The Use of Information Technology in Water Resources Management

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ACCESSIBLE WATER RESOURCES

- Not available
- 1-200 m$^3$/cap
- 201-1000 m$^3$/cap
- 1001-5000 m$^3$/cap
- 5001-10000 m$^3$/cap
- 10001-30000 m$^3$/cap
- > 30000 m$^3$/cap

EGYPT
WATER RESOURCES IN EGYPT

Current Water Resources
60 BCM

- Nile: 92%
- Deep GW: 2%
- Rainfall: 2%
- Desalination: 4%

Current Water Uses
79.5

- Irrigation: 76%
- Industrial: 13%
- Municipal: 4%
- Water Network: 7%
- Evaporation: 2%

Reuse of Drainage water 13.5 BCM, Shallow GW 6 BCM
Per Capita Share of Water Resources and Agricultural Land in Egypt

- Per Capita Share of Water Resources (m³)
- Per Capita Share of Agricultural Lands (Acres)

<table>
<thead>
<tr>
<th>Years</th>
<th>Per Capita Share of WR</th>
<th>Per Capita Share of Ag. Lands</th>
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<tbody>
<tr>
<td>1897</td>
<td>5000</td>
<td>0.8</td>
</tr>
<tr>
<td>1907</td>
<td>4000</td>
<td>0.7</td>
</tr>
<tr>
<td>1917</td>
<td>3000</td>
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</tr>
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<td>1927</td>
<td>2000</td>
<td>0.5</td>
</tr>
<tr>
<td>1937</td>
<td>1000</td>
<td>0.4</td>
</tr>
<tr>
<td>1947</td>
<td>0</td>
<td>0.3</td>
</tr>
<tr>
<td>1960</td>
<td>0</td>
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<td>1970</td>
<td>0</td>
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<td>1986</td>
<td>0</td>
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<td>2000</td>
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</tr>
<tr>
<td>2025</td>
<td>0</td>
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</table>
Water Challenges in Egypt

- Limited water resources (Nile, non-renewable groundwater, rainfall, …)
- Population increase and demographic distribution
- Water quality degradation
- Costs for new projects and O&M are escalating dramatically
- Lack of awareness and need for more coordination between different stakeholders
- Lack of efficient water supply and sanitation
- More than 90% of water supply of Egypt comes from outside its borders
Water Quality Deterioration

- Pollution caused by fast growing cities and industries
- Insufficient wastewater treatment facilities
- Lack of awareness
Main Themes of National Water Policy:

• Optimization of the Current Available Water Resources

• Water Resources Protection and Pollution Mitigation

• Development of Additional Water Resources (NBI)
Water Allocation features

- Water Requirements are determined on biweekly basis
- Releases from Aswan Dam to meet the requirements
- Operation of Barrages/Storage
  - upstream water levels for hydropower generation and water storage
  - downstream water level for water requirements and navigation
  - Head difference on gates to sustain the flow and structure stability
- Lag time
- Priorities of allocations
- Response to changes in weather/crop calendar
10^6 records include water levels, discharge, and rainfall.
Telemetry Locations

- **34,000** km of Irrigation network
- **19,000** km of Drainage network
- **1570** pump stations
- **22,000** constructions include barrages, bridges, etc.

*130 working telemetry remote sites out of 1000*
National Water Quality Monitoring Program
Monitoring Sites in the Delta

- 48 sites on irrigation canal
- 115 sites on drains
Groundwater Quality Monitoring Network
Main Information Center
Rice Cultivated Area (2014 – 1.47 million feddan)
Water Requirement
Violation on Domiat Branch 2014 - 2004

<table>
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<tr>
<th>Number</th>
<th>Area</th>
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<tr>
<td>3587</td>
<td>No</td>
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<tr>
<td>943.7</td>
<td>Area</td>
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Fish Farms

<table>
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<tr>
<th>Area</th>
<th>Description</th>
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<tbody>
<tr>
<td>860,000 feddan</td>
<td>Swamps</td>
</tr>
<tr>
<td>1,800,000 feddan</td>
<td>Lake</td>
</tr>
<tr>
<td>200,000 feddan</td>
<td>Fish Farms</td>
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</table>
Forecasting Nile Flood
Joint research project, Assessment of potential aquifers groundwater
Research Approach and Methodology (Modeling)

Water Evaluation And Planning

◊ Calculates water demand, supply, runoff, infiltration, crop requirements, flows, and storage, and pollution generation, treatment, discharge and instream water quality under varying hydrologic and policy scenarios.
Research Approach and Methodology (Modeling)

- The General Algebraic Modeling System (GAMS) is a high-level modeling system for mathematical programming and optimization. GAMS is tailored for complex, large scale modeling applications, and allows you to build large maintainable models that can be adapted quickly to new situations.

Egypt Agricultural Model

This model was used to analyze the current and future demands for irrigation water and to formulate investment programs in the water sector of Egypt.
Thank You

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05-Oct-2016
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