

Summer 2021; Volume 22 Issue 1

**“Promoting the professional and scientific interests of members to safeguard the public interest in the application of chemical sciences in water-related industries.”**

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## Leading up to COP26; The Water Climate Discussions

In the run-up to November’s COP26 in Glasgow, water professionals are being offered an opportunity to come together to discuss and address key climate-related issues within the water sector. We are facing a Climate Crisis that is a wicked problem to solve. Water availability and management will be a key part of any solution and coordinating ideas from those working in the water space will help provide some of the answers we so badly need.

To provide a focus for this work, 11 organisations are working together to make things happen - no mean feat given the pandemic that’s touched all of our lives over the last 18 months. These organisations bring together a diverse range of talent and skills. The IChemE, the IWA, the ICE, WaterAid, The Institute of Water, Water UK, British Water, the Future Water Association, the Royal Society of Biology, the Society for the Environment and the RSC, represented by the Water Science Forum, are coordinating these events and we are now part-way through a series of global online discussions. Each event is themed around the five designated COP26 Campaigns, namely Adaptation & Resilience; Nature-based Solutions, Energy Transition, Clean Transport and Finance.

During each hour-long online discussion, two experts in the field offer short, thought-provoking presentations and questions that prompt participants to engage with the topic. Participation is key, and a scroll through the comments or the Q&A feed for each event is testimony to the strength of feeling and commitment of those taking part to speak to and help define the issues. A short, publicly-available report is produced, summarising the output from each event, and these will be used as a starting point for the debates taking place during the end-of-series conference.

### Water Climate Discussion



Timed to help us reach consensus prior to the COP, the online Water Climate Discussion Conference will be held across the first three weeks of October and brings participants together, both individually and in groups, to continue the discourse and finalise a call to action. Quality networking will be integrated into the conference platform to generate a forum that can host collaborations by people across the planet, to enable us to generate outputs from water professionals worldwide.

Find out more on the [discussions here](#), where you can register for free for the remaining events and view completed discussion reports.

More information about the October conference is available [here](#). Please, note the dates in your diary and join us to add your voice to one of the most important conversations of our time. —*by Glynn Skerratt*

**Water Factoid**— Up to 700,000 microfibres are released per wash from synthetic materials!





## In the News

**Detergent pods contributing to plastic pollution— *Plastic Oceans***

<https://plasticoceans.org/detergent-pods-contributing-to-plastic-pollution/>

**Prozac turns guppies into zombies— *Science***

<https://www.sciencemag.org/news/2021/02/prozac-turns-guppies-zombies>

**Should rivers have the same rights as people?— *The Guardian***

<https://www.theguardian.com/environment/2021/jul/25/rivers-around-the-world-rivers-are-gaining-the-same-legal-rights-as-people>

**The never ending battle against emerging contaminants—*Water Industry Journal***

<https://www.waterindustryjournal.co.uk/the-never-ending-battle-against-emerging-contaminants-a-focus-on-pfas>

## New WSF Committee Members

Following a successful ballot organised by RSC, we have now filled our committee vacancies and welcome two additional members to the Water Science Forum committee. Meet our new committee members below:



*Aoife Quinlivan*

Aoife is a PhD candidate within the Centre for Doctoral Training (CDT) in Sustainable Chemistry at the University of Nottingham, with primary research interests including wastewater remediation and water management.

*Tell us an interesting fact about yourself?* I have recently taken up embroidery as a new hobby.



*Christian Zerfaß*

Christian carries out postdoctoral research at the University of Jena, Germany, within the collaborative research centre AquaDiva, which investigates the “critical zone” (connection between above- and below-ground water).

*Tell us a quote that motivates you?* Seneca the Younger: "It is not because things are difficult that we do not dare; it is because we do not dare that things are difficult."

**Event Discounts— did you know that WSF members are eligible for discounts to attend IChemE Water SIG events?!**

<https://www.icheme.org/membership/communities/special-interest-groups/water/events/>



# A Background to Nature-based Solutions, Green and Blue Infrastructure

As I write this, on Earth Overshoot Day 2021, humanity's demand for ecological resources and services start to exceed that which the Earth will be able to regenerate during the rest of this year. In seeking to #MoveTheDate later each year, as the [Global Footprint Network](#) rightly encourage us to, Nature-based Solutions (NbS) and Green and Blue Infrastructure (GI and BI respectively) are gaining increasing attention as parts of the solution to the dire straits in which we find ourselves. Both GI and BI can be considered as falling under the general umbrella of Nature-based Solutions.



