# Sullied Sediments:

**Sediment Assessment and Clean Up Pilots in Inland Waterways in the North Sea Region**

## AUTUMN 2019 NEWSLETTER – ISSUE #3

### Message from the Sullied Sediments Project Lead

Now that the summer holidays have long passed, the Sullied Sediments partnership is squarely focused on the final six months of delivery, not to mention preparing for the impact of Brexit – of which we will say more in the next issue of our newsletter. In September, our work package leads took part in a video conference during which we discussed the progress we have made on our project activities since the end of the last reporting round in March 2019. All of our deliverables have been developed in a collaborative and transnational manner and during the video conference we talked about the importance of translating these activities for audiences across the North Sea Region and beyond. I would like to add that there are many positive signs that our hard work is starting to pay off. Likewise, we have identified a few issues that we still need to resolve.

Building on this discussion, all of our project beneficiaries will meet in Manchester on 24 October to review budgets and ensure that our project expenditure is well managed through to the end of the project in March 2020. We will also discuss plans for the events where we will share our research and learning with end-users and other important stakeholders. Details of these dissemination events will be broadcast via our web space and newsletter soon.

Photo © East Riding of Yorkshire Council

In addition, we are looking towards our next annual meeting, which will take place in Antwerp on 14 and 15 January 2020. Our colleagues at VMM are kindly organising this gathering on behalf of the partnership. This will be the last time that project beneficiaries will be able to meet with our advisory partners so there will be a strong focus on outputs and results. We will also take the opportunity to acknowledge the outstanding work of our PhD students.

The next six months are going to be very busy, especially as we approach the 31st of October. We can, however, take some comfort in knowing that our partnership is strong. We have already had to overcome some major challenges and we will embrace those that follow with the same resolve and commitment.

**-- Professor Jeanette Rotchell, University of Hull**

### Profile on Dr Andrew Boa, Lead for Work Package 4 – Clean Up Pilots

Andrew studied chemistry at the University of York for both his undergraduate and postgraduate degrees. His research training was in the field of synthetic organic chemistry, and he had aspirations originally to join the pharmaceutical industry. However, after brief sojourns in Leicester and Leeds, a roll of a dice led him to University of Hull where he has been since 1995. He is currently a senior lecturer in chemistry, where he teaches from Year 1 through to Year 4, and also advises students

undertaking postgraduate research degrees. Over time his interests and research areas have diversified, as was required by the vagaries of the funding climate in the UK at that time. Now he and his group have interests in a wide area of applied chemistry-focused research, ranging from bio-organic and medicinal chemistry to materials and environmental chemistry. In addition to Sullied Sediments, Andrew is pursuing other projects involving sporopollenin exine capsules: for example using them as a solid support of catalysts for use in chemical reactions, and using them as antioxidants to prevent rancidification of food oils and related materials.

*In the next issue, we will profile Mark Lorch, who leads Work Package 5 – Citizens' Behaviour, and Jan Hendriks, who is based at Radboud University and contributes to Work Package 3 – Sediment Assessment.*

## Consultancies Involved in Sediment Analysis

There are three consultancies involved in Work Package 3 – Sediment Assessment (WP3-SA). They range in size from a micro-consultancy to a family-based business to a large corporation operating in 25 countries on five continents. They provide expert advice and specialised services to the project and in particular to the sampling programme that is being conducted across the North Sea Region.

### *Ecossa*

Ecossa is private laboratory that specialises in the use of meiofauna for assessing the ecological risk of chemicals in aquatic and terrestrial ecosystems. For Sullied Sediments, Ecossa performs sediment toxicity tests with the nematode, *Caenorhabditis elegans*, applying a standardised ISO guideline (ISO 10872) that allows them to assess the toxicity of sediment-associated contaminants on sublethal toxicity endpoints (growth and reproduction) within 96h (WP3-SA).

