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Berlin, 22. March

Use of Reclaimed Water

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UFZ – Data and Facts



Personnel 2006

- approx. 830 employees
- 86 % in the scientific-technical domain
- 14 % executive board / staff officers / administration



Funding 2006

- 83% Funding Federal Ministry of Education and Research and Federal States
- 16% third party funding, e.g. federal government, EU, etc.



UBZ – Environmental-& Biotechnology Centre



Mission of the *UbZ* is

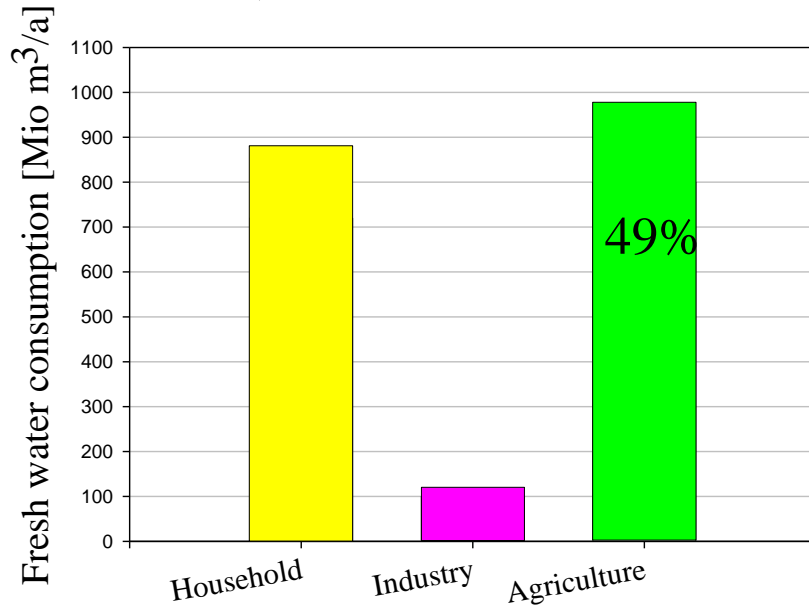
- to mediate between science and industry,
- to initiate, design, and run joint R&D projects with industrial partners,
- and to transfer recent biotechnological developments into practice.



Practical approach!

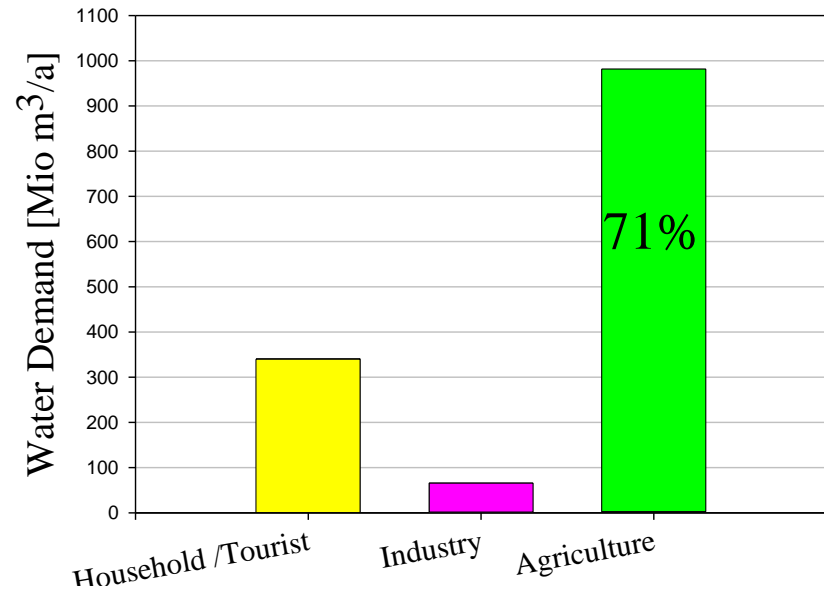
Water consumption in countries with aride climate

