

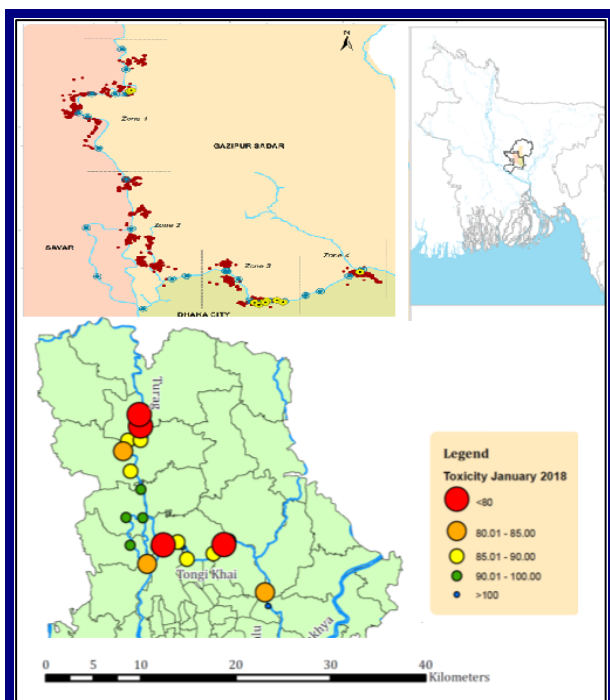
WRA Bulletin 56

April 2020

OVERSEAS WORK

Monitoring water pollution using molecular biosensors, Bangladesh

As part of the UK REACH project in Bangladesh (<https://reachwater.org.uk/>), Partner Paul Whitehead and Cordelia Rampley (Oxford Molecular Biosensors) have been evaluating the new technology of molecular biosensors and how they might be used in water research and pollution/water toxicity issues. Biosensors provide a new way of measuring the environment using the idea that microbes will respond to chemical pollution by altering their metabolism. The team tweak the DNA to enhance the activity of the microbes and also add the DNA of a light emitting gene. The biosensor equipment can then be used to rapidly detect and monitor pollution in rivers and groundwater. (See www.omb.co.uk to understand more about this technology).



Water use and access points along the Turag, Tongi and Balu river systems in central Dhaka (top plot) compared to the biosensor toxicity data showing the pollution hot spots around this part of the city (lower plot)

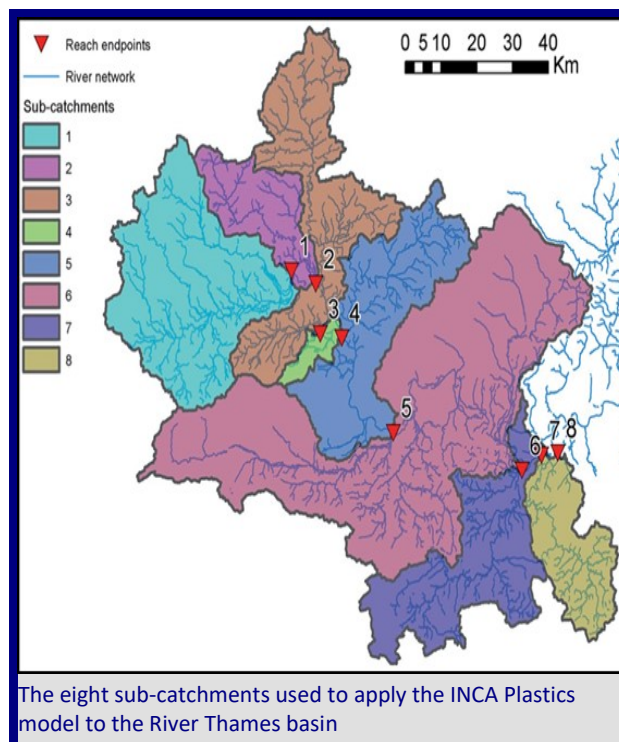
Working with colleagues in Bangladesh at BUET (Bangladesh University of Engineering and Technology) we have been testing water samples to map toxicity and pollution. We have been comparing

toxicity with direct water use along the Turag, Tongi and Balu rivers to assess health impacts. The idea is to assist the Bangladesh Government with restoration of the central Dhaka river systems, to improve water quality and people's access to clean water, as well as enhance livelihoods along the river system.

UK WORK

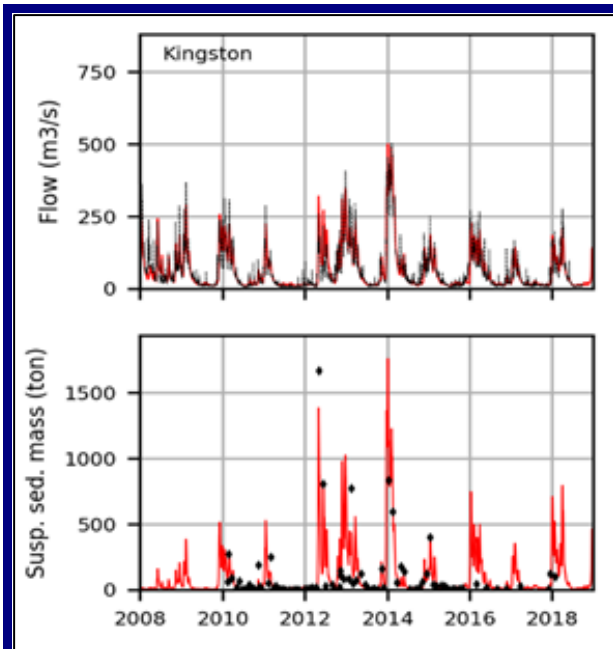
Modelling microplastics in the River Thames basin

In a project funded by Oxford University and supported by DEFRA, Partner Paul Whitehead, together with colleagues in Oxford and Associates Daniel Butterfield and Gianba Bussi, have created a new model of microplastics in rivers and applied it to the whole of the River Thames basin.