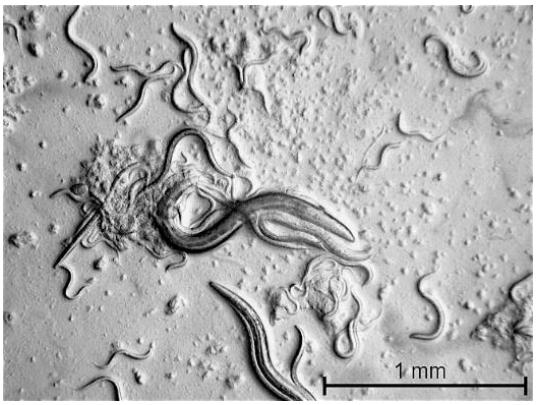

Photo of nematodes © Sebastian Hoess

To assess the *in-situ* effects of contaminated sediments on benthic invertebrates, meiofauna (including nematodes) is isolated from sediments, so that the nematode-based bioindex NemaSPEAR[%] can be calculated (WP3). In addition, *C. elegans* was used for evaluating the effectiveness of plant spores to remove chemicals from wastewater in support of Work Package 4 – Clean Up Pilots.

-- Sebastian Hoess, Director, Ecossa

### *Institut Dr Nowak*

Institut Dr Nowak is a private laboratory located in northern Germany. It specialises in chemical and ecotoxicological environmental analysis. Our contribution to the Sullied Sediments project is to provide an organic chemical characterisation of the collected sediments. Altogether 54 known pollutants in sediments are determined. Most of them are non-polar, persistent, known to be harmful to the environment and are already regulated in the sediment management decision-making process in Germany. These organic species are initially extracted from the sediment with an organic solvent under pressure and heat. The analytical detection takes place by means of gas chromatography-mass spectroscopy (GC-MS/MS) or liquid chromatography-mass spectrometry (LC-MS/MS).


Photo © Institut Doktor Nowak

***SOCOTEC UK Ltd***

The SOCOTEC laboratory at Burton-upon-Trent (UK) has been analysing the sediments taken from the three sampling locations in the Elbe, Humber and Scheldt catchments for a suite of nutrients, metals, total petroleum hydrocarbons (TPHs) and dioxins/furans.

Photo © SOCOTEC UK Ltd

The nutrient analyses covering available phosphate, exchangeable ammonium, nitrate, nitrite and organic matter are determined by automated colourimetric analysers.

A suite of metals, including environmentally problematic heavy metals, are analysed by acid digestion of the sediment sample and analysis by inductively coupled Plasma optical emission spectrometry/mass spectrometry (ICP-OES/MS).

TPH analysis to quantify the total hydrocarbon content and to break it down into the n-alkane distribution along with pristane/phytane ratio is carried out not only to quantify the petroleum hydrocarbons but also to assess the source and possible degradation. Analysis is carried out by solvent extraction, column fractionation and gas chromatography flame ionisation detection (GC-FID).

The final test area carried out is the identification of dioxins and furans. These are a class of compounds that are extremely toxic to both animals and aquatic life and as such extremely low levels are required to be monitored for. The technique of high resolution mass spectrometry (HR-GC/MS) is employed using 13C isotopic dilution to identify and quantify this important class of compounds.

-- Paul Walker, Senior Development & Technical Specialist – Specialist Chemistry, SOCOTEC UK Ltd

## Hamburg's Summer of Science

From 19 to 23 June 2019, the city of Hamburg – in the Elbe catchment – organised a "summer of science" in order to celebrate the University of Hamburg's centenary. All academic institutions in the Hamburg area were invited to apply for exhibition space, which we, the work group for "applied aquatic toxicology" of the Hamburg University of Applied Sciences, did along with many others.

Photos © Ute Katrin Niemann

Around 50,000 people visited the science festival during the four-day event. With support from the company, Olympus, which provided us with four stereo microscopes for the event, we offered visitors to our exhibition tent an in-depth look at what organisms live in sediments. Children in particular were very interested in observing the microzoobenthos, such as midge larvae and worms.

