

INTERNATIONAL WORK

Institutional Structure in Ethiopia and a review of modelling

As part of the ongoing WRA-REACH (Oxford) programme in Ethiopia, WRA has been working with students and Awash Basin Authority [ABA] staff to assess the water industry structure and to assess a range of water quality models. With limited supporting conditions in governmental water institutions, the level of in-stream water quality modelling integration in the ABA development plans is low. It is time to apply and capitalise on the potential opportunity of using the models in local, regional and national institutions for planning and impact analyses, and strategic policy documents. The methods described in this study can be a guidance for model practitioners of the Awash basin targeting improvement in their institutions. See <https://doi.org/10.1016/j.sciaf.2024.e02063> A comparison of main global water quality models used in water quality studies found the WRA model INCA to rank highly, compared to other models:

SN	Model criterion	Model type					
		A	B	C	D	E	F
1	Input complexity	4	2	4	5	5	5
2	Simulating multiple pollutants	5	5	4	4	3	3
3	Integration with other models	5	4	3	5	3	4
4	User friendly adaption	4	3	2	5	5	5
5	Compatibility to agricultural source pollution	5	5	5	5	3	5
6	Presence of user manual and documentation	5	5	5	5	4	5
7	Credibility in legal terms	5	5	5	5	5	5
8	Continued improvement and maintenance	5	5	5	5	2	3
Total Score		38	34	33	39	30	35

A INCA, B WASP, C QUASAR, D QUAL2KW, E CE-QUAL-R1V1, F SIMCAT

Biosensors, Metals and Hydrology in Ethiopia

WRA has been working with Oxford Molecular Biosensors (www.omb.co.uk) and colleagues in Ethiopia to assess the impacts of tanneries in the Upper Awash River near Addis Ababa. Metal concentrations along the Awash River vary significantly with high concentrations of Cadmium, Chromium, Copper, Manganese, Lead and Zinc near the city of Addis Ababa, reflecting the large number of industries in that area. Concentrations of Arsenic and Cadmium are high

at the downstream locations in the middle Awash, as shown in Figure 1.

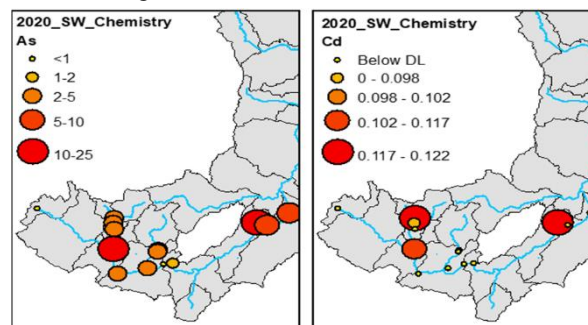


Figure 1 The distribution of metals such as Arsenic and Cadmium in the upper Awash River System near Addis.

A very useful tool to evaluate pollution is that of molecular biosensors. These are bacterially-derived sensors that can detect impacts of pollution and metals on biological health in the rivers or for public water supply. Figure 2 shows the process of developing and applying biosensors to water samples.

Analysis of samples for toxicity in the Awash has revealed the serious impacts of metals on biological health of the river waters, with likely damage to stream ecology and to people's health in the event of the water being abstracted for public supply.

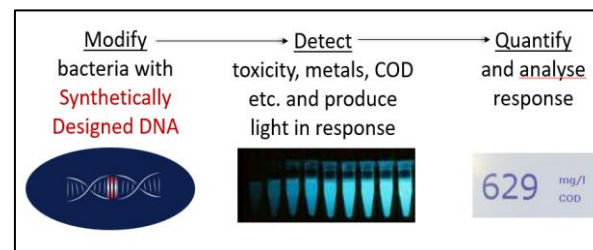


Figure 2 The Biosensor Toxicity Analysis

A regression model has been established between toxicity and metals including lead, zinc, copper, arsenic, and manganese and this model allows the prediction of toxicity anywhere along the river system. This is a useful management tool with which to evaluate pollution impacts along the river and its impacts on the biological system and water supplies.

UK WORK

Flood Risk Projects

WRA has been undertaking flood risk work in the UK for the past 30 years and provides site specific flood surveys which are suitable for a range of requirements. These can be to assist with buying, selling or insuring a property. They can also be specifically tailored to identify particular flooding problems and recommend flood alleviation measures. WRA provides surveys

which can be used for property development such as a flood risk assessment to accompany a planning application, and a surface water management plan and sustainable drainage design to meet local authority requirements. WRA also provides expert advice to local governments, parish councils, community groups or individuals who may be concerned about the increase in flood risk from a proposed new development such as a housing estate.



Flood Risk in Glasgow - SuDS Design

A review of flooding at Croft Park Avenue in Glasgow was requested after residents claimed that recent flood alleviation measures implemented by the Council had not provided the required level of protection.

WRA was commissioned to carry out an independent assessment of the causes of flooding in the area and the measures implemented to prevent future flooding. The report was also used by Glasgow City Council as defence for a legal claim raised by some of the affected residents.



Flood detention pond in Croft Park Avenue

The review included visiting the site to record locations affected, evaluate the measures the Council had put in place and assess the rainfall which caused the alleged flooding. The complaints of flooding had been compiled since 1999, but the first phase of the measures was only put in place in 2016, with a second phase completed in 2020.

The study found that the measures were adequate for moderate and frequent flood events, although may be overwhelmed under extreme conditions. The study found that the measures which had been implemented for the scale of the land area available were appropriate and commensurate with surface water management schemes in residential areas. One of the measures

involved planting trees in areas of parkland to increase the uptake of water and surface roughness. This would provide a higher level of flood alleviation as the trees mature. One negative comment, however, was that the measures could have been implemented by the Council earlier following the initial flooding complaints.

Other News - WRA 30th Birthday Event !!!

WRA will be 30 years this year, so we are planning a get together to celebrate the occasion.

WRA was formed in October 1994 by five independent consultants (ex Institute of Hydrology): Chris Green, Mike Lowing, Nick Mandeville, Ron Manley and David Plinston.

The company was one of the first SMEs to be set up with no central office, no central computer system, no central admin or finance team!! and with a distributed working environment, that is, working from a home office. So that was 25 years ahead of Covid type arrangements!! and it has really worked. WRA is still thriving.

We will host an event by the River Thames at some date in July or June, 2024. Further details to be announced.



Mike Lowing working in Brunei shortly after WRA formation

Next WRA Board Meeting

10th May 2024

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 Paul Whitehead: paul.whitehead@watres.com

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