

Sullied Sediments: Sediment Assessment and Clean Up Pilots in Inland Waterways in the North Sea Region

SPRING 2018 NEWSLETTER ♠ ISSUE #1

Project Overview

Many of the inland waterways in Europe are under threat due to the introduction of Watch List chemicals that are not currently regulated under the European Water Framework Directive. These chemicals enter our waterways as a result of our day-to-day activities and through industry, and many have been shown to be harmful to wildlife and the wider aquatic environment. Regardless of their source, these pollutants accumulate in the sediments in our rivers and canals over time.



Members of the University of Hull Team © University of Hull

Water regulators and managing authorities do not always know the levels, locations or impacts of these pollutants. Nor do they have the tools to assess sediments confidently and make informed environmental management decisions. To address these issues, the Sullied Sediment project partnership of scientific experts, regulators and water managers is developing and testing new tools that will enable stakeholders to better assess, treat and prevent contamination from these chemicals. This work is being carried out at selected sites in the Elbe, Humber and Scheldt river catchments.

The intention of the Sullied Sediments project is therefore to help regulators and water managers make better decisions with regard to the management, removal and disposal of sediments, thereby reducing economic costs to private and public sector organisations, and the impact of these pollutants on the environment.

The partnership is also endeavouring to reduce the extent of chemicals entering the water system by raising awareness about what we, as consumers, are releasing into the environment through the use of common drugs and household products. This will include the involvement of volunteers in a sediment sampling initiative across the North Sea Region, which will inform and empower them as water champions in their local communities.

The Sullied Sediments project has been co-funded by the European Regional Development Fund through the Interreg VB North Sea Region Programme with match funding from the 13 partners involved. The project partnership includes public, private, community and voluntary sector organisations based in the United Kingdom, Germany, Belgium and the Netherlands.

The project has been supported under the Interreg VB North Sea Region Programme's third priority, which is focused on a Sustainable North Sea Region. It is three-year project which led by the University of Hull (UK) and runs through to 2020.



Profile on our Project Lead – Professor Jeanette Rotchell

Jeanette is a Professor of Aquatic Toxicology at the University of Hull and her research is in the area of environmental toxicology, specifically genotoxicology and endocrine disruption. In addition to Sullied Sediments, other current projects are focused on cancer in fish, endocrine disruption and photoperiod in bivalves and micro-plastics in seafood supply chain and pharmaceuticals in the Humber Estuary.

Jeanette's recent research accomplishments include securing funding for this project, [Sullied Sediments](#). She has also supervised many PhD students and has been a Visiting Professor at the University of Hawai'i and the State Key Lab for Coastal and Estuarine Research in Shanghai, China. Her work is highly applied and impactful at a European level, and she has a strong track record in interdisciplinary working with colleagues from chemistry and biomedical as all as being stakeholder and end-user driven.



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Jeanette is married to Andy and has a teenage daughter plus two spoiled cats and a very old guinea pig.

Coming Together as a Partnership



The Sullied Sediments Partnership at our first Annual Meeting in Hull, UK © East Riding of Yorkshire Council

The Sullied Sediments project was launched at a kick-off meeting held in Amsterdam in January 2017. Over three days, our project beneficiaries and advisory partners met together for the first time. There was a lot of positive discussion as partners learned about the various work packages and started to plan how to deliver them.

The project team was also grateful to have representation from our funder, the Interreg VB North Sea Programme. Axel Kristiansen and Sarah Holsen from the Joint Secretariat presented valuable information about the programme, project and financial management and communications. Jeanette also led partners through an exercise to agree a set of core values for the project, which are:

- Transparency and accountability
- Awareness and respect for other partners
- Connectivity and transnational cooperation
- Informed curiosity and the wider project perspective
- Goal-oriented and focused on milestones
- Positivity and fun
- Trust and integrity

Nine months later, we hosted our first Annual Meeting in September 2017 in Hull, UK. During this two-day meeting, presentations were given by our Work Package Leads, the six PhD students involved in the project and the project leaders. Partners also received an update on the [Nuredrain project](#), which has also been co-funded by the Interreg VB North Sea Region Programme and with whom we are cooperating.