NbS is a term defined [according to the Int. Union for Conservation of Nature \(IUCN\)](#) as “actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human, wellbeing and biodiversity benefits.’ In 2015, the EU Commission came out with a complementary version of the wording, “actions inspired by, supported by or copied from nature and which aim to help societies address a variety of environmental, social and economic challenges in sustainable ways.’ By 2020 the [Organisation for Economic Co-operation and Development \(OECD\)](#) had settled on a hybrid of these, namely ‘NbS are measures that protect, sustainably manage or restore nature, with the goal of maintaining or enhancing ecosystem services to address a variety of social, environmental and economic challenges.’ The scope of nature-based solutions is, therefore, very wide and they can be used to mitigate pollution of the troposphere, water and land. Just to add to the acronym count, NbS is also sometimes referred to as blue-green infrastructure (BGI).

If differentiation is needed GI, for example, uses trees, green roofs and walls, lawns, hedgerows and woodlands, parks, fields, forests etc. to attenuate pollution. With respect to water, this approach can be particularly effective in helping to address urban flooding, coastal hazards, water scarcity/drought and loss of biodiversity. GI contributes to the protection and enhancement of nature and natural processes by consciously integrating green elements into spatial planning and development, improving our quality of life and providing environmental benefits. The term Green Infrastructure itself dates back to 2013 when two European Commission documents, [Green Infrastructure — Enhancing Europe’s Natural Capital \(COM \(2013\) 249\)](#) and [‘Building a Green Infrastructure for Europe’](#) described how social, environmental and biodiversity benefits could flow from using GI to address climate change adaptation and mitigation of its effects. The original UK National Climate Change Adaptation Programme, published in 2013, mentions GI as a means of addressing water and flood risk along with reducing the risk of death and illness associated with severe weather events and climate change by increasing resilience and preparedness. [The updated National Adaptation Programme, published in 2018](#), reinforces this approach.

Back to water, and other aspects of NbS involves using plants, soil, bacteria and other natural elements and processes to remove pollutants in water and wastewater - using ‘natural’ systems and processes for reducing the concentration of aquatic pollutants, or for managing water flows. Blue infrastructure can include elements such as [sustainable urban drainage systems \(SuDS\)](#) and constructed wetlands along with things like swales, lagoons, ponds, algae ponds and so on. Both blue and green infrastructure is becoming an increasingly important component of our built environment and the distinction between them is largely irrelevant. Both often provide a more sustainable outcome to our water management issues than the more traditional hard-engineered solutions.

It’s not all plain sailing of course. Further evidence needs to be accumulated to rebuff the argument that NbS treatment performance for water is not as predictable and consistent as traditionally engineered infrastructure. Some blue infrastructure projects have the unfortunate consequence of exacerbating emissions of methane and nitrous oxide - both of which are significant greenhouse gases with shorter half-lives in the atmosphere than carbon dioxide and significantly higher global warming potentials. Nevertheless, NbS will find an increasingly important role to play in 21st century water management and in delivering the sustainable future that we are all striving for. —by **Glynn Skerratt**



# Microplastics Down the Drain Webinar - A Case for Treatment



Through the 1970s and 1980s there was a growing awareness of the significance of plastic litter in the marine environment. However, it wasn't until 2004 that the term microplastics first appeared in a paper which was published in the journal *Science* by our opening speaker Professor Richard Thompson OBE FRS, Professor of Marine Biology at Plymouth University. A mounting body of scientific evidence has since been gathered to show microplastic pollution is not only increasing at an alarming rate but is more insidious and damaging to aquatic ecosystems and possibly has impacts on human health.

The WSF has an ongoing interest in microplastic pollution and held two workshops at Burlington House in 2017 and 2018. The second of these brought U.K. and European researchers together to share expertise in environmental sampling and methods of analysis for microplastics. Plans to hold a follow-up WSF meeting were cancelled due to COVID-19 restrictions, and a Zoom webinar was held in its place on 15 June, focusing more specifically on waste waters, their contribution to microplastic pollution, and to make the case for treatment.

Professor Richard Thompson has been working on the effects of plastic in the marine environment for more than twenty years and is an acknowledged world expert on microplastics. He opened proceedings by focusing on pollution of waste waters caused by tyre particles and clothing microfibrils, both being of current concern, and which he used to exemplify society's current relationship with plastic, posing the question "– where are the intervention points?". A recent study led by Plymouth University for Defra reported on significant concentrations of tyre wear particles found in sewers and water courses which arises from road runoff, waste water treatment effluent and via aerial deposition. However, further independent research is required into persistence, toxicity and precise environmental impact. Water companies have recently been put under the spotlight by news media reports of research which identified waste water treatment plants (WWTP) as the main source of microplastics in U.K. rivers arising from untreated wastewater entering storm drains. In practice the latter act as a pathway for uncontrolled sources of plastic pollution.

