Enhancing Regional Cooperation for Policy-Making on the Water-Energy Nexus

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21 February 2013
Topics

I. WATER AND ENERGY LINKAGES

II. REGIONAL SPECIFICITIES

III. REGIONAL MAPPING OF WATER-ENERGY LINKAGES

IV. PROSPECTS FOR POLICY-MAKING ON THE WATER-ENERGY NEXUS IN THE REGION

V. NEXT STEPS
I. WATER AND ENERGY LINKAGES

**Energy Consumption for Water**
- To Extract Groundwater
- To Power Desalination processes
- To Power water pumps and purification Systems
- To Power Wastewater Treatment Plants

**Water Consumption for Energy**
- Fossil fuel production and processing
- Energy production
- Renewable Energy production
- Operating hydropower plants

**Water and Energy Linkages**
Arab countries face mounting challenges in the water and energy sectors because of:

- Water scarcity
- Arid/Semi-arid climate
- Pollution and water quality concerns
- Climate change and climate variability

There is a need for a new, comprehensive and systematic methodology to approach the water and energy nexus in a sustainable way.
Setting Priority Issues

Based on regional specificity and priority needs

Defining and Evaluation of Criteria

Economical Impacts
Social Impacts
Environmental Impacts
Development Rights Issues
Human Rights Issues
Security Issues

Priority ranking

Multicriteria Analysis

1- Building the Performance Matrix
2- Setting Weights
3- Applying a MC analysis method
Available data on Aquastat - FAO for the 22 Arab countries

- Total groundwater withdrawal = 46436 (Million m³/year)
- Total desalinated water produced = 3285 (Million m³/year)
- Total fresh surface water withdrawal = 16557 (Million m³/year)

Assumptions:
- Assume the average depth of groundwater withdrawal = 100 m and assume the energy required to lift a vertical distance of 100 meters = 0.36 kWh/m³
- Assume the average energy required for desalination = 20 kWh/m³
- No available data to draw assumptions

Energy consumption (Million kWh/year):
- 16717
- 65700

Assume the average cost of 1kwh = 15 cents

Energy cost (US $/year):
- $2.5 Billion/year
- $9.8 Billion/year
Results of research show that heavy producers of fossil fuels and biofuels demonstrate greater intensity of energy-based water consumption.

Understanding the water demand of energy systems is essential to national water security since the production of energy requires considerable quantities of freshwater.

Despite not being able to verify the accuracy of the data that were adopted in this study, but it can be used for guidance.


There are no data sources to draw Scenarios of the regional water consumption for energy production.
ESCWA: Inter-governmental Consultation

Objective of the Meeting:

Provide inter-governmental forum for identifying and prioritizing future work on the water-energy nexus.

ESCWA prepared a questionnaire on Water and Energy Nexus in order to gather background information on the identified issues for discussion during the meeting, as well as the challenges characterizing countries of the Region. The questionnaire is composed of two parts:

Part (A) addresses the institutional and organizational aspects.

Part (B) focuses on technical and statistical data.
Findings from questionnaires:

A- The institutional and organizational aspects

Lack of institutional mechanisms for dealing with the water-energy nexus stakes in the ESCWA region and member countries.

B- The technical aspects (statistical data)

On water production and purification

- The rate of energy consumption in surface water applications and for producing water using underground extraction processes were not available;

- Future trends in ensuring the required amount of water would rely on sea water desalination, one of the highest energy-consuming sources;

- Future trends in operations of water production and purification would rely on the private sector.
B- The technical aspects (statistical data)

On water transmission and distribution

Current estimated ratios of water leaks in transmission and distribution networks were higher than best practice ratios, but future trends would be to reduce those ratios, which would necessarily lead to the reduction of the rate of energy consumption.

The current rate of energy consumption in water transmission and distribution networks varied in member countries from 0.5 to 2 kWh per m³.

The questionnaire showed the need to monitor and organize the energy consumption linked to water transmission and distribution, with a view to reducing its costs to a minimum.