Israel, 2000



Source: Klawitter Wasserwirtschaft Wassertechnik 2001,45-46

Jordan, projected 2005



Source: National Master Plan, 2002

Using reclaimed water in countries suffering from water scarcity

Avoiding over-utilisation of fresh water resources

- Recharge groundwater aquifers to prevent salt intrusion in coastal areas
- Replacement of fresh waters for irrigation in favour of urban and industrial demand



necessity for an advanced waste water treatment

Using reclaimed water in countries suffering from water scarcity

Supply guarantee for a growing population

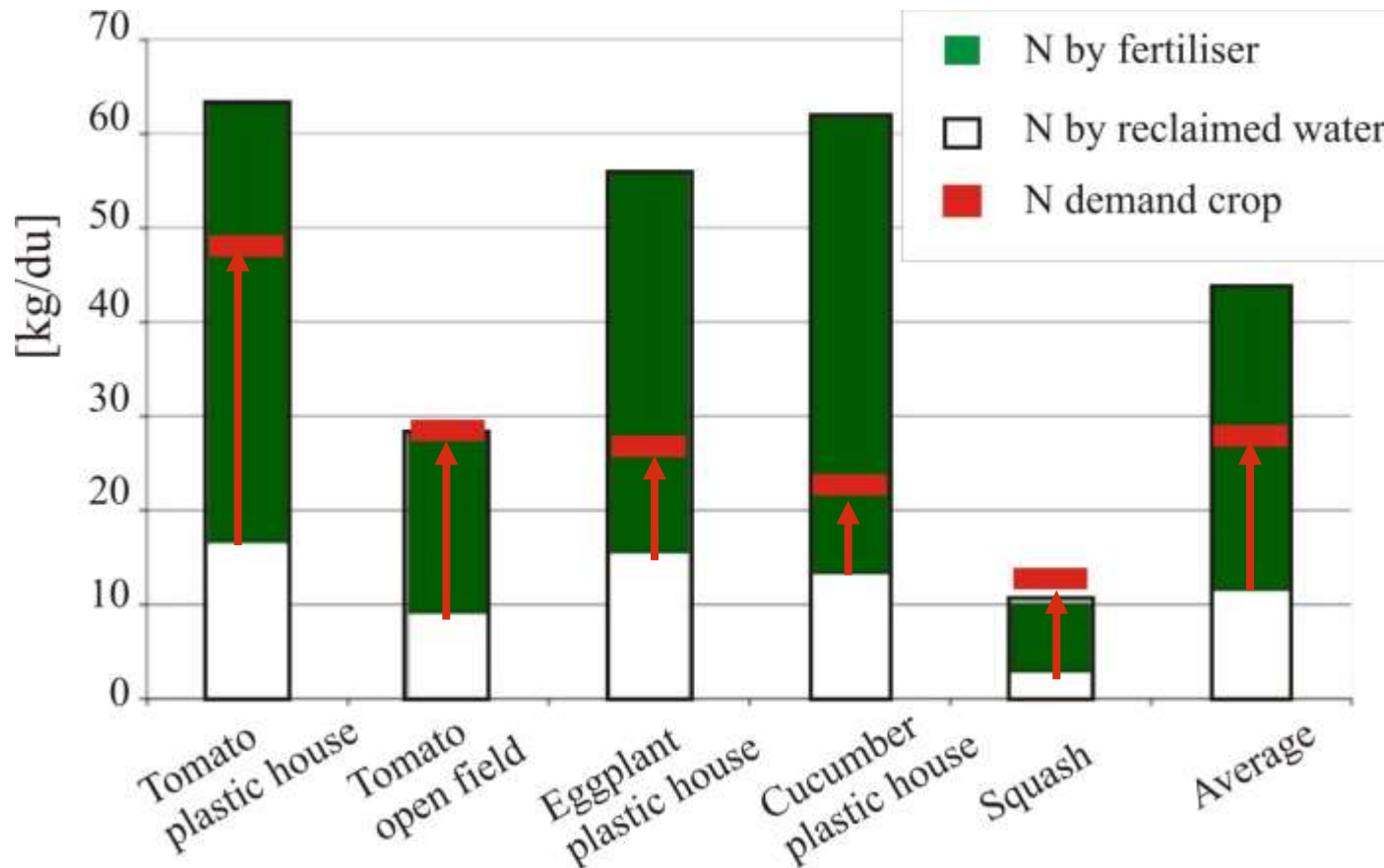
- Extend or intensify agricultural productivity by additional water for irrigation
- Use the nutrient content of waste water to save mineral fertiliser („fertigation“)