We also presented our lab organisms, nematodes and daphnia, which we use to test sediment quality, and explained to visitors the purpose of ecotoxicity tests, sediments and the aims of the Sullied Sediments project.

-- Professor Susanne Heise, Hamburg University of Applied Sciences

***More News from the Hamburg University of Applied Sciences***

After completing the existing biotest battery on the samples from the last collection round, which was undertaken in June and July, we are now busy collating and analysing the data that has been submitted by the participating partners from all of the test rounds. A science-based, integrative sediment assessment and classification system will be developed and applied to the collected data.

We are also working on testing the estrogenic activity of the samples. For this purpose, a luciferase reporter gene assay was established in our lab. We are currently working on the sample preparation for the test, which is somewhat challenging. After extracting the samples the next step will be a clean-up. Samples will then be ready to be tested for their estrogenic activity with the assay.

-- Sonja Faetsch, PhD researcher, Hamburg University of Applied Sciences

## Project Outreach and Dissemination

Our partners regularly attend and organise academic, industry and sectoral events where their research for the project is presented. This sharing of information and knowledge is vital because it broadens the reach of our project and ensures transnational impact beyond the Sullied Sediments partnership. Below are summaries of two upcoming events at which the project will be showcased:

### International Workshop: System Analysis of Sediment
***23-24 October 2019***
***Bremen, Germany***

From 23 to 24 October 2019, the fourth and final workshop on the systems analysis of sediment will be held Bremen. OVAM has contracted VITO/VLAKWA to organise these workshops.

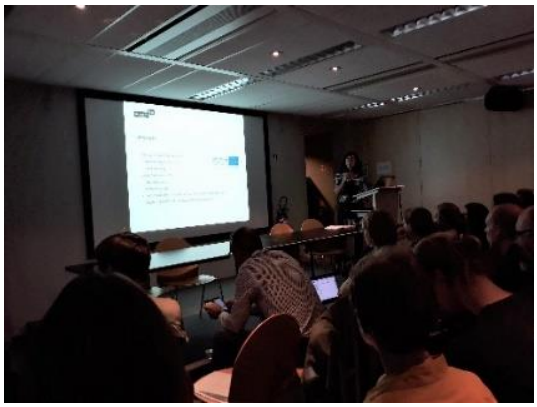
Photo © OVAM

Each year, 10 million m³ of dredgings and clearance spoil must be moved and disposed of in Flanders. In previous workshops, systems thinking and systems analysis were used to clearly visualise the cause-and-effect relationships as a way of identifying the root causes of this challenge and identify systemic solutions. The final workshop will provide delegates with a round-up of these insights and focus on the concretization of solutions with a high impact.

This workshop is combined with a visit to the clay mill in Delfzijl, the Netherlands, where Rijkswaterstaat (part of the Dutch Ministry of Infrastructure and Water Management) and the Province of Groningen, together with a number of other partners, are investigating different ways of converting dredged sludge from the Eems Dollard nature reserve into clay.

Registration for this event is mandatory. To book, please contact the SedNet Secretariat at Marjan.euser@deltares.nl. For more information, please visit OVAM's website:

https://www.ovam.be/finale-workshop-systeemanalyse-tijdens-derde-meeting-sednet-werkgroep-over-bagger-en-ruimingsspecie

**ContaSed2020: 2nd International Conference on Contaminated Sediments**
***14-18 June 2020***
***University of Bern, Switzerland***

Sediments are sources and sinks for contaminants and play an important role in mediating pollutants across compartments of ecosystems. ContaSed2020 will focus on organic and inorganic sediment contaminant classes including microplastics, emerging contaminants, heavy metals and persistent organic pollutants

The conference will feature keynote speeches, invited lectures, oral and poster presentations focused on the following themes:

- From source to sink: transport and deposition of contaminants in sediments
- Assessing risks of contaminants in sediments: methodologies and ecotoxicological case studies
- Analytical tools and methods for assessing sediment contamination
- Fate of contaminants in depositional settings
- Sediments as archives of historical pollution

