Training workshop: “Integration of Water- Agriculture Sectors: Concepts and Applications”

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The WEF Nexus Project/ ACCWaM Programme

GIZ aimed to mainstream the Nexus approach in the Arab region to policies and institutions, to better link existing sectoral strategies, policies and activities and to contribute to cross-sectoral goals such as SDGs and integrated climate change adaptation and mitigation.

The WEF Nexus Project:

• Regional level: Facilitate a process of developing a roadmap to harmonize regional sectoral strategies in an integrated approach towards WEF security and sustainable development in the Arab region, through LAS ministerial councils.

• National level: Identify entry points, processes and partners for increased coordination and cooperation of national (sectoral) policies and institutions in Egypt and Jordan, to harvest synergies and address trade-offs across the WEF Nexus.

Final Report
Mainstreaming the Water-Energy-Food Security Nexus into Sectoral Policies and Institutions in the Arab Region
Mainstreaming the WEF Nexus through consultation of national stakeholders and a Nexus stakeholder workshop. Recommendations were validated in a regional workshop under the auspices of LAS in April 2017.
Identification of critical trends & interlinkages

- critical interlinkages between water and energy security
- critical interlinkages between water and food security
- critical interlinkages between energy and food security
Priority WEF Nexus Inter-linkages in Egypt

- Water use for food production
- Energy use for treatment and conveyance of water
Most critical inter-linkages in Egypt (W-F)

- **Agricultural sector is the largest user of water resources**: 80% of the total water needs.
- Limited food self-sufficiency levels by scarce water resources (*50- 60% of food is imported*).
- In-efficient irrigation techniques
- Over-use of ground water.
- Government plans for a **20% expansion of current agricultural land** to increase food security is limited by existing water resources (mainly the Nile).
- Most of the land reclamation projects are in desert areas, often **irrigated with fossil groundwater** only provides an unsustainable and a short-term solution.
Critical inter-linkages in Egypt (W-F)

Options to address the interlinkages between water scarcity and food production:

- Increase water-use **efficiency in irrigation**, adopt sustainable agricultural practices and promote cultivation of **non-water intensive crop** varieties
  
  Vision 2030: reduce production of water intensive crops, such as rice, switch from flood irrigation to modern irrigation systems and promote efficiency in agricultural practices.

- Provide appropriate **incentives and reduce subsidies** to promote efficient use of water in irrigation. Agricultural subsidies continue to dominate the sector in the form of almost cost free water.

- Promoting **reuse of treated wastewater** for agriculture use and desalinated water initially for drinking purposes and for other economic activities if proven economically feasible.
  
  Vision 2030: increase the share of unconventional water sources from 20% today to 40% by 2030).
Critical inter-linkages in Egypt (W-E)

Energy use for water treatment & conveyance

Water sector requires large amounts of water

- There exists no land in Egypt that is irrigated without the need to lift water from waterways and ground water, except in Aswan and Fayoum.

- There are around 1,500 water lifting plants in Egypt, which are energy intensive installations, requiring costly fuel.

- Efforts to increase water supply in the future through desalination and wastewater reuse will require additional energy as well as for pumping and distribution of obtained water to the location of their use.
Options to increase energy-efficiency in the water sector:

- Using **renewable energy for irrigation systems** in Egypt, whether for pumping ground water or for the operation of generators used for lifting water from waterways.

- Using the **energy potential of biogas and bio-solids** in wastewater treatment plants to offset the energy needs of these plants.

- Promoting the use or **renewable energy for desalination**.
Critical inter-linkages in Egypt

(W- E) Water use for power generation

Additional water demand from energy sector; New power generation systems (renewables such as solar power) are often more water intensive than conventional systems.

Plans to increase use of RE and nuclear energy, can be water intensive.

(E-F) Energy use for agriculture

Agricultural intensification and expansion require additional energy, e.g. for machinery, fertilizer, water pumping.
Tradeoffs and risks related to silo approaches in EGYPT

Energy Security

- Additional water demand for power generation (some renewable energy and nuclear energy)
- Additional energy demand with increase in non-conventional water sources (desalination, wastewater, long-distance transfers)

Growing demand in one sector -> risks to other sectors and resources

Low efficiencies in the use of one resource -> negative impacts on other resource

Food Security

- Overuse of groundwater
- Plans to expand irrigated lands exacerbate already scarce water resources

