NBI Groundwater Project

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Project title: Enhancing conjunctive management of surface and groundwater resources in selected trans-boundary aquifers

case study for selected shared groundwater bodies in the Nile basin
Groundwater in NBI countries

Current situation:
More than 60% of the rural population uses groundwater for domestic uses, irrigation and watering of animals.
More Than 70% of the NB countries population are living in rural areas and mostly depending on subsistence agriculture for food supply.
GW is the only consistent source of water for many communities outside the Nile valley.
Most of the drilled wells in rural areas are traditionally constructed and mostly has no records of abstraction quality or quantity.
Current Prevalent Uses of Groundwater

- Domestic Water Supply
- Watering of Livestock
- Irrigation
- Industrial Water Supply
Use of Groundwater for Domestic Water Supply

Groundwater provides 80% of the domestic water supply in urban and rural settlements

- Provision of the water at the point of use thus eliminating the cost of conveyance from surface water sources.
- Provision of clean water not requiring treatment prior to consumption.
- Short construction time.
Factors Hampering the Development of Groundwater Resources

The spread of groundwater development in the Nile Basin particularly for irrigation was historically hampered by a number of factors.
Factors Hampering the Development of Groundwater Resources

- The high initial cost of investment and the alternative opportunity for the investment capital.
- The relatively high cost of operation.
- Logistical challenges thwarting the effective operation of the deep boreholes (e.g., fuel delivery, reliable power supply)
- Shortage of well-trained operation and maintenance service providers.
- Lack of sufficient knowledge about the underlying aquifer formation.
- Absence of aquifer development and management plans.
Strain on the surface water resources to meet increasing water demand for agriculture industry and domestic supply is increasingly driving communities and governing bodies towards the development of groundwater resources.

Factors Fostering the Development of Groundwater Resources

Strain on the surface water resources to meet increasing water demand for agriculture industry and domestic supply is increasingly driving communities and governing bodies towards the development of groundwater resources.
Factors Fostering the Development of Groundwater Resources

- Enhanced infrastructure.
- Improved groundwater development technologies and knowhow.
- Growing potential of using alternative renewable energy sources.
Transboundary Aquifers of Africa, with TBA codes. After: (IGRAC and UNESCO-IHP, 2015a).
The Nile Basin

11 countries
- Burundi
- D.R. Congo
- Egypt
- Eritrea
- Ethiopia
- Kenya
- Rwanda
- Sudan
- South Sudan
- Tanzania
- Uganda

- Longest river (6700 km),
- Area - 3.3 million km$^2$
- Diverse geographical, climatological and topographical regions
- Characterized by
  - High climatic diversity and variability,
  - Low percentage of rainfall reaching the main river
  - Uneven distribution of water resources.
  - High evaporation rates - vulnerable to drought and CC
## Tentative Aquifers from Nile Basin After IGRAC

<table>
<thead>
<tr>
<th>Aquifer Name</th>
<th>Countries</th>
<th>Total Aquifer Area (Km²)</th>
<th>Aquifer Area in the Nile Basin (Km²)</th>
<th>% area within Nile Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount Elgon Aquifer</td>
<td>Uganda, Kenya</td>
<td>5,398.32</td>
<td>4,579.49</td>
<td>85%</td>
</tr>
<tr>
<td>Gedaref</td>
<td>Ethiopia, Sudan</td>
<td>57,830.51</td>
<td>51,369.10</td>
<td>89%</td>
</tr>
<tr>
<td>Mereb</td>
<td>Ethiopia, Eritrea</td>
<td>38,752.68</td>
<td>27,210.24</td>
<td>70%</td>
</tr>
<tr>
<td>Rift Aquifer</td>
<td>Kenya, Tanzania</td>
<td>21,145.08</td>
<td>1,780.24</td>
<td>8%</td>
</tr>
<tr>
<td>Kagera Aquifer</td>
<td>Tanzania, Rwanda, Uganda</td>
<td>5,778.95</td>
<td>5,218.10</td>
<td>90%</td>
</tr>
<tr>
<td>Baggara Basin</td>
<td>Central African Republic, South Sudan, Sudan</td>
<td>239,876.71</td>
<td>196,127.11</td>
<td>82%</td>
</tr>
<tr>
<td>Coastal Aquifer Basin</td>
<td>Egypt, Israel, Palestinian Territory</td>
<td>23,338.14</td>
<td>11,72521552</td>
<td>0%</td>
</tr>
<tr>
<td>Karoo-Carbonate</td>
<td>Central African Republic, Congo, South Sudan</td>
<td>604,596.15</td>
<td>120,947.00</td>
<td>20%</td>
</tr>
<tr>
<td>Tanganyika</td>
<td>Burundi, Democratic Republic of the Congo,</td>
<td>184,594.89</td>
<td>2,279.49</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>Tanzania</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nubian Sandstone Aquifer System (NSAS)</td>
<td>Chad, Egypt, Libya, Sudan</td>
<td>2,892,867.48</td>
<td>567,344.75</td>
<td>20%</td>
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<tr>
<td>Aquifere du Rift</td>
<td>Democratic Republic of the Congo, South</td>
<td>44,632.12</td>
<td>30,023.07</td>
<td>67%</td>
</tr>
<tr>
<td>Sudd Basin</td>
<td>Ethiopia, Kenya, South Sudan</td>
<td>370,647.62</td>
<td>324,287.18</td>
<td>87%</td>
</tr>
</tbody>
</table>
Additional Obstacles to the Effective Development of Transboundary Aquifers

