, which means that the larger micro-plastics and the macro-plastics will be caught in both nets. The sampled material will be put in buckets and (possibly) dried before shipment to Slovenia.

4.5.3 Instrumentation

The most vital instrument is the current meter. Here the Aquadopp is deployed with highest accuracy to measure even the lowest waterspeeds. The Aquadopp is built in a float together with a depth meter. This makes it possible to build-up a cross-sectional profile of the river depth and local current speed.

Figure 10: Cross-section of River Channel showing Subsections

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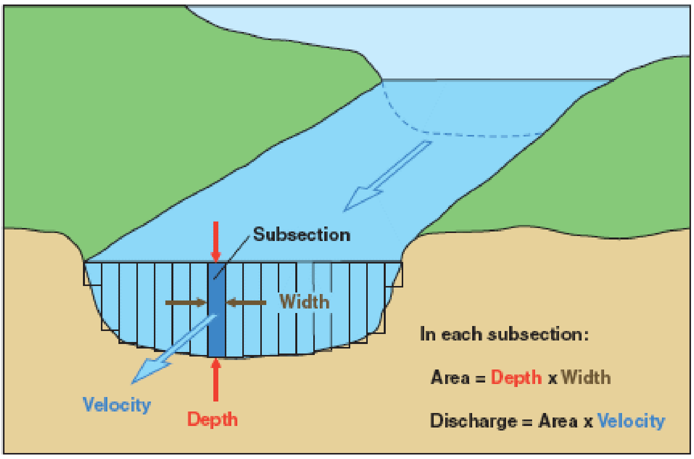


Current-meter discharge measurements are made by determining the discharge in each subsection of a channel cross section and summing the subsection discharges to obtain a total discharge.

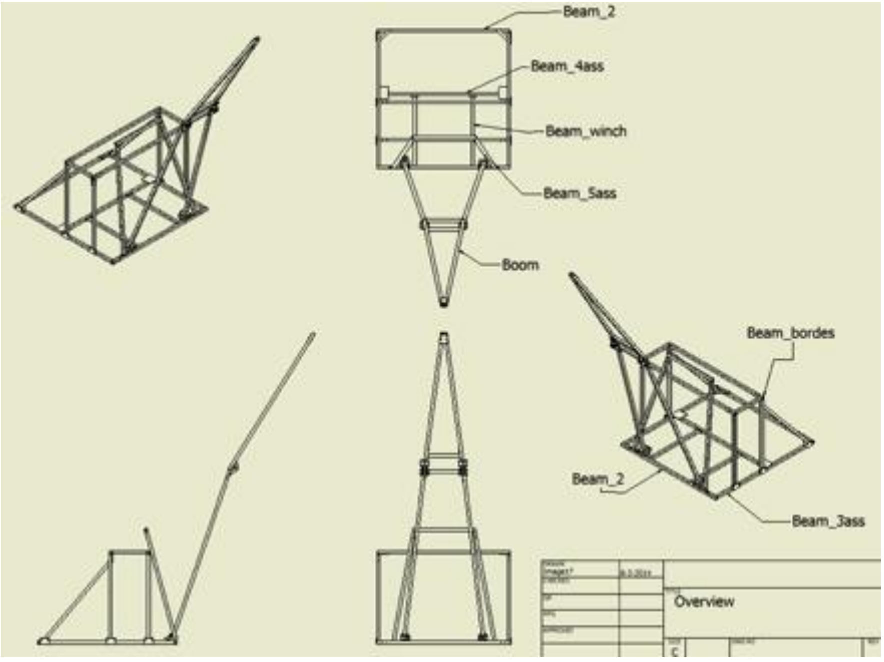
4.5.4 Auxiliary Equipment

To be almost fully autonomous the following equipment will be operational on the site:

4.5.4.1 Crane

The crane was designed to be fully disassembled in order to fit in the trailer (see design in Figure 11). It has a boom of 6 m in the shape of a triangle. Both the boom and the load can be lifted by two 24 V winches, which get their power from a special battery. The battery will be charged by a 24V charger, coupled to the generator.

Figure 11: Technical Diagram of the Crane



The crane has a counterweight of 2000 kg, provided by 2 IBC-tanks, both filled with 1000 litre of river water (see Figure 12). For filling the IBC's, a sufficiently capable pump is used. The tanks are open at the top, which means that they can be used to wash the samples caught in the manta net into the 1 litre containers. The crane is designed by Waste Free Waters and can be fully disassembled. The crane was assembled and tested in the week from 17th – 21st March. The crane and the whole setup was tested in the Meuse successfully at 24th and 25th March.