Water Security

- Additional energy demand for agricultural intensification and expansion, e.g. water pumping, operating machinery, fertilizer input
- Additional water demand for power generation (some renewable energy and nuclear energy)
Opportunities from a Nexus Approach in Egypt

Energy Security
- Appropriate financial incentives and reduction of subsidies (fertilizers, pesticides efficiency)
- Desalination increases national water supply
- Coupling wastewater reuse and energy recovery
- Re-use of treated wastewater recycles nutrients and reduces energy intensive fertilizers

Food Security
- Renewable energy for irrigation systems (e.g. solar pumping)
- Energy potential of agricultural residues
- Water Efficiency improvement in agricultural sector with 60% knock on effect for energy savings
- Appropriate incentives and reduction of subsidies (water efficiency)

Water Security
- > Exploring synergies
- > Reducing tradeoffs

Water Efficiency improvement in agricultural sector with 60% knock on effect for energy savings
The quantitative evidence base: (cross-) resource flows (Egypt) is incomplete

Supply
- Nilewater (87.3%)
- Groundwater (4.2%)
- Effective rain (1.9%)
- Desalination (0.3%)

Demand
- Crop consumptive use (65.5%)
- Drainage to sinks/sea (30.8%)
- Environmental outflow (5.0%)
- Evaporation losses (5.0%)
- Energy (?!)
- Net use municipal (6.0%)
- Net use undustrial (0.7%)

Virtual water exports

Source: ASME, estimated figures 2015
The quantitative evidence base: (cross-) resource flows (Egypt) is incomplete.

Flow diagram needs to be made dynamic (by way of trend & scenario analyses)


12/23/2019
Our participatory Nexus approach

1) identification of critical trends & interlinkages

2) mapping of institutions onto these interlinkages, identifying entry points for mainstreaming

3) focus on existing institutions first

4) proposing new nexus institutions as necessary

how to operationalize and apply the nexus?
## Mapping existing institutions onto these critical interlinkages

<table>
<thead>
<tr>
<th>Interlinkages</th>
<th>Relevant institutions</th>
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<tbody>
<tr>
<td>Energy use for water</td>
<td>• Ministry of Water / Energy</td>
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<td></td>
<td>• ……</td>
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<tr>
<td>Water use for food</td>
<td>• Ministry of Water / Agriculture / Planning</td>
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<td></td>
<td>• ……</td>
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</tbody>
</table>
Mapping strategies and planning processes onto these critical interlinkages - see country presentations

<table>
<thead>
<tr>
<th>Policy/plan</th>
<th>Lead institution</th>
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<tbody>
<tr>
<td>The National Water/Energy/Agriculture Strategy</td>
<td>Ministry of Water/Energy/Agriculture &amp;…….</td>
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<tr>
<td>SDG Implementation</td>
<td>Ministry of Environment / Planning &amp;…….</td>
</tr>
<tr>
<td>Paris Climate Agreement / NDC implementation</td>
<td>Ministry of Environment &amp;…….</td>
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</table>
A nexus approach for institutional coordination and policy coherence

- Energy Security
  - e.g. Ministry of Energy
  - e.g. National Water Strategy

- Water Security
  - Cross-sectoral Committees (e.g. for Sustainable Dev. or Climate Change)
  - e.g. Ministry of Planning
  - e.g. Prime Minister’s delivery unit Vision 2025

- Food Security
  - e.g. Ministry of Agriculture
  - e.g. Agricultural Strategy
  - e.g. Ministry of Water

- Multi-sectoral committee to be mandated for mainstreaming WEF nexus ?!
- Line ministries

Multi-sectoral committees are crucial for coordinating energy, water, and food security policies, ensuring coherence and efficient resource management.
Mapping WEF Nexus in existing Institutions in Egypt

<table>
<thead>
<tr>
<th>Interlinkages</th>
<th>Related institutions</th>
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<tr>
<td>Energy use for water treatment and conveyance</td>
<td>• Ministry of Water Resources and Irrigation (MWRI)</td>
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<td></td>
<td>• The Holding Company for Water and Wastewater (HCWW)</td>
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<tr>
<td></td>
<td>• Ministry of Housing, Utilities and Urban Development (MHUUD)</td>
</tr>
<tr>
<td></td>
<td>• Ministry of Electricity and Renewable Energy (MERE)</td>
</tr>
<tr>
<td></td>
<td>• Supreme Council on Energy</td>
</tr>
<tr>
<td></td>
<td>• Egyptian Electricity Holding Company</td>
</tr>
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</tbody>
</table>
A Nexus approach for institutional coordination and policy coherence

