

WRA Bulletin 30

May 2012

OVERSEAS WORK

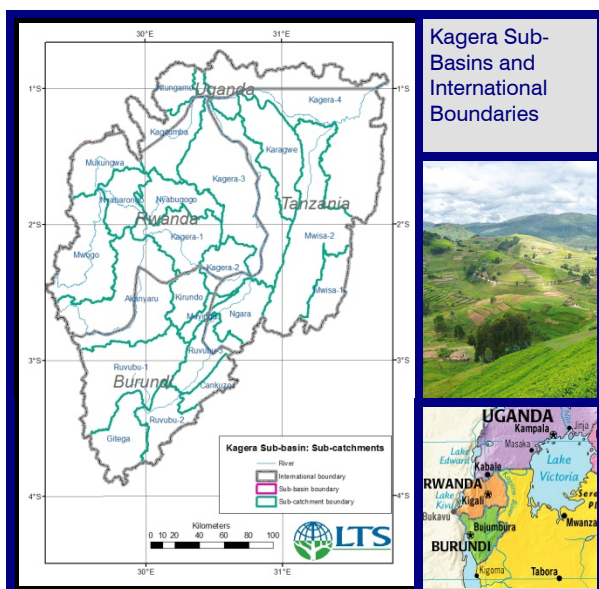
Kagera River Basin and Wetlands

Earlier in the year, the WRA team in association with LTSi completed the Kagera project, part of World Bank financed NELSAP project aimed at sustainable river basin management. The Kagera River Basin encompasses Rwanda, Burundi, Tanzania, & Uganda.



Rusumo Falls [photographed by Amakuru]

The Kagera basin has an area of 60,000 km² and flows into Lake Victoria, and half of the basin drains to the Rusumo Falls. In the past, some land in the basin has become degraded, so the aim of the project was to identify areas at risk and to outline viable development pathways. Specific projects were identified to respond to the needs for future development to be sustainable and enhance living standards of people living in the basin.



There were four main WRA activities:

- Identify relatively homogeneous sub-basins.
- Prepare data on flows, precipitation and potential evapotranspiration, with quality control of data.
- Calibrate the HYSIMCC rainfall/runoff model.
- Simulate flows for the whole basin for historic data and projected climate change.

This provided the basis for preparation of a set of maps showing hydrological and climatic characteristics of each sub-basin. The flows, runoff data, irrigation demand and water stress for each sub-basin were generated for historical conditions and climate change projections.

Lake Victoria

Lake Victoria has only one outflow at Ripon Falls, and this was drowned by construction of Nalubaale dam and hydropower station in 1952. Since then, the outflow of the lake has been artificially controlled using an Agreed Curve, which was the natural rating curve for Ripon Falls prior to dam construction. In 2002 a second hydropower plant at Kiira was built to operate in parallel with Nalubaale, but lake levels then fell dramatically, partly due to a period of low inflows, but compounded by releases for hydropower in excess of the Agreed Curve.

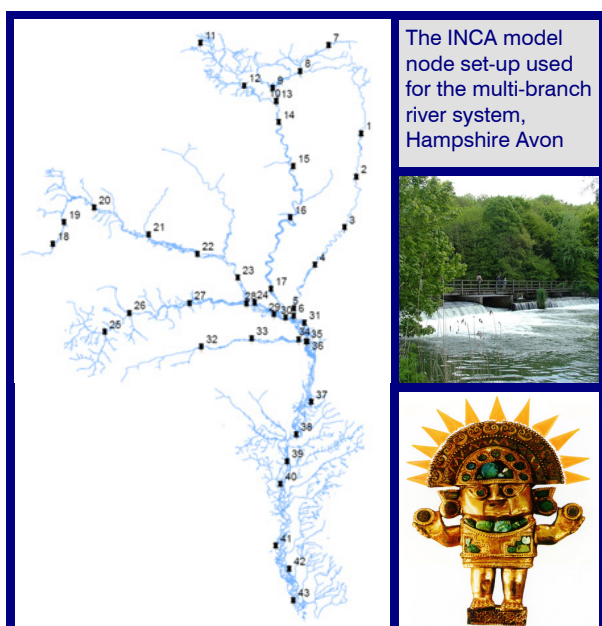


WRA has just completed a two-year project with the Centre for Ecology and Hydrology to develop a new release policy to replace the Agreed Curve. The client wanted the new policy to minimise variations in lake level, but store water in wet years to augment releases during drought: two conflicting aims. A series of possible release policies were examined seeking a compromise between the needs of hydropower, that requires a more uniform outflow regime, and others who would prefer stable lake levels.

UK WORK

Assessing Phosphorus Contributions from STWs Relative to Other Sources in the Hampshire Avon

WRA set up a new version of the INCA water quality model for the Hampshire Avon, working for UKWIR with WS Atkins and the University of Reading. The new version of INCA can simulate multi-branch rivers and simulates hydrology [flow, stream power], nitrate, ammonia, total and soluble reactive phosphorus, sediments and ecology [macrophytes and epiphytes]. The key issue was to assess phosphorus [P] impacts from STWs in relation to other sources of P from agriculture, and investigate alternative P removal strategies. The AMP 5 strategy will reduce instream P by 25% from a no-dosing situation, whereas a seasonal P dosing strategy would further reduce instream P by a further 11% in the River Avon.



INCA

The INCA software has been developed over the past 12 years as part of EU-funded projects (EU- INCA and Eurolimpacs and other projects funded by the Environment Agency, National Power, DEFRA, Natural England, English Heritage, EPSRC, ESRC and NERC, such as the NERC LOCAR project.

The Environment Agency is now setting up a decision support system to assist environmental impact decision-making as well as helping with the Water Framework Directive. As part of this process, the INCA software has been licensed to the Agency, including the new multi-branch version of the model.

<http://www.watres.com/software/INCA/info.html>

The basic structure of INCA has been tested on a wide range of British and European catchments. The model is process-based and therefore designed to cope with environmental change such as changes in land use, pollution levels and climate. The model seeks to incorporate the dominant mechanisms and processes operating and therefore does not include over complicated structures. However, because the model is process-based, it does require user skill in applying the model and in interpreting model results. The software is written in C++ and utilises a menu-driven interface as well as an output graphics and statistics package.

INCA provides the following outputs:

- Daily time-series of flows, & water quality parameters, such as nitrate-nitrogen and ammonium-nitrogen concentrations, at selected sites along the river
- Profiles of flow or water quality along the river at selected times
- Cumulative frequency distributions of flow and water quality at selected sites
- Table of statistics for all sites
- Daily and annual water quality loads for all land uses and all processes
- 3D pictorial representations of flow and water quality
- Time series plots of the soil and groundwater responses
- Output times series for transfer to other analysis programs such as Excel
- Procedures for saving modified parameter sets
- Scenario simulation results presented graphically or as output files

WRA Director/Associate News

Rachel Evans joins WRA as Associate, bringing expertise in water resources system simulation and rainfall-runoff modelling, and a specific insight to the demands of the British water industry and water resource planning. In addition to HYSIM, Rachel has experience of using WRAPSim and MISER models, through her work with Thames Water, Yorkshire Water and other British water companies, to assess supply/demand balance scenarios, for Water Resources Management Plans. Her water resources planning work has included headroom and outage assessment, and climate change analysis.



WRA Board Meeting

20 July 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: pach@watres.com

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