WEEG NEWSLETTER March 2021

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: A recent hacking attempt directed at a treatment plant for public water supply in Florida was fortunately foiled by a sharp-eyed controller, but such systems are increasingly vulnerable to attack. This made us think about water crime in general....

Hydraulic Engineering International: *Water Crimes, part 1*

Water is essential for life, for agriculture, for industry. It costs money, it has value and therefore we also have ***crime*** connected to water. So again, there's a bit more to hydraulic engineering than you thought. Now, what is water crime actually? Various researchers have attempted to define it and/or categorise it under different headings. Definitions are omitted here, as many are lengthy and legalistic: but possible categories include corruption, organised crime, pollution, theft, fraud and terrorism; or the simpler grouping of violations related to water quality, water quantity or water security.

Fig. 1: Water crimes

Incidents affecting water quality are common: even in the UK, water companies are prosecuted for pollution incidents. Earlier this month there were interesting reports of research on the use of artificial intelligence to detect unrecorded stormwater discharges. It is easy to imagine water industry managers initially breaking into a cold sweat about the potential publicity; followed swiftly by the realisation that this could lead to a welcome increase in the resources made available to tackle such problems.

The water quantity category is also familiar. The UK's Water Industry Act 1991 and other regulations contain various relevant provisions: for example, it is illegal to cut off a water supply for planned maintenance without notification, or to shut off a domestic customer for non-payment.

Fig. 2: Sewage leaks

This issue has a much broader reach: while it may not be a crime in the legal sense, concern over the ethical status of a world where many people have no access to clean water is clearly visible in the UN's Societal Development Goal SGD 6. It may come as a shock, however, to realise that water poverty is not just confined to the developing world: a survey published in 2020 showed that millions of US citizens cannot afford their water bills, with households plunged into debt while federal support for water utilities has plummeted.

Fig. 3: Water poverty in the USA

In comparison to these categories, water terrorism is relatively rare - although one study found 675 incidents in 71 countries from 1970-2016. Incidents can be classed as infrastructure or chemical / biological (including attack by electronic means). They may aim to disrupt supply, or cause damage through flooding, or deliberate poisoning etc. Reading around, the literature shows a wide range of motives and actors, from states to groups and individuals.

Depriving an enemy of water has a very long history. One of the earliest recorded examples is from around 2400 BC, when King Urlama of Lagash in Mesopotamia diverted boundary canals to restrict the water supply to the nearby city-state of Umma. Jumping forward four and a half millennia, during the conflict in Somalia in 2014 defeated groups were able to cut off liberated cities from their water sources, forcing residents to go to nearby towns that were still under their control.

In 2013-14 major dams in Iraq fell into the hands of non-state actors, leading to fears of disruption to water flows and hydropower services. In 2017 the Taliban destroyed a dam providing irrigation water in Kandahar province. States can also pose threats of this type: classic examples include transboundary river systems around the world, where the different needs of neighbouring countries (e.g. for irrigation versus hydropower) have created hotspots of international tension. Recently there were of course reports of water shortages in Crimea due to the Ukraine cutting off water supplies.

Civilian groups campaigning against changes to their water supply have also resorted to attacks on infrastructure. In one well-known example in the early 1900s, farmers in the Owens Valley of California repeatedly dynamited the aqueduct system that was being constructed to divert water to the growing city of Los Angeles. Indigenous groups around the world have often been driven to violence to try and preserve water rights and resources. But other cases remain a mystery: In 1999 a bomb destroyed Lusaka's main trunk main, cutting off the supply to a city of 3 million people. Despite speculation, no-one claimed or was accused of responsibility.

There's clearly much more crime of varying descriptions around drinking water supplies and water resources than you might at first have expected. Considering their importance to us, however, perhaps this is not so surprising. In a second part of this mini-series, we will look at other forms of water crime committed by civilian groups, including hacker attacks, poisoning and much more …

Hydraulics Laboratory: *New experimental facility*

In our Hydraulics lab, we have started to build a model algae raceway. Well, not quite yet: in the first stage of this project the existing wave tank, which has served us well over the last six years, is being removed...

Fig. 3: Removal of old wave tank

The free space will be filled with a 2.5 m wide, and 12.5 m long algal pond.

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Jobs in water engineering:

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

Advert: A Council is looking for a graduate to work on planning, flood risk management and land drainage:

Graduate Engineer — Runnymede Borough Council

https://www.icerecruit.com/job/198941/graduate-engineer/

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: Prof Sonia Heaven, s.heaven@soton.ac.uk, Bldg. 178, Room 5015

Further information:

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

www.facebook.com/Hydraulicslaboratory/

www.facebook.com/environmental.lab.university.of.southampton/

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