WEEG NEWSLETTER December 2017

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: Some of our readers may be aware of the problems that have occurred with many inland lakes – namely, their disappearance. One example is the Aral Sea (more on that in a following issue), another – and for other reasons – the Dead Sea. Now, a project is finally underway to reduce and potentially resolve the problems of the Dead Sea.

Hydraulic Engineering International: *The Red Sea - Dead Sea Water Conveyance*

That's the rather clumsy title for a joint Israeli-Jordanian mega-project.

You may be aware that the Dead Sea is continuously shrinking. The main reason for this is because the water from the River Jordan has been diverted for water supplies in Syria, the Lebanon and Israel. The Jordan used to have a mean flow of 40 m3/s; this is now down to 4-5 m3/s. This accounts for 60-70% of the volume loss. In addition, in the Southern part water is steered into evaporation ponds (...can you believe it?) in order to make potash and bromine. This makes up the rest of the water loss. As a result, the water level in the Dead Sea is dropping at around 1m per year! Fig. 1 shows the development from 1972 to 2011.

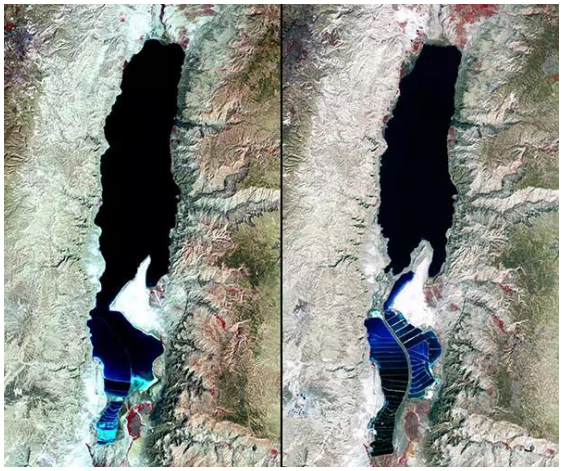

Fig. 1: The shrinking Dead Sea

One of the special features of the Dead Sea is its high salinity of 342 g/kg: for comparison, sea water has a salt content of 30 – 32 g/kg. Another is its geographical situation, as the Dead Sea lies at -430 m below Mean Sea Level.

The ongoing reduction in the water level of the Dead Sea is of course a major concern for Jordan and Israel. Several options to channel water from the Mediterranean or the Red Sea into the Dead Sea have been discussed, and in 2016 an agreement between Jordan and Israel was finally reached to build a pipeline connecting the Red and the Dead Seas, Fig. 2.

Fig. 2: Red Sea – Dead Sea water conveyance

The water conveyance comprises a pumping station and desalination plant at the Red Sea. The water needs to be pumped over a range of hills with a height of 230 m. In the first stage, freshwater production is estimated as 210 Mm^3 per year whilst 190 Mm^3 per year (6 m^3/s) reach the Dead Sea. At the crest of the system there is a reservoir and on the down-flow section, another desalination and a hydroelectric plant are planned. In its final stage, a freshwater production of 890 Mm^3 per year is expected. For comparison: it is estimated that a flow of 400 Mm^3 per year is required to hold the current situation, and that 700 Mm^3 per year are needed to stabilize the Dead Sea level. The initial tender stage opened in 2017, and the total project costs are estimated at US$10bn (initial stage: US$1.1bn). The system will not produce enough electricity to pump the water, so that additional power stations will be required.

The environmental impact will of course be large and is difficult to predict. There is the question of the mixing of Dead Sea and Red Sea water, algae growth, the effect of pumping on corals in the Red Sea and so on. It is currently believed, however, that the advantages of such a system outweigh its negative consequences.

New module in River Engineering:

From academic year 2018-19 onwards, we will offer a new 4th year module in river and estuarine engineering dealing with sediment transport, hydraulic structures in rivers, flood alleviation, and modelling of river engineering problems. The module is currently planned to include laboratory classes in numerical and physical modelling. If you are interested, please contact Dr Sergio Maldonado: S.Maldonado@soton.ac.uk

Student presentation "Woolston Wastewater Treatment Plant upgrade", 11.12.2017

Tim Chatfield, a Year 4 student who has spent his last two summers working on the Woolston Wastewater Treatment Plant upgrade, gave a short talk on this scheme.

Fig. 3: Woolston wastewater treatment plant

The project involves the relocation of current treatment facilities to a neighbouring site, the removal of existing installations and the construction of a new treatment plant. Tim gave a thorough description of the works, which involve state-of-the-art sewage treatment processes including membrane bioreactor systems. He also talked about the challenges of a project working on a very tight time schedule and a small site footprint with external constraints such as the requirement to vacate the temporary works in 2019. In all, it was a fascinating presentation which demonstrated how complex modern civil engineering problems are.

Upcoming MSc projects: Quantification of morphological diffusion in erodible channels

The accuracy of current morphodynamic models, i.e. models that predict the evolution of erodible channels, lags behind the actual implementation of ambitious river engineering projects in the context of climate change adaptation. This is due to many sources of uncertainty, one of which is the effect of local bed-slope on sediment transport rates. This project's objective is to tackle such a problem via a series of well-monitored experiments in one of our flumes. The experiments consist of erodible obstacles subject to a steady current. The evolution of the bed profile will be monitored using image processing techniques. Data obtained will be employed to derive a useful and reliable expression for morphological diffusivity. Supervisor: Dr Sergio Maldonado: S.Maldonado@soton.ac.uk

Fig. 4: Erodible channels: braided river

Jobs in water engineering:

These give you an idea of the type of work you can do when working in industry.

Advert: An interesting example – TRANT is looking for an engineer to work on projects with Southern Water

TRANT Commissioning Engineer – Water - Southampton

http://www.trant.co.uk/jobs/commissioning-engineer-water-southampton/

Civil and Environmental Engineering at Southampton University:

WEEG: the Civil and Environmental Engineering pathway offers the chance to deepen your knowledge in water-related areas, and gives you a better preparation for environmental engineering projects.

Contact: Dr Sonia Heaven, s.heaven@soton.ac.uk, Bldg. 7, Room 5004

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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