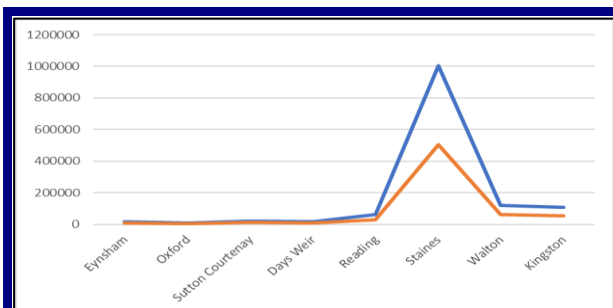
The eight sub-catchments used to apply the INCA Plastics model to the River Thames basin

The INCA Plastics model has been developed to simulate the transport and distribution of plastics in river systems. It forms a new element of the process-based and dynamic INTEGRATED CATCHMENTS suite of flow and water quality models. The model has been set up for the Thames from the source at Cricklade to the downstream tidal limit at Teddington Weir. It uses 2008-2018 daily data and effluent discharges and sewage sludge to simulate flows and suspended sediment at various locations along the river.



Simulated and observed flows and suspended sediments at Kingston Upon Thames, for the period 2008-2018

Microplastics data from UKWIR studies have been used to estimate loads of plastics from these sources. A set of mitigation studies have also been undertaken to evaluate the impacts of controlling plastic discharges. Reducing plastic sources by 50% makes a significant difference to the loads of microplastics moving along the Thames.



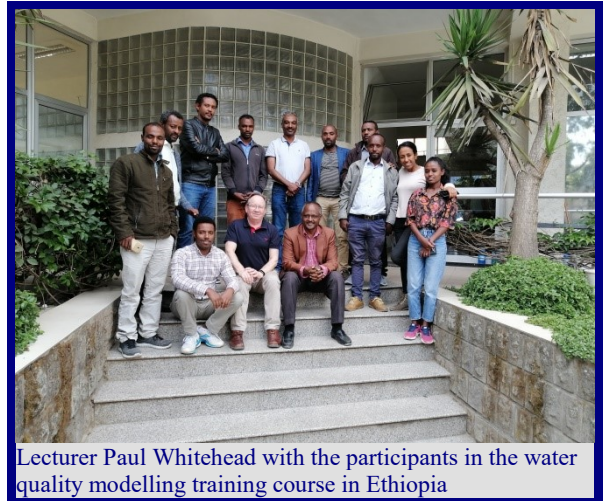
Microplastics load (kg) moving down the River Thames at different locations for the period 2008-2018. Blue line shows load simulated by the model for existing conditions, and orange line shows alternative results under a mitigation strategy.

TRAINING COURSE

Water Quality Modelling and Management Training Course, Ethiopia

Paul Whitehead gave a training course on Water Quality Modelling at the Water and Land Resource Centre at Addis Ababa University over 4-5 February 2020. Thirteen people attended drawn from catchment

authorities representing the Awash River, the Blue Nile, and the Rift Valley River systems. This training workshop was funded as part of the DFID REACH programme at Oxford University. The new versions of the INCA model set up previously for the Awash River system were provided, as described in Bulletin No. 52 April 2019. In addition, new setups for the INCA Metals model were established for the Awash, Akiki and Rift Valley catchments. Sets of scenarios were evaluated, with most concern shown over the highly toxic chromium, lead, zinc and cadmium produced from tannery effluents.



Lecturer Paul Whitehead with the participants in the water quality modelling training course in Ethiopia

New Partners

Two existing Associates, Peter Baur and Ben Piper, have been appointed as Partners of Water Resource Associates LLP from April 2020.



Peter Baur has a strong background in international development and hydrology in Africa, the Caribbean and Latin America, and brings technical skills in diverse areas of hydrology, hydrogeology and water quality, with a particular focus on the mining industry and due diligence.



Ben Piper is a former technical director for water resources at Atkins. He has a strong background in strategic water resources planning both in the UK and overseas. He brings technical skills in diverse areas of hydrology, water resources, droughts, policy development, and statutory planning.

Next WRA Board Meeting

Friday 17th July 2020, connecting by Zoom

The WRA Bulletin is a quarterly publication, and relies on contributions submitted by Partners, Associates and Consultants. The document is circulated by email, and published on the WRA web-site, aiming to keep the WRA network up-to-date with respect to current activities. Please email contributions for future issues to Nick Mandeville: nick@watres.com

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