Overview

WEAP© is a software tool for integrated water resources planning. It provides a comprehensive, flexible and user-friendly framework for policy analysis. A growing number of water professionals are finding WEAP to be a useful addition to their toolbox of models, databases, spreadsheets and other software. This introduction summarizes WEAP's purpose, approach and structure. A detailed technical description is available in a separate publication, the WEAP User Guide, available for download from www.weap21.org.

Background

Many regions are facing formidable freshwater management challenges. Allocation of limited water resources, environmental quality and policies for sustainable water use are issues of increasing concern. Conventional supply-oriented simulation models are not always adequate.

Over the last decade, an integrated approach to water development has emerged that places water supply projects in the context of demand-side issues, water quality and ecosystem preservation and protection. WEAP incorporates these values into a practical tool for water resources planning. WEAP is distinguished by its integrated approach to simulating water systems and by its policy orientation. WEAP places the demand side of the equation—water use patterns, equipment efficiencies, re-use, costs and allocation—on an equal footing with the supply side—streamflow, groundwater, reservoirs and water transfers. WEAP is a laboratory for examining alternative water development and management strategies.

WEAP is comprehensive, straightforward and easy-to-use, and attempts to assist rather than substitute for the skilled planner. As a database, WEAP provides a system for maintaining water demand and supply information. As a forecasting tool, WEAP simulates water demand, supply, runoff, streamflows, storage, pollution generation, treatment and discharge, and instream water quality. As a policy analysis tool, WEAP evaluates a full range of water development and management options, and takes account of multiple and competing uses of water systems.

WEAP development

The Stockholm Environment Institute provided primary support for the development of WEAP. The Hydrologic Engineering Center of the US Army Corps of Engineers funded significant enhancements. A number of others, including the UN, World Bank, USAID, US EPA, IWMI, BGR, WRF and NOAA have provided project support. WEAP has been applied in water assessments in more than one hundred countries, including the United States, Mexico, Brazil, Germany, Ghana, Burkina Faso, Kenya, South Africa, Mozambique, Morocco, Israel, Egypt, Syria, Jordan, Iran, India, Sri Lanka, Nepal, China, South Korea, and Thailand.

The WEAP approach

Operating on the basic principle of water balance accounting, WEAP is applicable to municipal and agricultural systems, single subbasins or complex transboundary river systems. Moreover, WEAP can address a wide range of issues, e.g., sectoral demand analyses, water conservation, water rights and allocation priorities, rainfall runoff and baseflow, groundwater and streamflow simulations, reservoir operations, hydropower generation, water quality, ecosystem requirements, feedbacks to the energy sector, and benefit-cost project analyses.

The analyst represents the system in terms of its various supply sources (e.g., rivers, creeks, groundwater, reservoirs); withdrawal, transmission and wastewater treatment facilities; ecosystem requirements, water demands and pollution generation. The data structure and level of detail are customizable to meet the requirements of a particular analysis or limits of data availability.

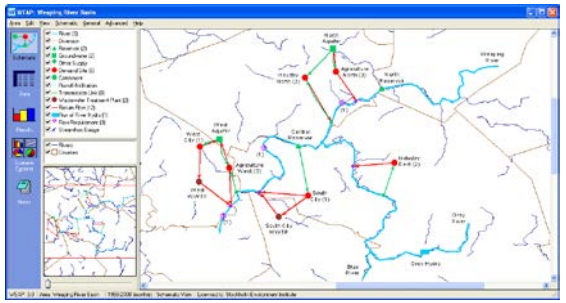
WEAP highlights

- Integrated water resources planning system
- Scenario-based analysis
- GIS-based graphical interface
- User-defined variables and equations; internal scripting
- Dynamic links to LEAP, MODFLOW, MODPATH, QUAL2K, and other models and spreadsheets
- Fast solution algorithms
- Flexible data structures
- User-friendly interface
- User Guide, Tutorial & online user support forum

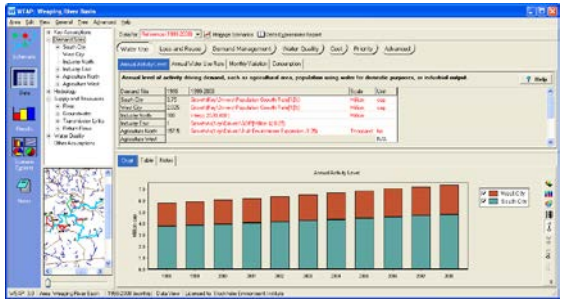
Program structure

WEAP consists of five main views: Schematic, Data, Notes, Results, and Scenario Explorer.