© East Riding of Yorkshire Council

Following the Annual Meeting, the Sullied Sediments team held our first dissemination event, which was tied into a regional conference organised by one of our advisory partners, the East and North Yorkshire Waterways Partnership. The theme of the conference was 'Catchment-level Working at its Best' and the day included talks from members from our partnership including the Elbe Habitat Foundation (see photo below), University of Hull and University of Leeds. In addition, Jeanette introduced local delegates to Sullied Sediments and post-graduate students from the University of Hull gave practical demonstrations relating to their work on the project.



© East Riding of Yorkshire Council

The purpose of this dissemination event was to promote the project to a new audience within the Humber catchment and create a dynamic environment where partners – from near and far – could share ideas and information and broaden their networks. All of the presentations from the day can be viewed on the Waterways Partnership [website](#).

Our second Annual Meeting will take place on the 19th and 20th September 2018 in Hamburg, Germany, and will be followed by a joint SedNet-Sullied Sediments workshop on risk assessment and risk management. We are looking forward to seeing our Sullied Sediments partners once again and meeting new colleagues from SedNet, as well as visiting another of the river catchments – the Elbe – where the project is active.

Work Package Updates from across the North Sea Region

We are now into our second year of delivery and partners are making good progress towards achieving the goals, or results, that we set for ourselves and the project. These results are:

Result 1) *A 10% reduction in the cost of managing dredged material at pilot sites. (In the short term, this will be achieved by decreasing uncertainty in decision-making linked to the management of contaminated sediments.)*

Result 2) *A 25% reduction in the level of selected Watch List chemicals in treated waste-water that is being released into target watercourses by the end of 2019, compared to baseline levels determined at the project start, through a clean-up pilot.*

Result 3) *A 20% reduction in the level of selected Watch List chemicals entering a waste water treatment plant via inflows at a selected site by influencing citizen behaviour and consumer choices by the end of 2019, compared to baseline levels determined at the project start.*



© Interreg North Sea Region Programme

The project includes three work packages that are designed to help us achieve these results. Below, several of our partners have provided updates on how they are working towards these goals and the better assessment, treatment and prevention of contamination from targeted Watch List chemicals.

Work Package 3 (WP3) – Better Assessment

Update from Hanne Hetjens, University of Antwerp

On the Scheldt and Zenne Rivers, the first two sampling campaigns were successfully undertaken in October 2017 and March 2018. While the second round of bioassays and (chemical) analyses will soon be started, the results and experiences from the first round have already been presented and discussed at a special WP3 meeting held in Mechelen, Belgium, in January 2018. Based on the lessons learned from the first two sampling rounds, we have decided to swap two of the test organisms originally selected with more reliable and promising ones in future sampling rounds. The final test battery now includes the freshwater oligochaete, *L. variegatus*; the freshwater amphipod, *Gammarus spp.*; and the rooted plant, *M. spicatum*. The results from the second round are expected soon.

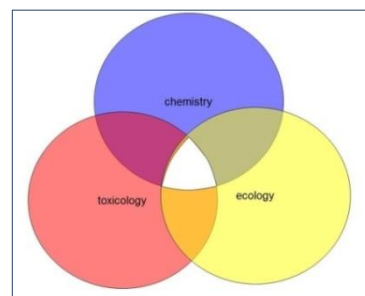


Performing sediment tests © Hanne Hetjens

Sediment sampling and analysis are also being carried out by teams in the Elbe and Humber river catchments. Updates on these campaigns will appear in later editions of this newsletter.

Update from Jan Hendriks, Radboud University

The aim of our work within WP3 is to develop relationships between the level of pollution in river sediment as determined by chemical, toxicological and ecological monitoring data. During the 1990s, data about sediment quality was collected in Zuidrand and Ketelmeer in the Netherlands. Chemical concentrations of heavy metals and persistent organic pollutants were measured, macrofauna data was collected and toxicological assays were conducted. In Belgium, data about sediment quality has been collected in Flanders since 2000. The same chemicals as in the Dutch dataset are measured as well as data about macrofauna. In a first statistical analysis, 28 chemicals were identified to contribute significantly to the different toxicological assay results. The same analysis will be done for the Belgium dataset to verify these results.



