Creating Shared National Water Data Management Systems towards a Mediterranean Water Knowledge Hub

Technical workshop on integrated water resources management (IWRM) indicators

Sep 30th - Oct 1st 2013, Barcelona

IWRM Framework & Water Management System

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MEW & IWRM Planning in Lebanon
Progress & achievements

- IWRM concepts and approaches have been introduced in Lebanon in the late 90s and have inspired:
  - Gathering political will and support for IWRM and the planning process;
  - Creation of a framework for broad stakeholder participation
- Preparation of the National Water Sector Strategy (NWSS) aligns with IWRM principles (approved March 2012)
- MED EUWI Country Policy Dialogue on IWRM in Lebanon (Phase I - concluded in 2009; Phase II (2010 - ongoing)
MEW & IWRM Planning in Lebanon Progress & achievements (2)

- The Water Code - a cooperation programme between the Lebanese and the French Government
  - Aims to tackle and recommends provisions for the implementation of sustainable management of water resources
  - Following a comprehensive and integrated framework for governance, institutional and management issues

- The Water Code has been submitted to the Council of Ministers for approval.
IWRM Conceptual Framework (MEW Lebanon)

Data Inventory (Assimilation)
Hydrology, watershed physical and physiographic, climatic, water use/demand, water quality, water systems, agriculture, land use/cover, socio-economic, etc

Legislative Framework
Laws, Policies, Legislations, Regulations

Decision Support System (DSS)
Modeling / Analysis (e.g. WEAP)
Analysis (Spatial, GIS)

Database (Spatial and temporal)

Acceptance
Institutional Framework
Institutions, public involvement, NGO’s, etc

Feedback
Communication

Endorsement

Planning, Management, Decision Making
Planning: MEW, CDR, LRA, MOA, Stakeholders...
Investment: (CDR, MEW, MOF...)
Operation: (WE, LRA, Municipalities...)

Monitoring System
(MEW, WE, LRA, MOE, MOA)
Insights (Data/ Information)

- Collection of available data
  - analysis of water resources situation (availability, uses, needs, etc);
- Preparation of integrated water resources management scenarios:
  - base for decision-making
  - creation and operation of a DSS model for selected Lebanese river basins;
- The DSS maximizes information retrieval, analysis and visualisation
  - Integration of the needs of different sectors that compete for the same water resources (e.g. drinking water sectors, supply and sanitation, industry, agriculture, tourism, the environment, etc)
  - Development of water uses scenarios and resources development, presenting different alternatives and the assessment of these scenarios on their social, economic, environmental and sustainability aspects.
## Available Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Reference</th>
<th>Format</th>
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</thead>
<tbody>
<tr>
<td><strong>Watershed physical characteristics</strong></td>
<td></td>
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<tr>
<td>Watershed area</td>
<td>sq km</td>
<td>Catchment, Sub-catchment</td>
<td>Geometry, Attributes</td>
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<tr>
<td>Rivers, streams, springs</td>
<td>Variable</td>
<td>River / RS</td>
<td>Geometry, time series</td>
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<tr>
<td>Lakes</td>
<td>Variable</td>
<td>Base Maps/ RS</td>
<td>Geometry, time series</td>
</tr>
<tr>
<td>Dams</td>
<td>Variable</td>
<td>Base maps</td>
<td>Geometry, time series</td>
</tr>
<tr>
<td>Wells</td>
<td>Variable</td>
<td>Extraction points</td>
<td>Geometry, time series</td>
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<tr>
<td><strong>Watershed physiographic characteristics</strong></td>
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<tr>
<td>Kc, RRF, PFD</td>
<td>-</td>
<td>Land cover/Topography</td>
<td>Geometry, Attributes</td>
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<tr>
<td>Water capacity/ Conductivity (surface &amp; deep)</td>
<td>Cm, mm/month</td>
<td>Soil / Geology/Hydrogeology</td>
<td>Geometry, Attributes</td>
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<tr>
<td><strong>Ground water</strong></td>
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<tr>
<td>Aquifer capacity</td>
<td>MCM</td>
<td>Geology/Hydrogeology</td>
<td>Geometry, Attributes</td>
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<td>Aquifer conductivity</td>
<td>mm/month</td>
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<td>Aquifer depth</td>
<td>m</td>
<td>Hydrogeologic maps</td>
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<td><strong>Climate</strong></td>
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<tr>
<td>Precipitation</td>
<td>mm/month</td>
<td>Hydro/Climatic stations</td>
<td>Time series</td>
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<tr>
<td>ET/ Evaporation</td>
<td>mm/month</td>
<td>Catchment</td>
<td>Time series</td>
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<td>°C</td>
<td>Catchment</td>
<td>Time series</td>
</tr>
<tr>
<td>Wind</td>
<td>m/s</td>
<td>Catchment</td>
<td>Time series</td>
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<tr>
<td>Humidity</td>
<td>%</td>
<td>Catchment</td>
<td>Time series</td>
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<tr>
<td><strong>Water Use</strong></td>
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<tr>
<td>Crop water requirement, Urban consumption…</td>
<td>M3/ha</td>
<td>Demand zone</td>
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<td>Capacity, operation</td>
<td>Water dataset</td>
<td>Attributes</td>
</tr>
<tr>
<td>Lake, dams</td>
<td>Capacity, operation</td>
<td>Water dataset</td>
<td>Attributes</td>
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<tr>
<td>Supply network</td>
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From data to Information

