Lessons Learned from Climate Change Adaptation Pilot Projects in the Arab Region

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Increasing Water Efficiency through Agricultural Drainage Water Reuse

Challenge

Egypt faces the challenge of meeting an **increasing demand** for water due to high population growth with a **limited volume** of freshwater.

The country relies on the **Nile River** as its main and almost exclusive source of fresh water.

The Nile **delta** is the most important agricultural production area.

Farmers try to boost their production, but **irrigation water is in short supply**, mainly during the summer season.

Climate change exacerbates the vulnerability that results from water scarcity.

To overcome this problem, farmers **use drainage water directly** from the drains to irrigate their lands, unaware of potential harms.

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Opportunities

In National Climate Change Adaptation Strategy, Egypt identified the **reuse of agricultural drainage water** as a promising option.
The GIZ pilot measure “Increasing Water Efficiency through Agricult. Drainage Water Reuse” **aims to improve the availability of its irrigation water,** particularly during the summer, **by mixing fresh irrigation water with drainage water under controlled conditions**.

The pilot measure, located in the Mahmoudia District of Beheira Governorate, was implemented in July 2013.
While GIZ provided the mobile pumping unit, MWRI’s role is to ensure its functioning, the allocation of the mobile pumping unit, and regular water quality monitoring.
ACSAD assists in evaluation and documentation.
The measure covers an area of about 6,000 feddan, cultivated by 3,000 farmers and organised in 3 Water User Associations (WUAs). 30% of WUA members are women.

وزارة الموارد المائية والرى
جمهورية مصر العربية
Ministry of Water Resources and Irrigation
Arab Republic of Egypt

جامعة الدول العربية
المركز العربي لدراسات المناطق الجافة والأراضي القاحلة
ACSAD 1968

Lessons learned

The controlled mixing of agric. drainage and fresh water **with a mobile pumping unit** can reduce the pressure and hence contribute to SDGs.
The **achievements** of the pilot measure in the Nile Delta are:

- increasing water supply and safeguarding the required **water quality**;
- improving **water use efficiency** and reducing energy consumption.

Preconditions for the safe application using a mobile pumping unit are:

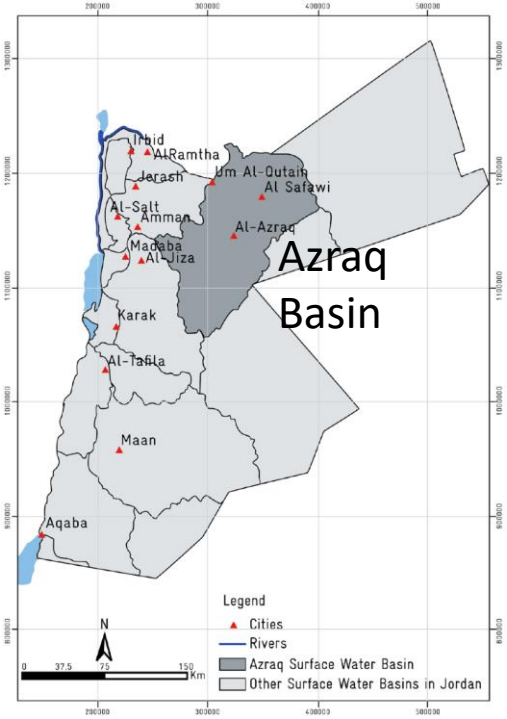
- An existing **legal framework** and a strong partnership with the country's water ministry; **guidelines** have to be developed and complied with.
- close **partnership** between national and local-level water authorities, the beneficiaries and the funding agency for the implementation, operation and maintenance of the system;
- an acceptable **quality of drainage** water plus an ample quantity of irrigation water;
- **permanent monitoring** of water & soil quality, which demands adequate laboratory facilities and training of farmers and pump operators.