→ How we can control the biological processes in WWTP to adjust the N content according to the limits but not to eliminate too much N?

Fertigation: Supply of Nitrogen by Reclaimed Water

Farm southern Jordan Valley, 2004 -2005

N_{tot} (RW, KAC-South): 2 – 3 mg/L



1 dunum= 0.1 ha

Source: Vallentin 2005 (modified)

Propagation of Water Reuse – What we have to allow for ?

Appropriate technology?



Agriculture

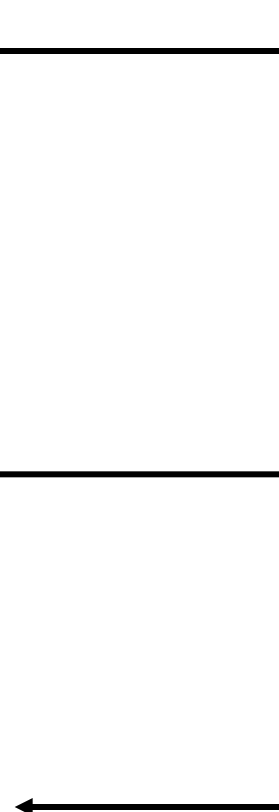


Environment



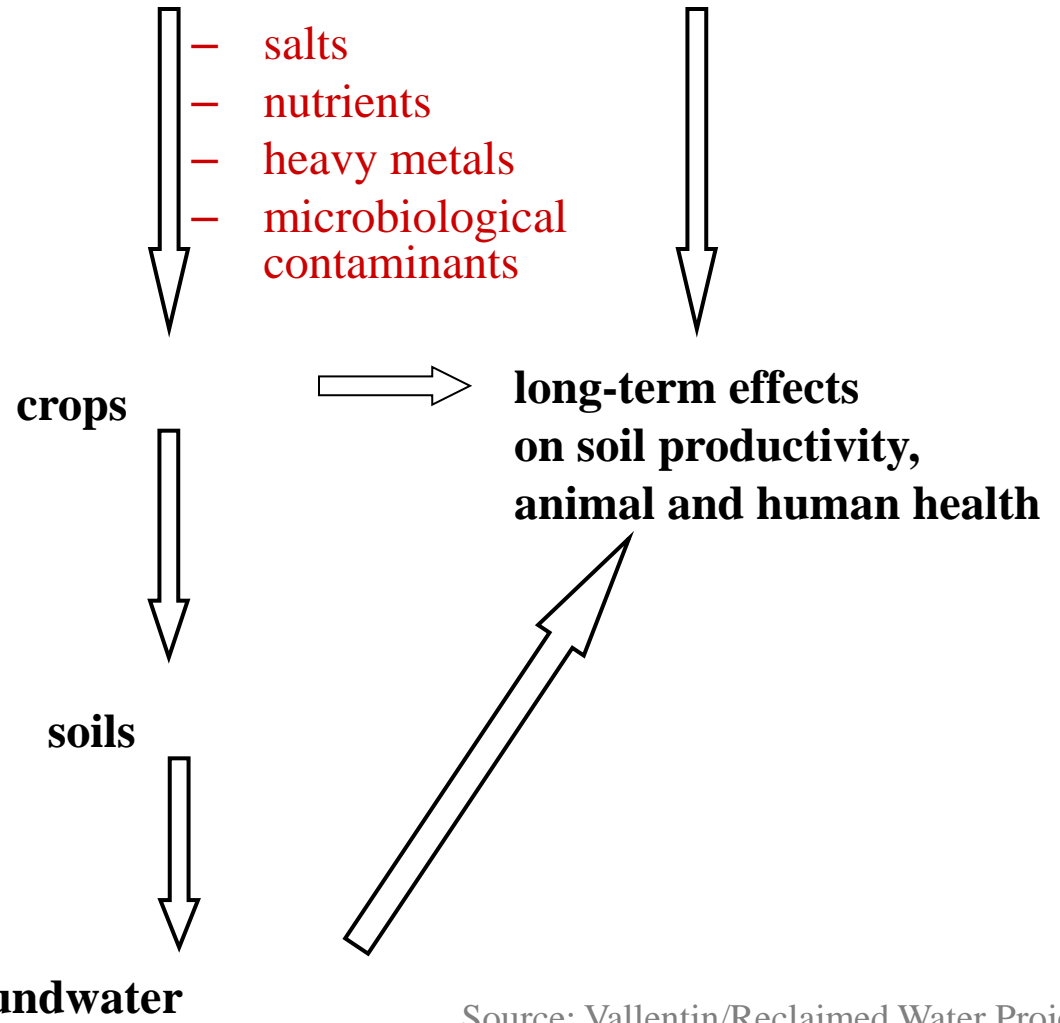
Socio-Economy

Impacts of water reuse



Agriculture

Impacts of irrigation with reclaimed water



Source: Vallentin/Reclaimed Water Project
(modified)

Agriculture



Unsustainable Development of Agriculture

- Cultivation of products with higher water demand and with water of pegged low price
- Salinisation of soils (incl. Boron)
- Marketing problems with products irrigated with reclaimed water

Environment

Groundwater Pollution:

Dissolved Nutrients

- Nitrogen

Pollution by Conservative Ions:

Salinisation (e.g. Boron)

- Devastation of Arable Land
- Disposal of Brines

Short Circuit of (Micro-) Pollutants:

- Pathogens (case of endemic disease)
- Organic Pollutants (Endocrine disruptors)

Source: Vallentin 2005

Socio-economy



- Population development: New Settlements (also refugees)
- Financing and operations model (cost-benefit analysis)

→ Sustainable solution

Demand for system solutions to include

advanced waste water treatment

+ irrigation technique



- flexible operation, site adapted
- modular approach (decentralised?)

Standards for domestic waste water for reuse

- **Irrigation water quality** (COD, BOD₅, *E. coli*, intestinal nematodes, SAR, a.o.)
- Sampling frequency (self monitoring, official control)
- Methods for analysis

National Standards



limits

WHO (2006): Guidelines for the safe use of wastewater, excreta and greywater.
Vol 2: Wastewater use in agriculture