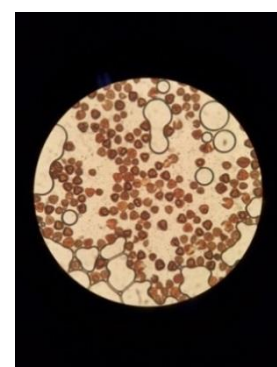
© Jan Hendriks

Work Page 4 – Better Treatment

Update from Andrew Boa, University of Hull

We have continued our work on using plant-derived sporopollenin exine capsules (SpECs) as a tailored adsorbent for the removal of Watch List chemicals (WLCs) from waste water and have begun planning bioavailability studies of WLCs adsorbed onto SpECs.

Different methods for the extraction of the SpECs from plant spores have been investigated, each one resulting in different surface chemistry on the adsorbent material. The WLC investigated in most detail was diclofenac and to simplify initial tests an aqueous solution of pure diclofenac was used. From the results obtained, it was clear that the method used to obtain the SpECs was key for the quantity of diclofenac removed per unit mass of adsorbent. A less clear-cut observation was made over the speed of removal. To complete this work we are in the process of extending studies to see the quality of removal of diclofenac, i.e. what happens at much lower concentrations of the WLC. We will also complete this part of the study by looking at river water spiked with known concentrations of diclofenac to simulate real life scenarios.



SpECs viewed under a light microscope © Aimilia Meichanetzoglou

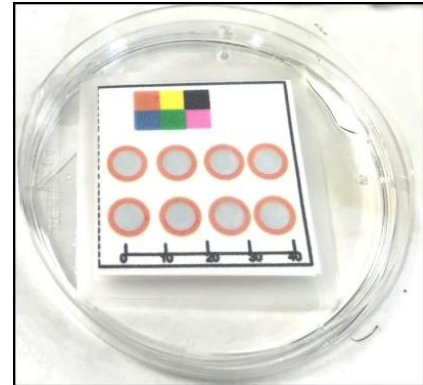
The second part of WP4 is the assessment of bioavailability, and thus eco-toxicity, of WLCs adsorbed to or in the presence of SpECs. This work will be undertaken with WP3 partners, each with expertise in studying a different type of aquatic species. Initial discussions have led to a protocol being developed, applicable across the range of species. Production of materials to send out to WP3 researchers will take place during the summer and autumn of 2018.

Work Package 5 – Better Prevention

Update from Samantha Richardson, University of Hull

We have been developing paper analytic device (PAD) tests, which will be used by volunteers in the field, for the detection of pollutants in river water using a colour-based response. Initially we developed a PAD test that detected phosphates in the water environment. The devices are simple to use and the results they produce appear in just a few minutes. The PAD is dipped into a vessel containing river water and if phosphates are present a blue colour of differing intensity (depending on the phosphate concentration) will develop on the face of the device.

In the summer and autumn of 2017, we tested these PADs with members of the public at several outreach events, and these trials showed very promising results. Once fully developed, the PADs will be used by groups of volunteers participating in our field sampling campaign to gather data from across the North Sea Region.



Paper analytic device prototype ©
Samantha Richardson

To record the results collected by volunteers, a customised smartphone applet called RiverDip is being developed. The applet will be used to collect and store images of the PAD after use, and to record the area where the water sample has been taken. It will also capture the time and date of the PAD test as well as the coordinates of the sample location. Using what we have learned from the development of the phosphate PAD, we are now developing a colour-based test for the detection of emerging pollutants recognised on the EU Watch List.

The next edition of the newsletter will showcase other aspects of the project. In the meantime, check out our [blog](#) or follow us on Twitter @SulliedSediment for regular updates on our work package activities.

Our Advisory Partners

The Sullied Sediments project is supported with advice, support and technical expertise provided by 12 strategic partners who have been carefully selected to form our Advisory Group. We meet with advisory partners at least once a year at Annual Meetings and at catchment-level meetings. Our Advisory Group includes representation from the water industry, local and regional authorities, academic and research institutions, regulatory bodies and the environmental and voluntary sectors.