On sanitation

The rate of energy consumption in sewerage networks was higher than the best practice figures.

Wastewater treatment plants mostly used aerobic technologies, whereas the climate in the region encouraged the use of anaerobic technologies.

Energy recovered from wastewater treatment plants was almost inexistent, whereas the best practice rate was around 0.1 kWh per m³.
IV PROSPECTS FOR POLICY-MAKING ON THE WATER-ENERGY NEXUS IN THE REGION

The issues raised during the Intergovernmental Consultation on the Water-Energy Nexus (Beirut, 27-28 June 2012)

- Self-Assessment of national capacities and natural resource endowments
- Knowledge Mapping (literature review) on data availability and research work on water-energy nexus in the ESCWA Region, including best practices
- Identifying indicators for monitoring (with regular reporting on the indicators by the countries reported to the committees)
- Sharing experiences and data between ESCWA countries

Identification of Priority Areas

- Increasing knowledge & awareness raising
- Increasing policy coherence
- Water-energy

Institutional Coordination
- Assessing trade-offs between competing demands

Balancing water security and energy security
The issues raised during the Intergovernmental Consultation on the Water-Energy Nexus (Beirut, 27-28 June 2012)

- Mapping water and energy losses and inefficiencies
- Optimizing resource use, reducing losses, rationalization
- Conservation, demand side management
- Privatization

Identification of Priority Areas

Increasing efficiency

- Assessing the cost and feasibility of different technology choices

Informing technology choices

- Promoting renewable energy

Climate change and natural disasters

- Increase Renewable Energy Use
- Renewable Energy Applications

Mitigation and Adaptation
IV PROSPECTS FOR POLICY-MAKING ON THE WATER-ENERGY NEXUS IN THE REGION

Setting Priority Issues

Increasing knowledge & awareness raising
Increasing policy coherence
Water-energy security
Increasing efficiency
Informing technology choices
Promoting renewable energy
Climate change and natural disasters

Defining and Evaluation of Criteria

Preference model

Priority ranking

Multicriteria Analysis
1- Building the Performance Matrix
2- Setting Weights
3- Applying a MC analysis method
Participants should assign ranks to the seven priorities for future activities in the water-energy nexus field, which were agreed upon during the meeting. They should discuss their priority ranking with stakeholders in their countries, with a view to reflecting the official national position.

**Preference model:**

- 3: would be assigned to an issue of great importance
- 2: to an issue of average importance
- 1: to an issue of limited importance

### Performance Matrix

<table>
<thead>
<tr>
<th>Priority Issues</th>
<th>Of great importance (3)</th>
<th>Of average importance (2)</th>
<th>Of limited importance (1)</th>
<th>Total</th>
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<tbody>
<tr>
<td>Increasing knowledge and awareness raising</td>
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<td>Increase policy coherence</td>
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<td>Improving efficiency</td>
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IV PROSPECTS FOR POLICY-MAKING ON THE WATER-ENERGY NEXUS IN THE REGION

Setting Priority Issues

Defining and Evaluation of Criteria

Priority ranking

<table>
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<tr>
<th>Priority Issues</th>
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<th>Priority rank</th>
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<td>Improving efficiency</td>
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<td>Climate change and natural disasters</td>
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</table>
ESCWA is examining the water and energy nexus in the region and helping to fill knowledge gaps through research and intergovernmental processes.

The Water-Energy-Food nexus will be the subject of the ESCWA Water Development Report 6 in (2015).

The Water and Energy Nexus priority issues in the ESCWA Region will be followed up during the next ESCWA “Committee on Energy” meeting in March 2013.

The Water and Energy Nexus priority issues in the ESCWA Region will be followed up during the next ESCWA “Committee on Water Resources” meeting in April 2013.

“Developing the capacity of ESCWA member countries to address the water and energy nexus for achieving sustainable development goals” will start in 2015 (financed by UN Development Account Project for a total budget of USD 525000).

Global deliberation on the Sustainable Development Goals will have water and energy monitoring and reporting targets.
Thank you!