Figure 12: Example of an IBC

4.5.4.2 Power supply

Solar panels are fitted on the camper for charging the camper battery. The camper is equipped with a converter to convert 12V DC battery power to 220V AC for charging batteries of laptops, telephones and the batteries of the instruments (Aquadopp, depth meter and the weather station). For powering the winches from the hoisting equipment and to power the pump, a gasoline power generator (Kipor 6500 VA) is available (see Figure 13).

Figure 13: Generator

4.5.4.3 Inflatable Dinghy

At the site an inflatable dinghy (length 3.2 m) is available, see Figure 14. It is equipped with a Yamaha 6hp outboard engine and can be transported inflated, inside the trailer, attached to the roof (see Figure 15).

Figure 14: Inflatable Dinghy

Figure 15: Dinghy Secured for Transportation

The dinghy will be used for surveillance and safety purposes and to determine the depth/current profile. For this purpose the dinghy tows the float up the river perpendicular to the sampling location, while the distance is measured by using a laser range finder with a reach of more than 500 metres (see Figure 16).

Figure 16: Laser Range Finder

4.5.5 Camper

The camper is a modern fuel-efficient camper based on a Fiat Ducato with a stronger engine than normally used in this type of camper. It is equipped with a roof-rack for transporting long parts and with solar panels to charge the camper battery when the location is some distance away from the grid (see Figure 17).

Figure 17: Camper with Trailer

Gas for cooking and heating is available using either LPG or propane. Two different gas tanks are available. A 200 litre fresh water reservoir and a tank for waste water are installed.

4.5.6 Trailer

The trailer is a sturdy Ifor Williams Boxvan trailer which is completely enclosed with solid walls. In case of bad weather it can operate as a shelter for the researchers (see Figure 18).

Figure 18: Trailer

4.6 Progress in Monitoring

Execution of the sampling activities is currently proceeding to the timetable indicated in Appendix 2.

5.0 Task 3: Analysis of Results

5.1 Introduction

After collection, all samples will be analysed in Slovenia. The main aim of the analysis is to determine the quantity and type of different litter items according to TSG ML master list, for macro-, meso- and micro-litter, and to determine its origin. Subtasks are as follows:

a) Analysis of collected samples of macro-, meso- and micro-litter;
b) Estimating river load and relevance;
c) Identification of plastic type and proportion;
d) Reporting on fractions requiring special attention; and
e) Possible sources/origins of the litter.

Since the samples have not yet been collected, little progress has been made in this task. However, some preparatory activities have taken place.

A literature review has commenced, and is still on-going, in order to establish the appropriate methodology for microplastics separation and chemical analysis. Some attention was given to determining the fastest, cheapest and most appropriate methodology to separate microplastics from organic material by using different combination of hydrogen peroxide, acids or other possible material (e.g. enzymes). Brief testing was done for organic matter degradation using samples from sewage treatment outflows in Slovenia. We tested acid or basic oxidation, coupled with heat:

- 30% hydrogen peroxide overnight followed by the 40% hydrofluoric acid (polystyrene and polycarbonate particles could be lost)[9],
- 30% hydrogen peroxide for 7 days,
- 30% sodium hydroxide and 20% Hydrochloric acid for 7 days and
- 35% hydrogen peroxide for 7 days.

We have tested several options of the acidic oxidation with heating to separate microplastics and organic material in shorter tests (5-10 hours):1) a treatment with H_2O_2, 2) a treatment with $K_2S_2O_8$.

We noticed slight bubbling upon addition of H_2O_2, discoloration but because of the formation of fluffy fibers we were not completely satisfied with the results and will continue testing.

After the first literature review phase we concluded that density separation followed by sample dilution and dissecting stereomicroscope is most optimized for separating microplastic particles. Before this step, all pieces of larger size (>5mm) will be excluded from samples. Each particle will be rinsed thoroughly before being excluded in order to prevent losing any microplastics attached to it.

[9] Dubaish, F., & Liebezeit, G. (2013). Suspended microplastics and black carbon particles in the Jade system, southern North Sea. Water, Air, & Soil Pollution, 224(2), 1-8.

After separating samples into macro, meso and micro classes we will first analyse macro and meso litter, since they are easily visible with the naked eye. The European Master List of litter will be used in order to categorise the pieces.[10] Pieces will be measured under microscope and noted for their size, shape and colour.