risk base approach

Integrated Water Resources Management Model in the Lower Jordan Valley SMART



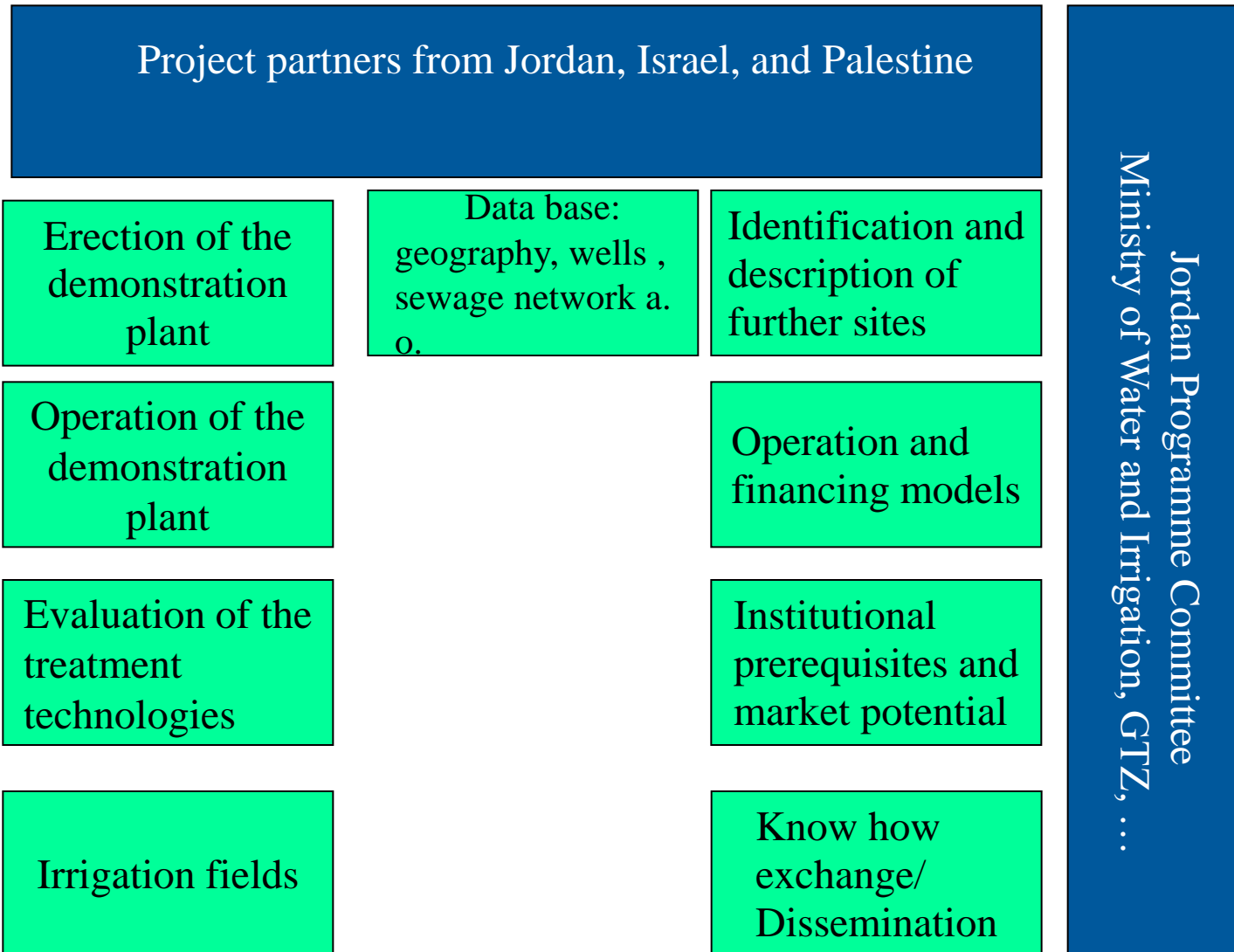
Proposal UFZ- Centre of
Environmental Research:

