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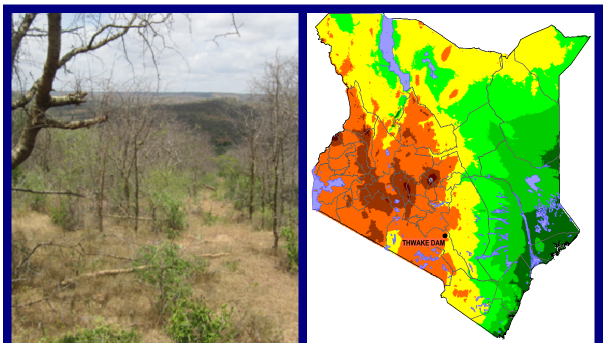
OVERSEAS WORK

Thwake Dam, Kenya

Kenya's Tanathi Water Services Board has appointed Dr Sean Avery to provide hydrological services to the Expert Review Panel for the proposed Thwake Dam on the Athi River, financed by the African Development Bank.

Athi River at the proposed Thwake Dam site

This dam will be over 70 metres high, and will have a catchment area exceeding 10,000 km^2. The upper catchment area includes Kenya's rapidly growing capital city Nairobi. The dam will supply water for irrigation, for the rural community and nearby small towns, and also an urban water supply will be pumped to Kenya's new city to be built at Konza (static lift 810 metres), not far from Nairobi. The dam will also generate hydropower. At present, a rockfill dam with clay core is envisaged.



Left image: Centre line of Thwake Dam
Right image: Map of Kenya showing Thwake Dam site

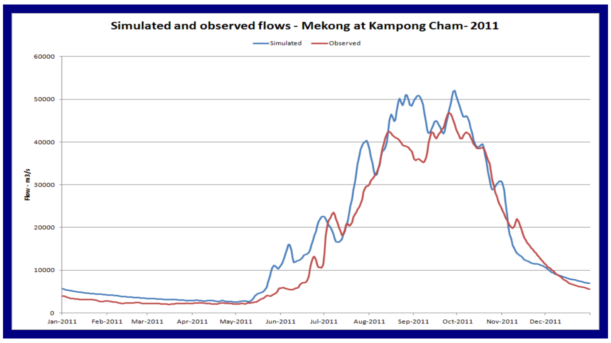
Hydrological Simulation of the Mekong River

Ron Manley has recently been working with SweRoad in Cambodia, looking at climate change impacts on rural roads. For this it was necessary to model the Mekong River as well as other national rivers. Firstly because the Mekong can lead to erosion and flooding of riverside roads and secondly because the Mekong can back up the Tonle Sap river and lead to, or aggravate, flooding around an important wetland.

Map of the Mekong River Basin

What made the simulation more challenging was that apart from Cambodia neither the Mekong Commission nor other riparian countries provided data. Most of the data came from WRA-tested web sites. Climate data were available for the period 1975 to 2011, but flow data were only available for different periods [1960s and 1970s]. As no flow data were available for China, the first station used was at Chiang Saen in Thailand, a point at which the catchment area was already 189,000 km^2.

The catchment area upstream of Chiang Saen was divided into three sub-catchments. Calculating the PET for the upper reaches, where temperatures are below zero for much of year, proved problematic and Ron worked with Dr Robin Hall to find a solution. The simulation was carried out in six further steps down to Kampong Cham in Cambodia, the last station upstream of the delta. Data for that station were only provided for two years, 2001 and 2011, which were used for model calibration.



UK WORK

Kennet and Avon Canal

WRA recently worked in partnership with Dr Rebecca Zeckoski and W S Atkins to help determine how phosphorus in the final effluent from sewage treatment works (STW) affects [RWZ1] algal dynamics in the Kennet and Avon Canal at Copse Lock. The specific aim of the work was to determine whether targeted improvements at STWs discharging to the canal would improve water quality in terms of the concentrations and loads of suspended solids and algae. The study used a relatively new model developed by Rebecca Zeckoski that simulates the hydrological, sediment, and algal processes of inland navigational canals.

Lock 61 is part of the flight of locks at Crofton near the summit. There are concerns that algae growing in the canal are having a detrimental effect on the water quality of the lower reaches of the River Kennet

The model was set-up for the Kennet and Avon Canal between the summit reach and Copse Lock where the canal flows into the River Kennet. The modelled outcomes indicate that the introduction of P-stripping at the Kintbury STW will reduce the annual algal load at Copse Lock by approximately 5%. Implementation of P-stripping planned for the Great Bedwyn STW in 2015 will likely reduce annual algal loads in the same canal reach by up to 10%. Introduction of the same measures at smaller works [East Grafton and Wilton Water] would have only a very small impact.

The Kintbury Feeder provides a significant portion of flow in the canal. Model simulation shows that removal of this source would increase the residence time of the water in the canal, thereby allowing greater algal growth and the concentration of algal biomass and inorganic sediment in the reach through reduced dilution. A decreased flow would reduce the water level in the canal, which would put boat propellers closer to the sediment bottom, thereby increasing sediment generation by boats. The modelled outcomes suggest that the decrease in sediment and phosphorus load achieved by removing the Feeder would be insufficient to overcome the detrimental effects of the resulting reduced flow rate.

R W Zeckoski 2010, Water Quality Modeling for the Kennet and Avon Canal [PhD thesis, Cambridge University].

WRA Software - HYSIM

It might at first seem that there is little connection between the Mekong River and the River Wreake in England. The Wreake drains an area of little over 400 km^2, a tributary of the River Soar in Leicestershire which then flows north to the Trent near Nottingham. The Mekong River rises in the Himalayan Mountains of the Tibetan Plateau and flows for 4,350 km through China, Laos, Thailand, Cambodia and Vietnam to the South China Sea. Part of its basin lies within Myanmar, and the total catchment is 795,000 km^2.

The River Wreake was the first river to be modelled by HYSIM and the Mekong is one of the latest. When Ron Manley started development of HYSIM in the 1970s, the model was made as physically realistic as possible, including both hydrology and hydraulics modules. Such an approach allows HYSIM to be applied to a wide range of conditions beyond those for which it was originally developed and tested.

The Lower Mekong River in Cambodia

WRA Partner & Associate News

Dr Harvey Rodda has now become a WRA Partner, bringing over 20 years of experience working in hydrological consultancy at home and abroad, and is visiting lecturer at UCL, contributing to the MSc course in Geophysical Hazards.

He started his career in consultancy at the National Institute for Water and Atmospheric Research in New Zealand, looking at the impact of the dairy and fertiliser industries on water quality. This nurtured his expertise in the application of GIS to hydrological modelling. Returning to the UK, flood related studies became his new focus, working for Risk Management Solutions and as principal hydrologist for Peter Brett Associates. In 2004, he set up an independent business, Hydro-GIS, and continues to work in the field of flood hydrology and hydraulics, involved in country-wide flood risk models, flood mapping, GIS, hydrological and hydrodynamic modelling.

WRA Board Meeting

19 July 2013, Wallingford

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 Holmes: pach@watres.com

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