DSS

Components

Hydrology

Water Resources

Scenarios

Water Quality

Economy

Indicators

Precipitation, ET, Temperature

Flow, Infiltration, Recharge

Water use/demand/supply

Future/Climate projections

Physical, chemical, biological

Water pricing

Analysis

Meteorology

Hydrology

Water resources

Integrated

Provisional

Provisional
Evaluation of alternatives?

- Answer questions related to:
  - Water quantity
    - How to decrease water deficit in specific areas?
    - Increase water use efficiency for urban consumption?
    - Increase water efficiency in agricultural practices?
    - Decrease water shortage during summer and dry periods?
  - Water quality (Provisional)
    - Quantify point source and non-point sources pollution? waste water impacts
    - Quantify urban, industrial waste water impacts?
    - How to increase water quality for urban and agricultural supply?
Evaluation of Measures (Provisional)

- Interventions to increase water quantity
  - structural, non-structural actions
  - Change in management practices
- Interventions to increase water quality
  - Construct Infrastructures
  - Change in management practices
- Intervention by using regulations and policies
Where we stand from a complete IWRM?

- **For surface water:**
  - Mapping of the location and boundaries of water resources (e.g. watersheds, rivers, streams, wells, etc);
  - Assessing climate and hydrologic variables;
  - Assessing physiographic and physical hydrologic variables;
  - Detection of baseline conditions for surface water resource (i.e. hydrologic cycle)

- **For groundwater:**
  - Mapping of the location and boundaries of groundwater resources (i.e. geologic, and hydrogeological analysis);
  - Detection of baseline conditions for ground water resource

- **Scenario analysis**
  - Water resource management, operations, and planning
  - Climate variability and change analysis
  - Stakeholder consultations / water users contribution

<table>
<thead>
<tr>
<th>Completed</th>
<th>Ongoing</th>
<th>Planned</th>
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</table>
Where we stand from a complete IWRM? (2)

- Preparation of a summary of significant pressures and impact related to human activity on the status of surface water and groundwater including:
  - estimation of pressures on the quantitative status of water including abstractions,
  - analysis of other impacts related to human activities on the water system;
  - estimation of point source pollution,
  - estimation of diffuse source pollution
- Identification of direct stresses and main drivers:
  - Water shortage
  - Natural (e.g. drought),
  - Man-made (e.g. pollution)
  - Social, capital, etc
- Identification of indirect impacts
  - Human health, overexploitation of resources, degradation of ecosystems
- Recognizing of long-term potential impacts
  - cultural deterioration, land degradation, loss of biodiversity
- Preparation of a socio-economic analysis of water use

Completed    Ongoing    Planned
Where we stand from a complete IWRM? (3)

- Defining the main environmental objectives
- Preparation of key potential programs and measures
  - Achieve adequate management of water resources (both as Quantity & Quality)
- Development of a management plan
Future Directives (Indicators)

- Continue the assessment of the status of surface and ground water resources nationwide
- Automation of the collection and analysis of:
  - Hydrologic and meteorologic data/information
  - Water resources information
  - Water quality and pollution indicators
  - Agricultural water management

- Development and monitoring of water plans
  - 5 years and 10 years plans
MEW (IWRM Priorities)

- Involve stakeholder participation in decision making
  - Development of Multiple Workshops & Trainings
- Complete stakeholder needs assessment
- Develop Water Resource Management Plan
  - Develop a set of programs and measures
  - Develop a comprehensive monitoring plan
Data Sharing

- Outputs from the DSS and data from the MEW database:
  - Provide information:
    - Water demand/analysis
    - Hydrologic simulations (e.g. surface runoff, ground water recharge, ET, GW/SW interaction, etc)
    - Reservoir (dam) operation
    - Water demand/use and hydrologic forecasts
    - Climate change impact analysis