Microplastics separation will then begin with removal of visible pieces (normally 1-5 mm in size). Separation will continue by using stereomicroscope (up to 80x magnification) and tweezers. Each piece of separated supposedly microplastic litter will be placed in pre-prepared plates followed by analysis for chemical characterization using IR technique.

The process for buying equipment was started by talking and meeting with distributors of Zeiss, Leica, Euromex, Olympus and Nikon equipment. So far we believe Zeiss will be the most appropriate to choose regarding the ratio between quality and price.

6.0 Task 4: Compile a Report

The current report is Progress Report 1. We aim to compile our findings for the next period, March-July in a Second Progress Report, to be submitted at the end of July.

An outline, i.e. showing chapter headings and sub-headings, of the Final Report will be submitted by 11th July.

An advanced draft of the Final Report, which will be approximately 70% complete, will be submitted by 20th August.

The completed Final Report will be submitted by October 31st, with a further month for Commission approval. The project will therefore be completed by 30th November 2014.

To summarise:

- Progress Report 1 covers the period up to March 2014;
- Progress Report 2 covers the period April up to July 2014 and a draft will be submitted by the end of July 2014;
- An outline of the Final Report to be submitted by 11th July
- An advanced draft of the Final Report to be submitted by 20th August;
- Completed Final report submitted by 31st October 2014;
- Any small amends in order to obtain Commission approval to be completed by 30th November 2014

[10] JRC (2013) Guidance on Monitoring of Marine Litter in European Seas, a guidance document within the Common Implementation Strategy for the Marine Strategy Framework Directive, pp. 128

7.0 Project Timing

Due to some delay with awarding the project and difficulties with the sub-contracts between Eunomia, Deltares and Waste Free Waters, we had to adjust the timing of some of the activities. We will now execute the project according to the schedule in Appendix 2 and this focusses on completion of the project by 30 November 2014 (submission of Final Report on 31st October with a further month for Commission approval).

APPENDICES

A.1.0 Appendix 1

Identification and assessment of riverine input of (marine) plastic litter

Introduction for: Riverine authorities contacts

Problem

Plastics are one of the most widely used materials in the world with useful properties. However, many used plastics eventually leak as solids to the environment where they can cause harm to organisms as well as have esthetic impact. A large part of the plastics in the seas and oceans are thought to come from land and are transported to the marine environment through rivers. Rivers, next to wind, are thought to act as important transport pathways with estimated contributions of up to 80% of marine litter pollution. Measures to combat marine litter should take into account these landbased sources of the pollution to prevent new litter entering the marine environment.

The Marine Strategy Framework Directive (2008/56/EC) (MSFD) introduces the requirement to develop integrated strategies for the EU seas with the aim of achieving "Good Environmental Status" by 2020 through implementing the necessary measures and monitoring their effectiveness. One of the eleven qualitative descriptors for determining Good Environmental Status under the MSFD is on marine litter (Descriptor 10).

The European Commission initiated a project to start an inventory of litter transported by European rivers with the aim to identify and to assess the amount of litter entering the different European seas and the sources of that litter. In this EU project, we aim to study the amounts of plastic particles that are present in four European rivers, especially in the areas where rivers discharge into the sea. We would like to ask for your help to do this.

The project

Under the Framework Contract Emerging Pressures, human activities and measures in the marine environment (including marine litter) (ENV.D.2/FRA/2012/0025) Eunomia Research & Consulting along with its subcontractors (Deltares, Institute for Water of the Republic of Slovenia) prepared a proposal to the above-mentioned service request by European Commission Directorate General Environment which was approved for financing. The project will be realized by the end of October 2014. The objectives of the contract are:
(1) to monitor litter in suspension in 4 European rivers;
(2) to assess the amount of litter discharged from these rivers into the sea and
(3) to identify the largest sources within the investigated river basins.

The more detailed objectives of the project are:

- Identify existing monitoring programs on riverine litter in the EU and propose and apply a common approach to monitoring and analysis of plastic particles in the mouth of the Rhine, Oder, Po and Danube Rivers;
- Establish connections and communication with river authorities and include them in the process of monitoring;
- Assess the amount of small and micro-sized litter transported to the marine environment via rivers through cost-effective monitoring methods using a Manta trawl and to contribute to extend existing monitoring guidelines. The focus will be on monitoring micro-litter (333µ - 5 mm) and small particles (5 – 25 mm) transported in suspension in the rivers;

A.2.0 Project planning