- Absence of institutional/regional coordination.
- Competing national development demands and priorities.
- Prevalence of sovereign unilateralism approach to resource management.
- Politics of reconciling international political borders with groundwater basin boundaries.
Proposed TB Aquifers

1 – Gadaref: Ethiopia – Sudan
2 – Mount elgon; Kenya – Uganda
3 - Kagera aquifer: Tanzania – Uganda
NBI Groundwater Project

Focus on selected aquifers rather than ‘basin wide’

- **Geographic coverage:**
  3 shared aquifers, Algedaref- Adagrat aquifer shared between Ethiopia and Sudan, Mt Elgon shared between Kenya and Uganda; and Kagera Aquifer shared among Burundi, Rwanda, Tanzania and Uganda

  **Budget 5.3 M USD**

  **Funding – Global Environment Facility (GEF)**
strengthening the overall water resources management nationally and basin-wide

• Project components:

  **Component 1:** Furthering knowledge and understanding about availability of groundwater resources in the Nile River Basin and its adjacent areas

  **Component 2:** Development of action plans on groundwater resources governance, management, and protection for inclusion in national, sub-basin and basin-wide

  **Component 3:** Targeted pilot projects to explore conjunctive use of surface and groundwater

  **Component 4:** Strengthening capacity to address groundwater issues at the national and regional levels

  **Component 5:** Communications and awareness raising
Component 1: Furthering knowledge and understanding about availability of groundwater resources in the Nile River Basin and its adjacent areas.

Output 1.1: Shared aquifers diagnostic analysis reports for all selected shared aquifers that serves as baseline fact-based analysis of current status of the aquifers, historical trends in resource availability, existing governance mechanisms at national and cross-border levels and threats that the aquifers face.

Output 1.2: A regional groundwater knowledgebase for all shared aquifers that draws on data and analysis carried out

Output 1.3: Water balance modelling of the selected aquifers with quantified: recharge, outflows (base flow, deep percolation, etc) and withdrawals.

Output 1.4: Projection of groundwater availability and use under climate change for selected aquifers
Component 2: Development of action plans on groundwater resources governance, management, and protection for inclusion in national, sub-basin frameworks—also including consideration of surface water/groundwater resources conjunctive use.

Output 2.1: Regional Shared Aquifers Integrated Management Action Plan for strengthening cooperative management and utilization of the selected shared aquifers will be developed. The Action Program is envisaged as a collection of recommended measures that are intended to address gaps and threats identified in Component 1 and enhance sustainable use of shared aquifers.

Output 2.2: Technical guide on integration of groundwater aspects in NBI’s subsidiary action programs for the selected sub-basins targeting key activities.
Component 3: Targeted pilot projects to explore conjunctive use of surface and ground waters, and links to biodiversity conservation and climate change adaptation

Purpose of component: Pilots will be implemented in the three selected aquifer areas to demonstrate novel approaches for sustainable management of groundwater and conjunctive use of groundwater and surface water resources. The results and lessons will also help to inform the development of national and regional action plans (Component 2). Successful pilots from this project will be scaled up through other national and sub-regional initiatives. Component 3 has two outcomes and two outputs (one for each outcome).
Component 4: Further strengthening capacity to address groundwater issues at the national and regional levels

Outcome 4.1: Technicians, academics, and senior planners at national, sub-regional and regional levels capacitated on key requisite techniques on groundwater monitoring and sustainable management.

Outcome 4.2: Regional and national decision makers have increased their understanding on importance of groundwater and capacitated to develop and adopt recommendations emerging from the analyses related to groundwater governance and conjunctive management facilitating policies.
Component 5: Communications and awareness raising

Outcome 5.1: Groundwater issues and conjunctive use management included in NBI communications and awareness raising activities;

Outcome 5.2: Lessons and experiences on conjunctive use management and the inclusion of groundwater considerations disseminated to IW (and other) projects globally.
THANK YOU!