President's Perspective

In my final 'Perspective' as BHS President, I am focusing on concerns over sewage discharges, the need to increase flood resilience, a new review of carbon sequestration effectiveness and the return of in-person lectures in our universities.

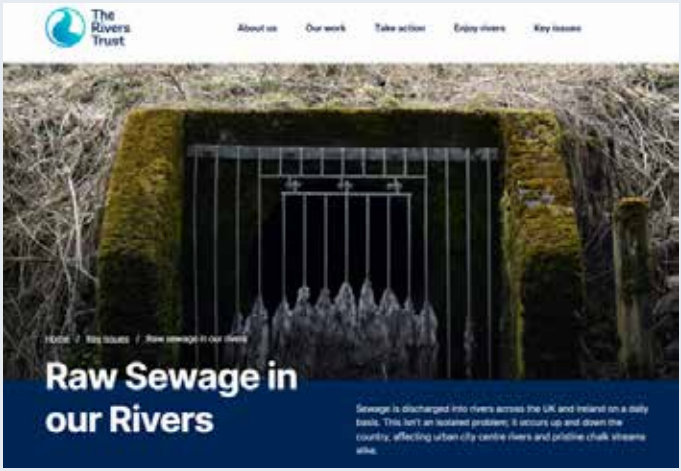
Sewage discharges to UK Rivers in the news

In recent months, the media have been highlighting the frequency of untreated discharges from UK sewage works outside times of flood overflows (BBC Panorama 17 April; Rivers Trust 2 July; *The Herald* 4 July; Riverside TV 14 July 2021). The imposition of a record £90 million fine for illegal discharges by Southern Water (Environment Agency 9 July 2021a) reinforced these concerns. Fears have also been raised about treated sewage and slurry applied to agricultural land entering watercourses (*Guardian* 12 Feb). The problem of micro-plastics in sewage discharges was the focus of an academic study by the University of Manchester (Woodward *et al*., 2021).

Clearly, these practices are negatively affecting both soil and aquatic fauna (National Biodiversity Network, 2019). As noted previously (*Circulation* 147), water companies have and continue to make huge investments in improved sewage treatment systems. Perhaps even greater investment is needed - with all of us paying for the true environmental costs of our loo flushes?

Concerns over pace of improvements to UK flood resilience

On 8 Feb 2021, the House of Commons Environment, Food and Rural Affairs Select Committee (EFRA) called for the Government to define clear targets to reduce the vulnerability of the 5.2 million properties at risk of flooding in England (EFRA, 2021). Scientists in the media (Reuters 17 July) have linked people-induced climate change to last month's life-claiming floods in Germany, Belgium and China. Given the likelihood of such events increasing over the next decades (Hanlon et al., 2021), even the most optimistic future limits on GHG emissions will not prevent us from needing major infrastructural investment to reduce current flood vulnerability



in the UK and elsewhere (NASA blog 2021).

The national and regional authorities with responsibility for flood mitigation in the UK (EA, NRW, SEPA, DfI and lead Local Flood Authorities) have built many very effective flood defences over recent decades and this work is continuing. Over the last few months groundworks have started on the £76 million scheme to reduce flood risk in Kendal (17 Feb) and the £45 million York scheme (10 May), while on 10 June 2021 the government approved the funding for the £500 million Thames flood scheme (BBC 10 Jun). In July the government announced record funding to better protect 336,000 properties by 2027 and so help avoid £32 billion in damage to the economy and reduce national flood risk by up to 11% (*Guardian,* 29 Jul).

Our flood authorities and their technical consultant partners are world-leading in the design and construction of flood defences, increasingly involving nature-based elements. Mitigating flood risk for all the 5.6 million at-risk properties across the UK (please note that here I am talking about the UK not England only) is going to require huge shifts in public expenditure towards these flood authorities at the expense of other demands on the public purse. If this is going to happen, politicians and the public need to understand that effective flood mitigation requires interventions on a huge scale. Approximately 100,000 m^3 of flood intervention is needed for a watercourse draining only 10 km^2 of upstream catchment and 1 million m^3 for a watercourse draining 100 km2 (see photo of 1.2 million m^3 Garstang Flood Basin). Blue-green infrastructure can be effective at mitigating floods, but only if undertaken as intensively as traditional engineering.

Local planners and politicians also have a critical role to play. The green areas around our urban settlements are often the only places major flood storage basins or other major NFM measures could be located. So, planners' first priority should be taking significant steps towards mitigating existing flood risk

with new blue-green or grey infrastructure before permitting new developments in our peri-urban areas.

