

## **OVERSEAS WORK**

#### Pelagus Hydroelectric Scheme, Sarawak

Bakun dam on the upper reaches of the River Rajang in Malaysian Province of Sarawak on the Island of Borneo is the second highest rock-fill dam in the world. The main use of the dam will be for hydropower with a secondary role of flood mitigation, and is nearing completion.



There are other potential hydropower sites downstream of Bakun Dam, at Belaga and Pelagus. Ron Manley has supported Norconsult, in carrying out the hydrological studies for the inception phase of Pelagus Dam. Storage at the Pelagus site is limited, around one day of average flow, depending on configuration, compared to Bakun Dam where the storage is equivalent to several months of average flow. This meant that not only the flow but the operation of Bakun Dam had also to be considered.

The first task was to collate the hydrological and meteorological data collected for previous studies. There was good data on precipitation and flows for recent years, though less a few decades ago. However there was little data available on other climate parameters needed to calculated evaporation: temperature, hours of sun and relative humidity. These data were obtained from internet sources. Using this data HYSIM was calibrated to flows at both Bakun and at Pelagus. Catchments like this are among the easiest to calibrate as there are few, if any periods of soil stress; which is always a problem for hydrological models. Whilst the calibration was generally good some issues were identified for future study. These included the infilling of precipitation data, only a few stations were operating in the 1960s but as long a period of simulated as possible was needed for

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frequency analysis, and some apparent inconsistencies between flow measuring stations.

It was also necessary to develop an operating model of Bakun Dam, using a simple operating rule. This model attracted considerable interest as the dam has been handed over from the developers to the operators and its operating rules have not yet been finalised.



One of the objectives of the study was to determine the flooding at Pelagus. This showed that whilst the presence of the dam upstream at Bakun reduced floods of a low frequency (around 10 to 20 years return period) it had less impact on floods of a higher return period (100 years or more). This was as expected. Major floods generally occur when soils are fully saturated and conditions likely to cause that would also lead to Bakun Dam being near to capacity.

## Lake Turkana and the Lower Omo

Between 2010 and 2011, Dr Sean Avery was engaged by the University Oxford to further assess the Lake Turkana Hydrology and impacts of Gibe III and Lower Omo developments. This consultancy has included the following professional presentations and report:

- Presentation to 14th World Lake Conference; Austin, Texas, November 2011.
- Presentation to UNESCO / World Heritage / IUCN / National Museums of Kenya, detailing threats to the Lake Turkana World Heritage sites, March 2012.
- Lecture to East African Wildlife Society on the uniqueness of Lake Turkana, June 2012.
- Report entitled Lake Turkana & the Lower Omo: Hydrological impacts of Gibe III and Lower Omo irrigation developments.

Further research is envisaged including temperature and climate change evaluations on the lake.

## **UK WORK**

#### Scotland

Following on from the Hysim-Aquator work in 2012, Scottish Water has asked for further model simulations to investigate environmental flows for the Bonar Bridge water supply.

The current scheme which uses Loch a'Ghobhair will be supported in future by abstraction from a larger peaty loch to the north called Loch Buidhe.



The proposed active management guidelines for Loch Buidhe would require environmental releases at the dam, to maintain 4.67 Mld [Q95] for the period June-September, and 8.21 Mld [Q80] for the period October-May. In addition, three small freshets would be released in September-November, and one larger flood, equivalent to the mean annual flood or bank-full discharge. For the purposes of modelling, freshet releases of 207.4 Mld have been programmed in February, April and October, and a mean annual flood of 577.2 Mld in December. This takes 34% [547 Ml] of the active storage volume available of 1623 Ml, to maintain the salmon fisheries down stream, a river currently at good WFD status.



## Sussex Ouse & River Cuckmere

Following on from WRA studies in 1998, 2006 and 2008, the simulated daily flows for the Sussex Ouse and the River Cuckmere have been extended for a further four years, for the period January 2008 to November 2011. These flow data were then used as input to existing AQUATOR models of the water supply systems for each catchment, for South East Water.



This study was undertaken by Rachel Evans and Julian Smith, with Ron Manley contributing the PET [potential evapo-transpiration] estimates.

One recommendation emerging from this work was that any future exercise to extend the HYSIM model flow simulations beyond 2011 should include a prior detailed review of available rainfall and PET data, and an effort to update the climatological baseline data-set.

# WRA Director/Associate News

**Bob Sargent** joins WRA as Associate, bringing expertise in surface water runoff, flooding, water quality regulation & environmental policy, having been very active on the UK scene as BHS president and Honorary President of CIWEM.

![](_page_1_Picture_14.jpeg)

After many years in Scotland, Bob has worked in both the private and public sectors providing technical solutions, policy and advice on flood management, water resources and drainage, habitat enhancement, climate change adaptation and a range of hydrological issues. His expertise in flood hydrology and management has taken him to Barbados and Romania.

#### WRA Board Meeting

19 October 2012, Brightwell-cum-Sotwell

The WRA Bulletin is a quarterly publication, and relies on contributions submitted by Directors, 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: <u>pach@watres.com</u>

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