

Data

Model Components

Output

- Supply Side**
- Precipitation
 - Streamflow
 - Groundwater aquifer
 - Reservoir
 - Conveyance facility

- Operation Rules**
- Inter-provincial water allocation
 - Reservoir operation policy
 - Hydropower constraints
 - Ice flood control
 - Sediment flushing control
 - Water supply reliability

- Demand Side**
- Urban domestic water use
 - Energy sector water use
 - Manufacturing sector water use
 - Rural domestic water use
 - Irrigated area
 - Cropping intensity
 - Crop pattern
 - Irrigation efficiency
 - Crop price
 - Crop production cost
 - Offstream ecological water demand
 - Instream environmental flow

Node-arc network flow

- ✓ Reservoir node water balance
- ✓ Groundwater node water balance
- ✓ Junction node water balance
- ✓ Demand node water balance
- ✓ Flow continuity

Hydropower

- ✓ Firm power
- ✓ Power generation

Rural domestic and agricultural

- ✓ Rural domestic and irrigation water use
- ✓ Crop area, yield, production

Urban domestic and industrial

- ✓ Urban domestic water use
- ✓ Industrial water use

Ecosystem

- ✓ Offstream ecological water demand
- ✓ Instream environmental flow

OPTIMIZATION

- ✓ Objective: maximize the benefits of hydropower generation, crop production and water supply
- ✓ Constraints: resource, infrastructure, technical and institutional constraints

- Water Resources System**
- Reservoir storage
 - Changes of aquifer storage
 - Surface water division
 - Groundwater extraction
 - Domestic water supply
 - Industrial water supply
 - Irrigation water supply
 - Return flow
 - Offstream ecological water use
 - Instream environmental flow

- Socioeconomic System**
- Water supply reliability
 - Benefits across sectors and regions
 - Water scarcity cost
 - Shadow price of water

- Management and Policy**
- Water-saving investment
 - New water sources
 - Water allocation policy
 - Optimization of productive force distribution
 - Food security
 - Regional economy

Inflow

outflow