# WEB.BM – The ultimate river basin management tool

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MODEL ACCESS: WWW.RIVERBASINMANAGEMENT.COM

### WEB.BM IS A WEB APPLICATION THAT PUTS THE BEST COIN-OR OPTIMIZATION LIBRARY TO GOOD USE IN WATER MANAGEMENT BY USING THE HIGHEST MODERN SOFTWARE STANDARDS

Modern river basins contain infrastructure that regulates river flows. Managers face two closely-related questions: what is the best way to (a) operate the existing infrastructure; and, (b) design future infrastructure expansion? Addressing both questions requires the best use of the computer modeling technology that acts like a crystal ball that can be used either as a planning or as an operational tool (assuming there are reliable short term runoff forecasts). The main model features are:

- The use of the COIN-OR library of solvers with sophisticated and automated linearization of all common non-linear constraints found in river basin networks
- Modern web application with Google Maps interface and MS SQL server database
- Multiple time step optimization for hourly, daily, weekly or user-defined time steps
- Multi-year optimization with over 500,000 variables and constraints solved in 10 min.
- Easy switch between the use of historical (planning studies) or real time data
- Inclusion of all relevant water demands and constraints





TARGET AUDIENCE / MODEL USERS: **Government Water** Management Agencies **Consulting Firms** Academic **Researchers Hvdro Power Producers** Irrigation Management Agencies **PREVIOUS USE** CANADA: Alberta Innovates / University of Alberta **INDIA:** National Hydrology **Project (NHP) SERBIA:** 

Electrical Power Company (EPS)

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#### HOW DOES WEB.BM WORK AND WHY IS IT DIFFERENT?

- WEB.BM solves multiple time steps simultaneously. This is important since the storage releases may change every 6 hours or less during floods, while reservoir releases may travel more than 18 hours to reach the critical downstream areas that need flood protection. By the time the storage release gets to its destination that requires flood protection, it will also be transformed due to channel routing processes.
- Hydrological River Routing based on the Dynamic SSARR (US Crops of Eng.) method is included in the solution procedure. This procedure requires the travel time vs flow tables for river reaches. It is a non-linear routing method included directly in optimization as additional model constraint. Tributary inflows and diversions can also be added.
- 3. WEB.BM ensures that proper timing and quantities released from storage will reach downstream destinations when expected after all necessary flow transformations due to the effects of routing, tributary inflows and diversions.
- WEB.BM real-time model solutions improve with longer runoff forecasts, which is especially visible for flood management in systems with sufficient flood storage zones. The length of forecast given in days can be modified by the user.
- 5. WEB.BM model connects river reaches, reservoirs, diversion canals, in-stream and off-stream water users, return flows, hydro power plants, and adds all related constraints driven by outlet structures, water diversion licenses, apportionment agreements, reservoir routing and net evaporation, canal losses, and the SSARR channel routing that automatically adjusts routing coefficients as a function of flow-dependent travel times.



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