Ministry of Water (MWRI)
Ministry of Electricity and Renewable Energy (MERE)
Ministry of Petroleum
Energy Security

Ministry of Planning and Administrative Reform (MPAR)
Ministry of International Cooperation (MIC)
Ministry of Agriculture and Land Reclamation (MALR)
Food Security

Ministry of Petroleum
Ministry of Electricity and Renewable Energy (MERE)
Ministry of Water (MWRI)

High-Level Ministerial Committee (HLMC)
Nat. Committee to follow up on the implementation of SDGs
Nat. Committee for Climate Change

Sustainable Development Strategy 2016
Higher Council for Sustainable Development (HCSD)

Nat. Committee to follow up on the implementation of WEF nexus

Multi-sectoral committee to be mandated for mainstreaming WEF nexus

Line ministries
Mainstreaming WEF Nexus into Policies and Strategies - Entry Points

1. Within existing coordination mechanisms:

2. Within ongoing sustainable development process.

3. Within existing sectoral and cross-sectoral planning processes.

4. Within a new coordination mechanism.
Need for more policy coherence

Coordination across sectoral ministries (and other agencies) in setting development goals, strategies, & legal frameworks should be enhanced

- **MWRI** responsible for water resources management, including for agricultural irrigation, other sectors, and municipal water - need to consider energy & agriculture requirements

- **MALR** responsible for agricultural development, including selection of crops and land reclamation, decisions needs to take into account water and energy requirements

- **MERE** responsible for supplying sufficient energy to various sectors - needs to be better involve in decision making in other sectors
Mainstreaming WEF Nexus into policies and strategies
Entry point 1: existing coordination mechanism (1)

Entry point: existing intersectoral mechanisms could be mandated to adopt a WEF Nexus perspective in their planning and strategy development processes, promoting cross-sectoral synergies and preventing trade-offs

• **High Level Ministerial Committee (HLMC) on Water**
  
  • Development of a national water strategy in Egypt was initiated in 1996 with the participation of nine ministries, {Ministry of Electricity and Renewable Energy (MERE) was not included}, who met every two months for the purpose
  
  • **HLMC** on water was created in 2005 to follow up on the Plan, headed by the MWRI and co-chaired by one of the nine ministers
  
  • Functions through a technical committee and **Water Resources Units created in the nine ministries to support coordination**
Mainstreaming WEF Nexus into policies and strategies
Entry point 1: existing coordination mechanism (2)

National Committee for Climate Change responsible for preparing and up-dating national strategy for climate change.

- Headed by MoE and including representatives from relevant ministries
- Aims to ensure the integration of climate change in sectoral policies

National Committee to follow up on and coordinate implementation of the SDGs

- Under the direct supervision of the Prime Minister, led by Ministry of International Cooperation (MIC) and Ministry of Planning and Administrative Reform (MPAR)
- Further includes Ministries of: Environment; Social Solidarity; Local Development; Higher Education and Research; Health; Housing, Utilities, and Urban Communities; and Education and Technical education

Most Critical Interlinkages between water and food security in Egypt
Mainstreaming WEF Nexus into policies and strategies
Entry point 1: existing coordination mechanism (2)
Mainstreaming WEF Nexus into policies and strategies
Entry point 2: on-going sustainable development process

*Egypt’s Vision 2030*, launched in 2016, strategy development was coordinated by the Ministry of Planning and Administrative Reform (MPAR) and followed a consultative process engaging all ministries and relevant stakeholders.

Foresees establishing a **Higher Council for Sustainable Development (HCSD) attached to the Prime Minister’s office**; coordinated by MPAR and MoE.

- HCSD entrusted with coordination and oversight of work of sectoral ministries towards SD, development of economic instruments and market policies to support SD, monitoring and evaluation of achievements.

- **HCSD could be mandated to put special focus on a WEF Nexus perspective**; e.g. through subcommittees or special entities;

- additionally each ministry should apply the Nexus approach by **assigning the planning department within the ministry the responsibility of coordinating** with other sectors;

- Moreover, a Civil Society Council including representatives of the WEF sectors may be created to bring in a cross-sectoral perspective.
Mainstreaming WEF Nexus into policies and strategies
Entry point 3: existing sectoral & cross-sectoral planning processes

Institutional and policy reforms for water resources management

- Egypt’s Vision 2030 foresees strengthening the institutional & legislative structure of the water resources management system, by re-identifying the roles of the sector’s governing agencies & drafting the necessary legislation, including the use of economic instruments.
- MWRI main responsible ministry - to further involve ministries responsible for agriculture, energy, sewerage. Can build on High Level Ministerial Committee (HLMC) on Water.