Our advisory partners are:

- East and North Yorkshire Waterways Partnership (UK) | www.waterwayspartnership.co.uk
- Elbe Habitat Foundation (Germany) | <http://www.stiftung-lebensraum-elbe.de/>
- Environment Agency (UK) | <https://www.gov.uk/government/organisations/environment-agency>
- Federal Institute of Hydrology (Germany) | <http://www.bafg.de/>
- Foundation for Applied Water Research (STOWA) | http://www.stowa.nl/foundation_for_applied_water_research_stowa/
- Hamburg Ministry of the Environment and Energy (Germany) | <http://www.hamburg.de/environment/>
- Northumbrian Water (UK) | <https://www.nwl.co.uk/>
- River Hull Board (UK) | <http://www2.eastriding.gov.uk/council/plans-and-policies/other-plans-and-policies-information/flood-risk/flood-risk-strategy/>
- Sediment European Network Steering Group (European) | <https://sednet.org/>
- Thames Water (UK) | <https://www.thameswater.co.uk/>
- Vlakwa (leading the Nuredrain project) (Belgium) | <http://www.vlakwa.be/>
- Yorkshire Water (UK) | <https://www.yorkshirewater.com/>

We asked our advisory partners to tell us why they chose to get involved in the project. Here is what some of them said...



Yorkshire Water

“Yorkshire Water is enthusiastic to be involved in such an interesting project, keen to contribute from an Industry perspective and looking forward to seeing the results and completion of all the hard work.”

**-- Dr Amber Bullen MChem, CChem, CSci, MRSC,
Treatment Policy Manager, Yorkshire Water**



“The German Federal Institute of Hydrology (BfG) is a supreme federal agency within the portfolio of the Federal Ministry of Transport and Digital Infrastructure (BMVI). It is a governmental scientific institution for research, assessments, and consulting in the fields of hydrology, water quality and ecology. It advises the federal ministries and their

subordinate bodies on fundamental and specific issues in the context of planning, development and construction of waterways including their operation and maintenance.

Developing assessment criteria, concepts and guidance for the management of dredged material and sediments in freshwater and coastal areas are key issues of our work. Regarding our specific skills in investigation (chemically and eco-toxicologically) and assessment of sediment-bound contaminants, our role as an advisory partner to Sullied Sediments offers the possibility for knowledge exchange to improve sediment quality and risk assessments. The project’s approach to assess and compare the impact of pollution in different river catchments poses a challenge that the BfG is also concerned with on a national level. In addition, the BfG is the German coordinator of DANUBIUS-RI that will be a pan-European distributed research infrastructure dedicated to interdisciplinary studies of large river-sea systems (www.danubius-ri.eu).”

-- Dr. Vera Breitung

Head, Department of General Water Quality Issues (and also representing SedNet)

-- Dr. Marvin Brinke

Department of Biochemistry and Ecotoxicology



“Thames Water is actively seeking ways to minimise pesticides in drinking water, and catchment management is a key area. The intriguing idea of enhancing capture of metaldehyde in the catchment with spores is the reason we are supporting this project.”

-- Michael Chipps PhD

Principal Research Scientist, Sustainable Water: Process Innovation

Getting our Message Out

One of the project’s communication objectives is to “change citizens’ behaviour regarding the use of common Watch List chemicals through a strategic mainstream media campaign and coordinated field sampling programme using volunteers across the North Sea Region”. In May 2018, we launched our mainstream media campaign with an article in *The Conversation*, an independent online source of informed commentary and debate about the issues affecting our world. The article, written by PhD student Samantha Richardson, outlines ways that we can all help to reduce pollution in our waterways. To read the article, please click on the link below:

<https://theconversation.com/four-simple-ways-you-can-reduce-pollution-in-your-local-river-95385>

In addition to *The Conversation*, the project has been featured on regional news websites and BBC television in the UK. Our partners have also been blogging, tweeting and promoting the project through their social networks. In addition, colleagues have been speaking about Sullied Sediments at sectoral and academic events including the 2017 [SedNet annual conference](#) in Genoa, [RSC Twitter Poster Conference](#) 2018 and [FameLab UK](#).

There are a number of ways you can keep informed about the project in addition to this newsletter. Why not?..

- Visit our webpage: <http://northsearegion.eu/sullied-sediments>
- Follow us on Twitter: [@SulliedSediment](#)
- Subscribe to our blog: <https://sulliedsediments.wordpress.com/>

Our Project Beneficiaries

Our 13 project beneficiaries have match-funded the grant from the Interreg VB North Sea Region Programme and are actively involved in delivering the project:



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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.