

# WEEG NEWSLETTER January 2022

The newsletter is published monthly by the University of Southampton's Water and Environmental Engineering Group WEEG, and reports things of interest in this field worldwide, as well as ongoing undergraduate student and research work in WEEG itself.

We believe that water and energy are the most important topics worldwide for the next decades. Our work covers river and coastal engineering, water and wastewater and energy related to water.

**Editorial:** Sewage is not always a popular topic, but one that has to be taken seriously, and where greater awareness is needed of the factors behind some very topical issues.

## Environmental Engineering International: *Sewage in the news*

Whichever media you get your news from, it seems impossible to go more than a few days without seeing headlines on pollution from sewage. These range from local incidents to more extensive studies such as that by Prof Peter Hammond on unlawful wastewater discharges (Fig. 1). Why is this so - are we becoming worse polluters?

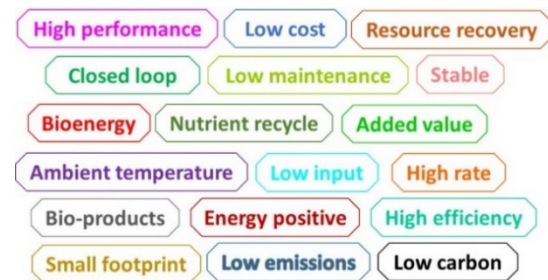


**Fig. 1: Recent news coverage**

One reason is rising expectations and standards, as we grow more aware of the impact of pollutants on the environment. Enthusiasm for wild swimming may also be bringing previously hidden problems to the attention of the public. Despite some major investment in the past few decades, there is a backlog of ageing infrastructure which when combined with growing populations can lead to overloading and failure of wastewater treatment plants (WWTP). The challenge for engineers is to upgrade these, while meeting a whole range of other criteria (Fig. 2) - and all at an affordable price.

A less palatable aspect is bad behaviour by the water industry. While many individuals in the sector are motivated by a desire to protect the environment, unfortunately it can be in the financial interest of companies and their shareholders to allow or even promote discharge of inadequately treated wastewater - as long as they get away with it. The past few

years have seen major fines imposed (Fig. 3), with our local provider an uncomfortable recordholder, but many other water companies also on the list of shame. So maybe the headlines are good news that something is happening on this issue.



**Fig. 2: Process requirements for WWTP**

But in end, it comes back to hydrology and hydraulics. There is a widespread consensus on trends in global temperatures; much less on what will happen to rainfall, with even accepted models showing a very wide range of possible outcomes. More energy in the atmosphere, however, means more extreme events - including higher precipitation over shorter periods. Meanwhile an increase in urbanised area means faster runoff and less chance for infiltration to recharge groundwater.

Like many countries, the UK has a legacy of combined sewer systems, where a single network carries both blackwater from sinks and toilets, and surface water from roofs and roads. For practical reasons, the amount that WWTPs are designed to process is limited. Typically anything up to 6 times the average dry weather flow (DWF) receives at least preliminary screening and sedimentation; flows are stored for at least 2 hours and if possible returned to the plant when the storm abates. The rationale is, this is better than discharging untreated sewage: at 6 DWF or more there is a great deal of dilution, while river flows also increase during major rainfall events, so the concentration of any pollutants is much lower. WWTP treatment efficiencies can be increased by innovative process designs, including some that can be retrofitted. But if peak flows increase, then ultimately the physical capacity of the network sets the limit. In a combined sewer, storm runoff can resuspend foul materials that have settled during periods of low flow, releasing them into rivers through

stormwater overflows. While efforts are being made to design systems that can prevent this, finding effective solutions is difficult. New buildings and developments must now have separate sewers for black water and surface runoff; but if flows in combined sewers become too great then pumping stations and other infrastructure cannot deal with them and untreated wastewater is discharged.



Fig. 3: More unwelcome headlines

We have been living off Victorian investment in our sewerage systems for a long time, and remodelling these has a huge price tag. So while indignation against the water industry is understandable and a powerful lever for change, we also need a grasp on the wider causes. We can invent technologies that are more efficient at removing pollutants; but dealing with increasing volumes of water is another thing. Ideas like green roofs and rain gardens are excellent, but cannot be scaled up to existing cities. And of course, every builder who illegally connects a new extension or patio to the foul drain is adding to the problem.



Fig. 4: Victorian sewer system

Unacceptable wastewater discharges are already hitting the headlines. They aren't going to go away, and major investment combined with some very clever engineering indeed is going to be needed to tackle this issue.

### MSc Projects: *Some 2022 topics*

Topics for this year's Masters students have now been confirmed and they are starting work on a dazzling array of themes. Examples from the environmental biotechnology side range from developing an anaerobic fermentation system for fatty acid and ammonia production,

to CO<sub>2</sub> biomethanisation as a process enhancement for farm-based digestion, and to new methods for characterising wastewater biosolids and sludges. More details and outcomes will be available later in the year.

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### Topic: *History is continuing...*

While clearing up his office, our colleague Dr Derek Clarke found a copy of an Institute of Irrigation Studies (IIS) Newsletter from 1989.



Staff and Students of the Institute, 1988/89 (From left to right)

Fig. 5: IIS Newsletter No. 1, August 1989

This priceless document not only records some of its teaching and research activities, but also has a staff and student photo. Southampton remains famous in this area, with numerous IIS graduates now in very senior positions around the world - and at least four of the staff shown still actively contributing to our Group!

### Jobs in water engineering:

This section gives you ideas of the type of work you can do when working in industry.

**Advert:** One of several currently advertised posts with local authorities in this area:

### Flood Innovation Project Manager

[www.icerecruit.com/job/203973/flood-innovation-project-manager](http://www.icerecruit.com/job/203973/flood-innovation-project-manager)

### Civil and Environmental Engineering at Southampton University:

**WEEG:** our modules offer the chance to deepen your knowledge in water-related areas, and give better preparation for environmental engineering projects.

Contact: Em Prof Sonia Heaven, [s.heaven@soton.ac.uk](mailto:s.heaven@soton.ac.uk), Bldg 178, Room 5021

### Further information:

We have two Facebook pages, which provide a logbook of our laboratory activities:

[www.facebook.com/Hydraulicslaboratory/](https://www.facebook.com/Hydraulicslaboratory/)

[www.facebook.com/environmental.lab.university.of.southampton/](https://www.facebook.com/environmental.lab.university.of.southampton/)

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