Reforming current legislative framework & subsidization system in the energy sector

- Egypt’s energy sector is currently in a process of reform. MERE has recently finalized a strategy, which has been endorsed by the Supreme Council of Energy.
- Action planning to implement the strategies provides opportunities for coordination of measures across the WEF nexus sectors and setting sector-specific energy-related targets

Promoting sustainable agricultural practices that reduces water and energy use & increases output

- Subsidy reform, and a package of incentive and regulatory reforms to promote sustainable agriculture.
- Development of rural communities – physical, social and environmental services
Mainstreaming a WEF Nexus perspective in Egypt can be supported by monitoring and evaluation (M&E) of cross sectoral interlinkages through indicators, such as

- Measuring the **efficiency** and **cost-effectiveness** of the use of different sources of water taking into account the energy requirements and production costs involved

- **Indicators related to the agriculture and water sectors in the strategic plan for renewable energy** in order to promote coordination between the three sectors and ensure energy efficiency in the production of water, food, as well as electricity (energy requirement per unit of water, food, as well as electricity production in KW/hr)

- Measuring **crop productivity per water (and energy) input** with a view of increasing it

- Measuring **trends in the reuse of treated wastewater in the agriculture sector** with a view of supporting efficient use of water resources, possibly also including the rate of energy recovery from sewage sludge
Capacity needs assessment: Information management

Ensure harmonized baseline information for the critical WEF interlinkages are in place

- Central Agency for Public Mobilization and Statistics (CAPMAS) is the main government body entrusted with data gathering and analysis, but sectoral ministries also gather and analyse data.

- Critical interlinkages between water, energy and agriculture/food and with other sectors should be actively addressed in data analysis and modelling exercises.

- CAPMAS could also build an integrated database for the water, food/agriculture, and energy (and environment) Nexus.
Capacity needs assessment: **Technical capacities**

Strengthen technical know-how of concerned staff at the line ministries and other stakeholders related to WEF Nexus interlinkages

- **review curricula of the different disciplines** in order to integrate the environmental and social dimensions across sectors, ensure coordination and integration between different sectors, and introduces and operationalizes the water, energy, agriculture/food nexus

- **strengthen research and development capacities** in support of integrated WEF nexus approaches, support collaboration of sectoral research centers
Capacity needs assessment: Communication and outreach

Strengthen communication and outreach as an important pillar for raising awareness of policy makers on WEF Nexus interlinkages

➢ Raise awareness on

▪ Socioeconomic aspects of the WEF Nexus, importance for improving livelihoods and eradicating poverty

▪ Positive effects of a WEF Nexus perspective for environmental sustainability and resource efficiency, combating land degradation and reducing vulnerability to climate change
Challenges Faced

1. “Sector silos”: different institutions are in charge of water, energy and agriculture policies.

2. Trade-offs: diverging interests among actors.

3. Limited experience in Nexus implementation: The Nexus perspective is a new concept

4. Insufficient knowledge of Nexus dynamics on the national and regional levels.

5. Lack of a comprehensive data base on Nexus experts.
Lessons Learnt

- Nexus mainstreaming can only be achieved through participatory approaches.
- Besides “horizontal” integration across sectors, “vertical” integration across levels and scales is equally important.
- Water sector leading the Nexus mainstreaming process, may make other sectors (energy and agriculture) less interested.
- The Nexus approach provides excellent opportunities for cross-country sharing of technical, economic and institutional innovations, providing opportunities for regional cooperation and economic integration.
- Demonstration of success stories and quantification of financial gains from Nexus approach is the best buy in for policy makers.
Lessons Learnt

- Small size PPP could be an entry point to make WEF Nexus a business case - Awareness and incentives should be created among private investors for WEF Nexus projects.

- Private sector in MENA is active in the energy sector and could be the entry point for implementing WEF Nexus projects.

- Financial institutions lack knowledge on Nexus yet ready to be involved in Nexus projects: capacity building and Nexus examples are needed.

- Policy-related activities; cross-ministerial Nexus processes should be complemented with Nexus projects demonstrating benefits for all stakeholders to create acceptance for institutional changes.
Thank you for your attention