Part 1: **Hydrochemistry, Water
Budgets**

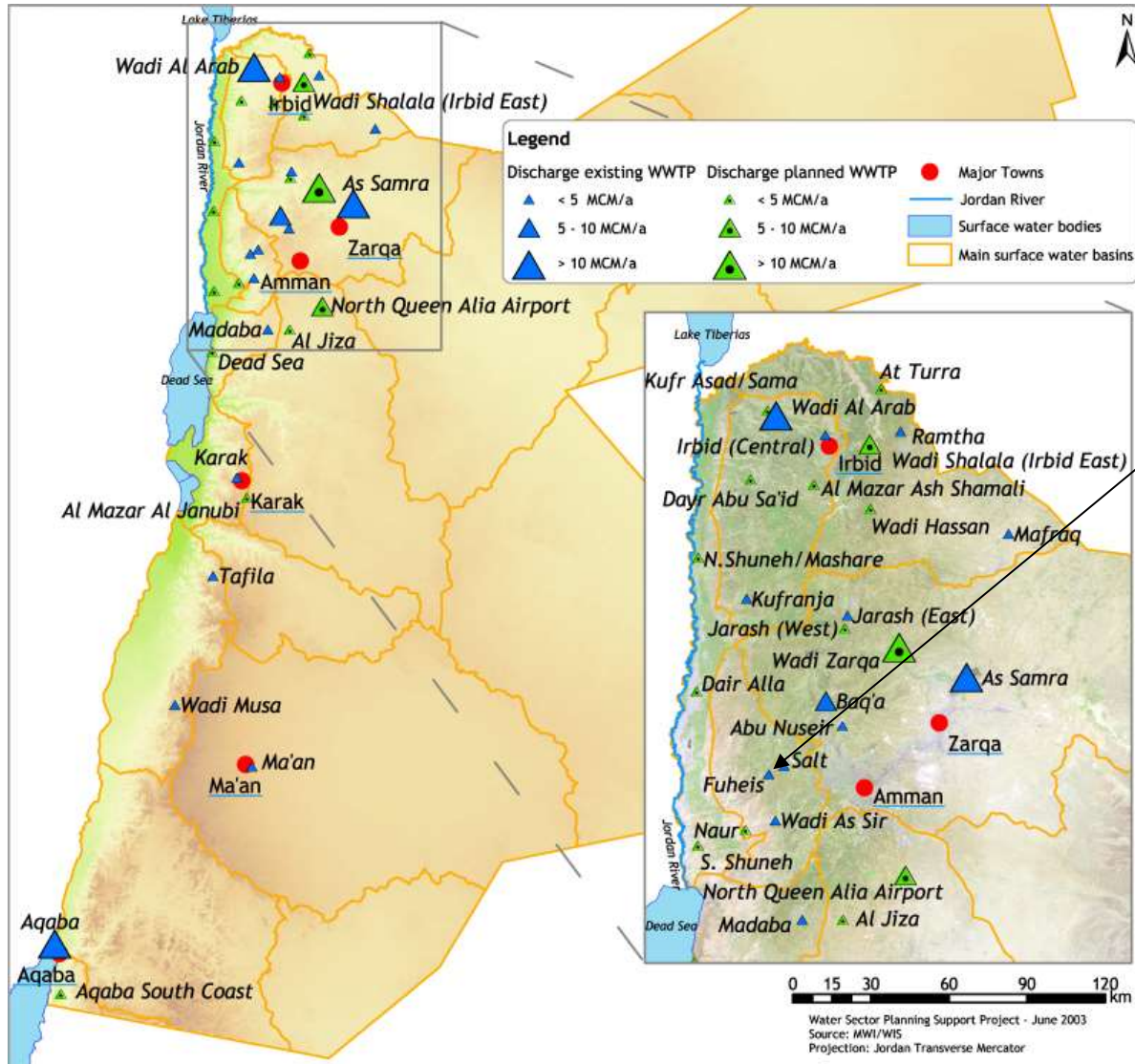
Part 2: **Managing Waste Water
for Reuse**