From Irrigated Agriculture to Solar Energy Farming in the Azraq Basin, Jordan

Challenge

Jordan has 12 groundwater basins, 10 of which are **strongly overused** beyond their replenishment rates.
One of them is the **Azraq Basin** in the northeastern part of Jordan.
The centre of this basin was covered by **vast wetlands** until the early 1990s.
Both man-made and natural **impacts,** (such as groundwater abstraction for irrigation and the capital Amman, climate change) caused a **severe depletion** of the basin.
The total abstraction is **twice** the natural recharge rate.

Surveys among farmers in the Azraq Basin came to the conclusion that many farmers **suffer from water supply problems** and are therefore interested in **alternatives** to irrigated agriculture.



Opportunities

GIZ - ACCWaM is venturing into the **possibility to substitute irrigated agriculture with solar energy-based power generation**.
The innovation is called 'solar energy farming'.
The measure is targeting several urgent issues:

- reducing the further lowering of the **groundwater table** of the aquifer;
- offering a **source of income** to farmers as a water-friendly alternative to agriculture
- generating **electricity**, which is high in demand in Jordan,
- contributing to increase the share of **renewable energies**, hence reducing CO2 emissions;

In 2012, the Jordanian Highland Water Forum agreed on solar energy farming as a **high-priority adaptation measure** to reduce groundwater abstraction.

The Jordanian **Ministry of Water and Irrigation** is the main partner. **ACSAD** will help upscale the measure within the Arab region.

Lessons learned

In general, solar energy farming can be a **sustainable alternative** to irrigated agriculture.
Farmers can stay on their land, maintaining the installations and enjoying a **secure income**.
Uncertainties exist insofar as the **amortisation period** of the investments runs for about 20 years – a long time span in a fragile environment.

Transferability

The **preconditions** for transferability are:

- **Contracts** between the grid operators and the farmers, which fix an acceptable **price** for feeding energy into the national power grid;
- **Access to loans** (with regard to bank security, land ownership,
- etc.) and financial support;
- **Access to technical services** for implementation and maintenance;
- Widespread **information distribution** on the pros and cons of
- ‘energy farming’ and later on the training of ‘energy farmers’.

How to Prevent Sea Water Intrusion in the Beirut Area in Lebanon

Challenge

As is the case with many other coastal aquifers around the Mediterranean basin, the **aquifer below the Greater Beirut area** in Lebanon is suffering from **overexploitation, seawater intrusion** and hence deteriorating water **quality.** In 2010 the groundwater pumping in the Greater Beirut area was estimated at 705 MCM/year.

The expansion of settlements, deforestation and further surface sealing by roads, etc. **in the upper watershed** led to **reduced natural aquifer recharge**, aggravated by the impacts of climate change.
The **magnitude of flash floods** was rising, causing heavy floods in Beirut and other coastal cities. This water can potentially be used for **groundwater recharge** of the coastal aquifer..

