

CEH WATER RESEARCH in INDIA

Dr. Gwyn Rees Science Lead - Water Resources Centre for Ecology & Hydrology







CEH is the UK's centre of excellence for research in the land and freshwater environmental sciences





CEH & NERC in a UK Government setting



Resources

325 scientists, 100+ PhD students & 125 support staff across the UK









Flow Regime Estimation for Hydropower



IWRM tool in the HKH



Prototype developed for the Uhl (HP) and West Rapti (Nepal) river basins

DFID-funded, adapted from UK LowFlows 2000

An IWRM tool for estimating natural and artificially influenced dry season flows in the HKH







Climate change impacts on glacier-fed rivers

New macro-scale model for the Indus, Ganges and Brahmaputra basins

... incorporating a regional glaciermelt model

...to estimate average annual and monthly baseline runoff on a 20km x 20km grid

Apply climate change scenarios to forecast extent of deglaciation and the impact on future river flows in the region

e.g. %change in decadal mean flow for Indus for different climate change scenarios





GWAVA: integrated water availability model

Natural water availability

Rainfall-runoff model

Possible scenarios

Climate change; Land-cover change

Artificial Influences

Reservoirs; Inter-basin surface water transfers water abstractions, return flows; water quality; Water demands from households, industry and livestock Irrigation demand &efficiency; network leakage

Possible scenarios

Population growth; Land-use change; economic development; water treatment; etc.





Actual water availability/stress





GWAVA: integrated water availability model



Water Scarcity Index (SW4)

Compares availability and demands for all months in the year to find the month with the minimum surplus, and so shows the critical situation in the year in terms of the deficit of availability over demand. This is then standardised as to always fall within the range 1.0 to 1.0.





Pilot e-flows study in the Narmada basin

- Developing GWAVA e-flow module, to support appropriate allocation of water resources, to meet needs of people & the environment
- Collaboration with National Institute of Hydrology, Roorkee
- E-flow module being piloted in the Narmada basin
- Multi-scenario approach different demands/stressors, from local data
- Currently testing & calibrating the model







Agriculture water-use efficiency

Water4Crops



Plant

one of the largest EU-India projects, *"integrating bio-treated wastewater reuse with enhanced water use efficiency*

Farm

Supply to Crop

Dam

- Poor Service
- Slow Delivery
- Varying Flows
- Poor Control

Centre for Ecology & Hydrology

Dam to Farm

Leaks

Seepage

Evaporation

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Operating Spills

Poor Measurement

Use by Plant

Channel

- Imprecise Timing
- No Measurement of Crop Needs

COSMOS-India

Supporting water management: developing a network of real-time soil moisture monitoring stations across India, using Cosmic Ray Soil Moisture Sensors (CRSs)







INCOMPASS

INteraction of Convective Organisation with Monsoon Precipitation, Atmosphere, Surface and Sea

NERC-MoES funded project to "*improve the rainfall prediction method in operational weather and climate models*".



















Ganges water quality & microbial ecology

- Seasonal surveys of upper Ganges
 - Microbiological biodiversity and function investigated through DNA sequencing
 - Water quality analysis, including nutrients and metals
- Builds on similar studies of River Thames, to research...
 - Algal and bacterial biodiversity
 - Pathogen distributions
 - Plankton ecology
 - Causes of algal blooms







Sampling site

Thank you

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