

## Introduction to Hydro-BID: A Regional Water Resources Management Simulation System for the Latin America and Caribbean Region

Fernando Miralles-Wilhelm

University of Maryland and Inter-American Development Bank

The Inter-American Development Bank (IDB) provides substantial financial and technical support for infrastructure projects in water and sanitation, irrigation, flood control, transportation and energy. Many of these projects depend upon water resources and have a significant potential of being negatively affected by local and regional changes in development variables that alter water availability, such as climate, population growth and shifts in land use associated with urbanization, industrial growth and agriculture. Assessing the potential for future changes in water availability is an important step for ensuring that infrastructure projects meet their operational, financial and economic goals. It is also important to examine the implications of such projects for the future allocation of available water among competing users and uses, to anticipate and help mitigate potential conflict, thus enabling such projects to be consistent with long-term regional development plans and preservation of essential ecosystem services.

The IDB has sponsored work to develop and apply an integrated suite of water resources modeling tools, collectively referred to as *Hydro-BID*. The *Hydro-BID* modeling system includes hydrologic analysis modules to estimate the availability (volumes and fluxes) of freshwater at the regional, basin and sub-basin scales.

The *Hydro-BID* system currently includes:

- an Analytical Hydrography Dataset (AHD) representing over 230,000 catchments in the Latin America and Caribbean (LAC) region and their corresponding topography, river and stream segments;
- a GIS-based navigation tool to browse AHD catchments and streams with the capability of navigating upstream and downstream;
- a user interface for specifying the area and time period to be modeled and the location at which water availability will be modeled;
- a climate data interface to obtain rainfall and temperature inputs for the area and period of interest;
- a rainfall-run-off model based on the Generalized Watershed Loading Factor formulation; and
- a routing scheme for quantifying time of travel and cumulative flow estimates across downstream catchments.

*Hydro-BID* generates output in the form of a time series (with a choice of time interval, e.g., hourly, daily, weekly, monthly, yearly) of changes in water storage and flow rates for the selected basins and time period. A case study addressing water allocation issues in the Rio Grande basin in Argentina as an illustration of the simulation modeling system's inputs, operation and outputs was finalized recently. The initial version of *Hydro-BID* has been received enthusiastically in presentations to potential users and constituents in the IDB and to outside technical audiences via conferences and workshops, and there are several requests for parameterization of the model and practical applications from strategic Bank clients within the Water Resources Sector in LAC (e.g., in Brazil, Trinidad and Tobago and Perú).

In this next phase of development of *Hydro-BID*, it will also include economic analysis and decision support tools to estimate the costs and benefits of adaptive measures and help decision makers make informed choices among alternative designs for infrastructure projects and alternative policies for water resources management.