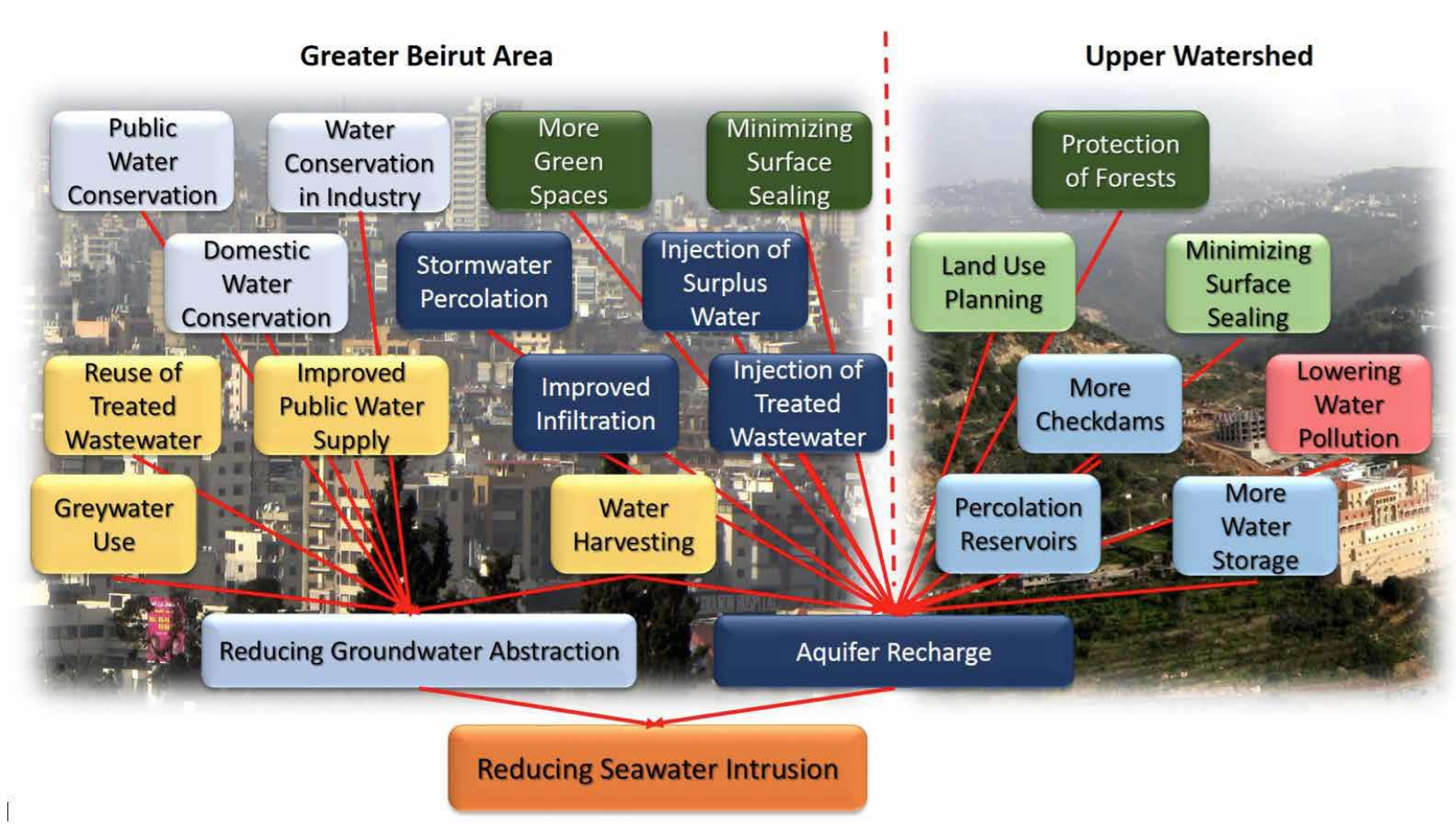
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Opportunities

In order to explore the **potential of managed groundwater recharge** using an appropriate integrated water resources management (**IWRM)** approach, a project feasibility study was commissioned by GIZ – ACCWaM in 2013.

A team from the American University in Beirut submitted its findings in 2015.
The study has not yet been implemented.

The **IWRM approach** has to include aware-ness-raising, water demand- & supply-side measures, structural interventions and legal/ policy/administrative actions.



giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Lessons learned

- Any success of **managed groundwater recharge** will depend on close **cooperation** between State organs, non-governmental organisations, financial bodies, research institutions/universities and the public.
- The progressing **impacts of climate change**, including the **rising sea levels**, will aggravate the already existing problems.
- The approach must cover **a fairly large area** in order to be efficient.
- A **holistic approach** has to include many target groups and institutions in addition to considering hydrogeological diversity.

Transferability

- The **general IWRM approach** can be transferred to other densely populated coastal areas in MENA region.
- The **high costs** involved will in many cases call for the involvement of an international donor.
- The **complexity of an IWRM** approach and the general paucity of relevant data demand inputs by scientists of numerous disciplines.