Professor Thompson argued society has been conditioned to treat plastic materials as throwaway over 60 years of use without fully recognising the damaging environmental effects of microplastics. There are still many knowledge gaps regarding evidence of harm from micro- and nano- size particles on biota under natural conditions. Plastics provide many societal benefits but need to be designed for life in service and end of life. An example of an intervention is the banning in 2018 in the U.K. of plastic microbeads as an exfoliating agent in cosmetic and personal care products where natural products could be substituted. In conclusion, Professor Thompson viewed plastic pollution as a symptom of an inefficient, outdated business model, requiring a collaborative effort to tackle different aspects of product design and waste management. To this end he argued it was essential to have more evidence from reliable independent sources in order to ensure appropriate decisions are made to reinforce and incentivise change, thereby supporting effective interventions. Microplastics will have long-lasting environmental effects if we don't act.

The second presentation was given by Dr Jesús Javier Ojeda, Associate Professor at the Faculty of Science and Engineering, Swansea University. He discussed his research, which is currently supported by NERC, to develop suitable standardised methodologies for monitoring of microplastics in wastewater treatment plants, providing examples of sampling methods, sample preparation and analysis. Dr Ojeda is the project leader of an ISO Working Group "Sampling of micro articles and fibres" (ISO/TC147/SC6/WG16) in charge of developing an ISO standard for the sampling of microplastics in water matrices. He highlighted the importance of adopting sampling techniques appropriate to the water treatment stage and selecting analytical methodology according to the type of data required. –*Continued on next page....*

**Continued.....**The third presentation of the day was a joint presentation "Wastewater Treatment Plants and beyond: Forensic approaches to investigate sources of microfibre pollution". This described a co-conducted study of WWTP on the Hudson River undertaken by Dr Claire Gwinnett, Professor in Forensic and Environmental Science at Staffordshire University and Rachel Miller, National Geographic Explorer and Founder of the Rozalia Clean Ocean Project. The latest forensic methods and spectral databases developed at Staffordshire for criminal investigations have been employed in the identification of microplastics and quantifying microfibre pollution along the length of the Hudson, NY State using a 60 ft research vessel 'American Promise'. The data enabled creation of a novel 4D distribution map plotting the composition and dimensions of plastic particles at different depths and locations along the river. Methods of automated analysis and machine vision developed and patented by Staffordshire University were used to identify the likely origin of microplastics and entry point along the river. Techniques familiar in forensic work were also employed to avoid risks of cross contamination. Rachel presented the latest pre-published data which showed pollution levels increased downstream of each WWTP situated along the river. Distribution patterns within the water column reflected the nature of the particles and river currents, providing additional valuable information.

The webinar attracted a total of 173 online registrations from a total of 21 countries, with strong representation from water utilities. During the 2 hour event up to 86 attendees were shown as logged in at any one time. A survey of attendees returned very positive feedback despite connection glitches during the session. - **by Adrian Clark**

## Papers of Interest (RSC Journals)

Reproducibility and sensitivity of 36 methods to quantify the SARS-CoV-2 genetic signal in raw wastewater  
<https://pubs.rsc.org/en/content/articlelanding/2021/ew/d0ew00946f#!divAbstract>

Effects of GAC and UV/H<sub>2</sub>O<sub>2</sub>-GAC filtration on the bacterial community and opportunistic pathogens in simulated drinking water systems  
<https://pubs.rsc.org/en/content/articlelanding/2021/ew/d1ew00222h>

Visit MyRSC: <http://my.rsc.org/groups/home/74>

## Water Science Forum bursaries

Water Science Forum bursaries have helped support research across a number of subjects. If you are interested in applying for our Water Science Forum Bursaries, up to £2000 is available per applicant for both the Alan Tetlow and Water Science Bursary. They are open to all WSF members from any country and the money available can be used for a wide range of activities including conferences, research, lab visits and research projects across a range of topics including water quality.

Contact: Hon Sec, RSC Water Science Forum, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK

See our website for more information: <http://www.rsc.org/Membership/Networking/InterestGroups/WaterScience/bursaries.asp>

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The views expressed in the newsletter are those of the authors and do not necessarily represent the views of the RSC, the Water Science Forum



RSC INTEREST GROUP  
WATER SCIENCE FORUM

## Get Connected—WSF are on Social Media

Water Science Forum are now on Twitter and Linked In. Please join us and become a group member by following the links provided below. We welcome your involvement with posts and conversations on all water related topics.



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