A call for abstracts has been issued and is live until 15 January 2020. The deadline for registration is 1 April 2020. For more information, please visit the Oeschger Centre for Climate Change Research website at:

http://oeschger.unibe.ch/contased2020

## In the News

The Sullied Sediments project has received some high-profile coverage over the past two months. Two examples of this coverage are highlighted below:

***Work Package 4 – Clean Up Pilots***

In August, the University of Hull PhD student, Aimilia Meichanetzoglou, presented her research at the prestigious American Chemical Society's Fall 2019 National Meeting and Exposition in San Diego (ACS). Aimilia talked about how researchers at the University of Hull are seeking new ways to use stripped-down pollen grains to remove contaminants from water. Aimilia explained how this research is being carried with input from the University of Leeds, Yorkshire Water and Northumbrian Water, who are helping to test the 'real-world' applicability of this innovative clean-up process.

Ahead of her presentation, Aimilia took part in an ACS press conference. To watch this footage, click on the link below and select the video called "Cleaning pollutants from water with pollen and spores — without the 'achoo!'":

https://bit.ly/acs2019sandiego

Photo © American Chemical Society

To help visualise Aimilia's research, the ACS has produced a great video which explains how the pollen grains are prepared for and utilised in water clean-up process and how this is benefitting the Sullied Sediments project. This video can be viewed here:

https://youtu.be/DnC_Fdj4v2k

In addition, this ground-breaking research has been reported in Forbes and on Le blob, l'extra-média. These news articles can be accessed using the links below:

https://www.forbes.com/sites/natalieparletta/2019/08/26/pollen-and-spores-offer-a-safe-way-to-clean-pollutants-from-water/#41ce538674ed

https://leblob.fr/actualites/depolluer-eau-grace-des-spores

***Work Package 5 – Citizens Behaviour***

The British Broadcasting Company (BBC) has reported on the roll-out of the volunteer sampling campaign in the Humber catchment. In August, the Sullied Sediments team and volunteers associated with Pocklington Canal met with the BBC Look North's Environment Correspondent, Paul Murphy, to demonstrate how volunteers are being trained to take water samples using a paper testing device, measure for phosphate and share their findings with the project via a bespoke app called RiverDip.

Photo © BBC

The BBC's coverage of the volunteer programme conveys how a large, transnational project can have an immediate impact at the local level. Not only are we amassing data about water quality from areas that are not routinely monitored, we are also raising awareness in citizens about the importance of caring for their local waterways and encouraging people to get outdoors and volunteer. The BBC's coverage can be watched here:

https://tinyurl.com/yybjj6dw

## Our Sullied Sediments Partnership

The project partnership includes public, private and voluntary sector organisations from across the North Sea Region. It is made up of our project beneficiaries, who are responsible for delivering the project, and our advisory partners (in *italics*), who provide their expertise and knowledge to assist the partnership:

**Belgium**
OVAM
University of Antwerp
VMM

**Germany**
ECOSSA
*Elbe Habitat Foundation*
*German Federal Institute of Hydrology*
*Hamburg Ministry for the Environment and Energy*
Hamburg Port Authority
Hamburg University of Applied Sciences
Institut Dr Nowak

**The Netherlands**
*Foundation for Applied Water Research (STOWA)*
Radboud University

**UK**
Canal and River Trust
East Riding of Yorkshire Council
*East and North Yorkshire Waterways Partnership*
*Environment Agency*
*Northumbrian Water*
Socotec UK
*Thames Water*
University of Hull (Project Lead)
University of Leeds
Yorkshire Water

**International**
*Sediment European Network Steering Group (SedNet)*

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If you would like more information about the project, please contact the Project Coordinator via email at sullied.sediments@eastriding.gov.uk in the first instance.

We would be grateful if you would share this newsletter with any colleagues who may be interested.

The next three editions of our newsletter will be published in November, February and April. If you have received this from a colleague and wish to subscribe, please send an email to the address provided above.

Thank you for interest.

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