Perhaps, COP26 will highlight the need to focus thought and substantial investment in Climate Change Adaption (Committee for Climate Change 16 Jun) to make our communities and businesses more resilient to flooding. Lessons that will come from Defra's new £170M Flood & Coast Resilience Innovation Programme (Circulation 148) – a novel 'learning by doing' research initiative – will hopefully show the practical ways of delivering such an investment.

Investment in blue-green infrastructure for ecological restoration and carbon sequestration

As highlighted in *Circulation* 147, the state of our terrestrial and aquatic habitats continues to decline. Ofwat's announcement that the UK water sector are to invest £2.8 billion in environmental projects to support the country's green economic recovery (Defra blog 17 May) is therefore most welcome. The Environment Agency's publication of a technical report showing which nature-based interventions can most reliably deliver carbon sequestration at landscape scales (Environment Agency 7 May 2021b) is a very useful new resource for those in the water sector investing in blue-green infrastructure.

Investing in our university students

The last seventeen months have been challenging for many, not least our university students. The loss of most in-person lectures and much in-person practical work due to Covid-19 has had many downsides, though students have undoubtedly benefited from innovations in digital learning that have arisen (*Circulation* 149).

There is now a greater appreciation of the skills and motivational benefits that come from hands-on practical work when teaching hydrology, though much less discussion of the value of in-person lectures.

In 2017, Sarah French and Gregor Kennedy wrote an excellent article reviewing the value of in-person lectures. They noted that '…students perceive that they learnt better, engaged more and even enjoyed themselves more when attending lectures in person…', and that students were more '…motivated to learn as a result of the group dynamic in the lecture setting and the presence of the lecturer…'. Further, they noted that a face-to-face lecture provides '… the capacity for lecturers to monitor students and determine their level of understanding…' and so '…adapt the lecture in real time to ensure that it is being taught at an appropriate level and is being understood by the group as a whole…' (French and Kennedy 2017). They raised many other excellent points that resonate with comments that I have received from our undergraduate and postgraduate students over the last academic year. I encourage academics to read this article (https://doi.org/10.1080/1

3562517.2016.1273213) and to encourage their universities to permit the return of in-person lectures from October. This should however, come with the proviso that the universities double efforts to mitigate the risk of large numbers of students missing large parts of teaching modules due to contracting Covid-19 from each other or because their course lecturer is on sick leave with Covid-19!

New perspectives

From our Annual General Meeting on 7 Sep 2021, you will have a new BHS President – Hayley Fowler, who is Professor of Climate Change Impacts in the Water Resource Systems Engineering Group of Newcastle University's School of Engineering. I look forward to working with Hayley on the 2021-2 BHS Main Committee and Executive as BHS Past President, and to reading her President's Perspectives from issue 151 onwards! A huge thank you to all UK hydrologists for maintaining our water supply, sewerage and hydrometric systems, delivering flood forecasts and flood schemes, persevering with your learning, adapting your teaching and sustaining world leading research, over the last 17 months in particular. I look forward to seeing many of you at our online members gathering on 7 Sep 2021 'Innovation in UK Hydrology' (details elsewhere in this issue of *Circulation*). I then hope to see many of you in-person at BHS2022 at Lancaster University, combined with fieldwork in the Lake District National Park, over the three days 12-14 Sep 2022.

Nick Chappell
BHS President
August 2021

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A warm welcome to Giuseppe our new Early Career Representative

Giuseppe comes from Calabria in the South of Italy, in the tip of the Italian boot. Calabria is a mountainous area located in the Pollino National Park, which stores Europe's most ancient tree and where Romans took wood for building their ships. It is a region frequently threatened by earthquakes and rainfall-induced landslides, that is why he has always been interested in civil engineering and worked with the University of Rome Tor Vergata for his MSc project to reduce the landslide risk in the area.

At Bristol University, he studies the reliability of bridge networks hit by water-related hazards to ensure communities' resilience and with Dr Maria Pregnolato and Dr Andre R. Barbosa considering climate change effects and infrastructure ageing, using descriptive and inferential statistics, and machine learning techniques.

Aside from work, he loves gardening, walking in the countryside – as a way to connect with nature – and playing with pets. He also practices cycling and swimming, because they challenge his limits, both mentally and physically. As an Early Career Representative, he will be really glad to promote Young Hydrologists' interests for their academic, personal, and professional development.