Managing Waste Water for Reuse



Demonstration Site in Jordan



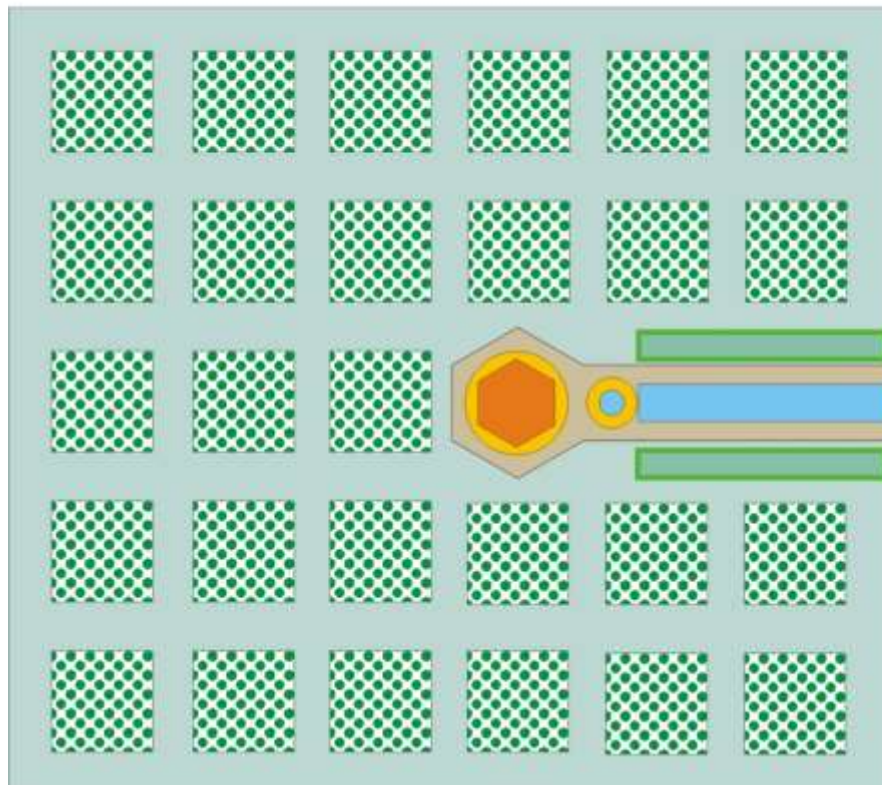
Waste Water Treatment Plant
Fuheis

17 km away from Amman

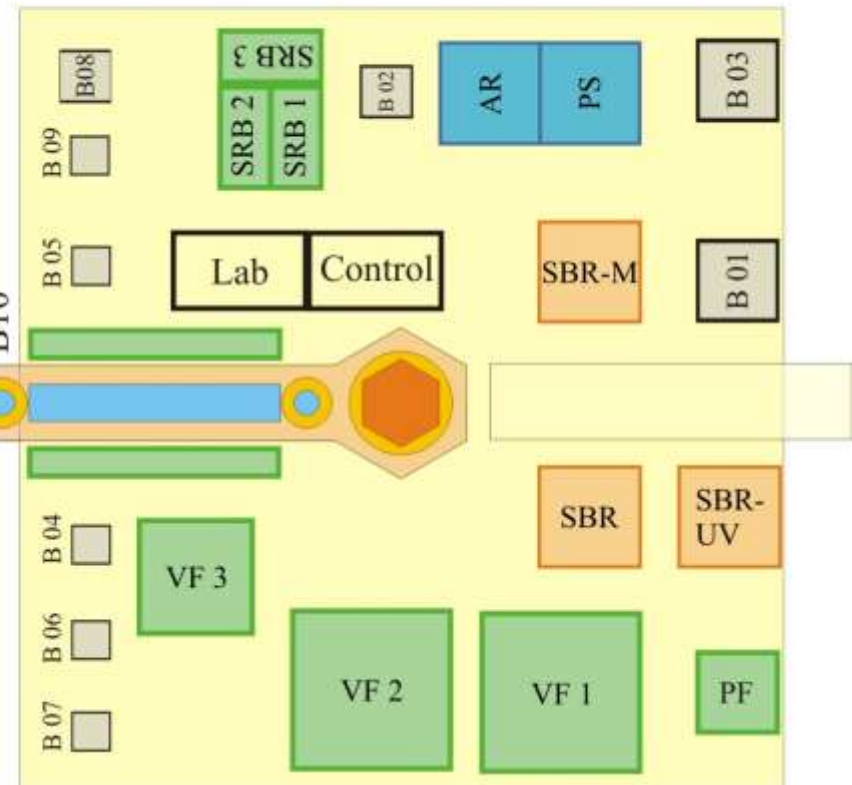
Demonstration Site in Jordan



Irrigation fields



Demonstration Plant



**Thank you for your
attention!**

<http://www.iwrm-smart.org/>

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