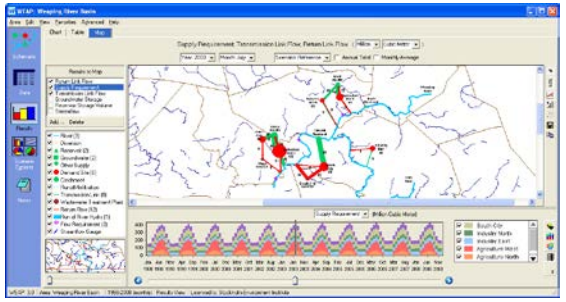
Schematic: GIS tools for configuring your system. Drag and drop to create and position. Add ArcView or other standard GIS vector or raster files as background layers. Instant access to data and results for any node.



Data: Model building: create variables and relationships, enter assumptions and projections using mathematical expressions, and dynamically link to Excel.



Results: Detailed and flexible display of all model outputs, displayed in charts, tables and maps.



Notes: Document your data and assumptions.

Scenario Explorer: High-level view of data and results. Create scenarios on the fly. Move sliders to change the values of data variables and WEAP recalculates so that you can instantly see the impact on user-selected key results.

Scenarios

Scenario analysis is central to WEAP. Scenarios are used to explore the model with a wide range of questions, e.g.,

- What if demographic or economic patterns change?
- What if water conservation is introduced?
- What if ecosystem requirements are tightened?
- What if the mix of agricultural crops changes?
- What if groundwater is more fully exploited?
- What if reservoir operating rules are altered?
- What feedbacks exist between water and energy sectors?
- How might climate change alter demand and supplies?
- How does pollution affect water quality?
- How will land use changes affect runoff?

Powerful tools

An intuitive GIS-based graphical interface provides a simple yet powerful means for constructing, viewing and modifying the user-designed schematic of the water system overlaid on ArcView and other standard GIS files. Data for any component can be edited directly by clicking it on the schematic. Wizards, prompts and error messages provide advice throughout the program. With WEAP's highly flexible and comprehensive reporting system, the user may customize reports, which may be saved as "favorites." All tables can be exported directly into Excel. Extend WEAP's built-in models via the use of scripting and links to external models and data.

Applications

WEAP has been applied in hundreds of projects world-wide for integrated water resource planning, including:

- China: developing scenarios to support a multi-stakeholder dialog on competing uses of water resources
- Africa: on issues of water and development (with IWMI)
- Mideast: establishing alternative water development and allocation scenarios in a process involving both Israeli and Palestinian participants
- India and Nepal: exploring water supply and conservation options in the region's diverse water conditions
- California: evaluating effects of climate change on water supply and ecosystem services
- Aral Sea: conducting comprehensive analysis of water accounts, and developing scenarios to explore a full range of options and outcomes

What's new in WEAP version 3?

- Integrated Water-Energy modeling via link to LEAP
- Scenario Explorer
- Export results to Google Earth
- Internal scripting and user-defined variables
- Environmental Flow Requirements Wizard
- FAO 56, dual Kc, daily catchment hydrology (MABIA)
- Water allocation for hydropower demands
- Groundwater particle tracking (MODPATH)
- Calibration Wizard (PEST)
- Safe Yield Wizard
- Windows 8 and 64-bit Windows compatibility
- Many other improvements!

For More Information

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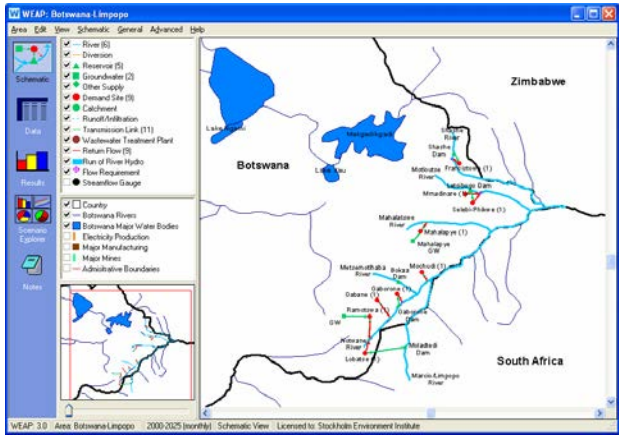
WEAP

Water Evaluation And Planning System

A Tool for Sustainable Water Analysis



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