

### GIS-based decision support: Assessment of Local Lowest-Cost Wastewater Management Solution (ALLOWS)

**Key findings**

Development of an GIS-based DSS-tool for the Assessment of Local Lowest-cost Wastewater Management Solutions (ALLOWS)

Scenario development for :

- Ira & Yarka
- Dair-Yusuf
- Ajloun Governorate
- Al-Salt City
- Al-Azraq

As result, the most cost-efficient wastewater solutions were identified among various scenarios specifically developed for each settlement.

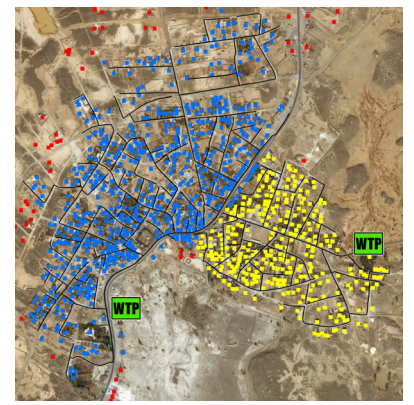
Planners and decision makers in the water sector often face challenges in identifying suitable development strategies and finance schemes for wastewater infrastructure. Here, integrated and modular sanitation systems can be crucial for improving quality of life in particular in regions with virulent migratory pressures. Modular systems can be flexibly adapted to contingent population dynamics in wa-ter scarce regions. Their adaptivity as regards to topogra-phy, population dynamics, reuse

options, and local climate is very conducive to rural and suburban developments, as high capital and operating costs and long depreciation times for complex sewer networks and pumping stations required for conventional centralized treatment solutions often prevent investments. In contrast, a modular infrastructure is adaptive to sudden changes (migration) and thus can improve local groundwater-dependent rural water availability, in particular via fresh water substitution with treated wastewater, e.g. in agricultural irrigation, and via the protection of groundwater from infiltration of untreated wastewater. Rather than competing with existing central sewer networks, integrated and modular sanitation systems are complementary measures that are pivotal to a spatially inclusive and sustainable sanitation system.

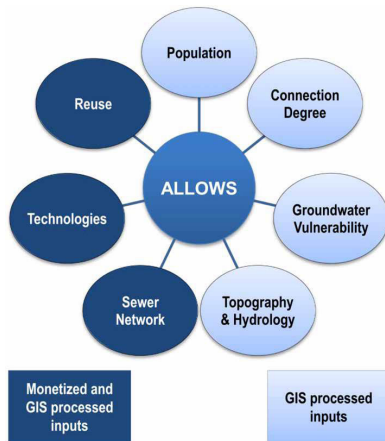
Within this context, the UFZ has developed a GIS-based preliminary planning and decision support tool in order to develop cost-effective local wastewater management options for any given demographic and physical context. The ALLOWS-tool (Assessment of Local Lowest-Cost Wastewater Solutions) provides an integrated analysis of the current situation, assists in the development

of technical solutions (scenarios), and provides a cost comparison among different scenarios.

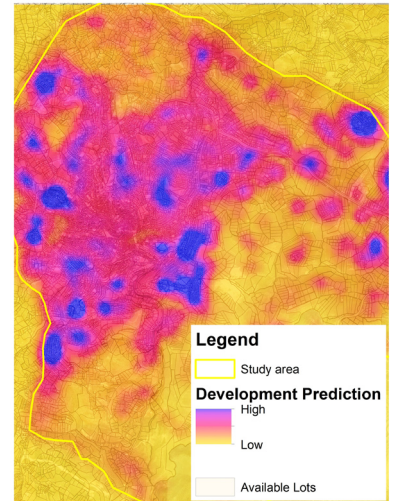
A spatial analysis enables high precision assessment of the current wastewater situation and facilitates the development of possible management scenarios under real conditions. These scenarios are based on hydrology, terrain, groundwater vulnerability, connection degree, present



infrastructure, population density, and population forecast. Technical data including the length of the required sewer network and the treatment plant capacity form the basis of the economic assessment of the scenarios. Dynamic cost comparison delivers the net present value for each scenario, and thus assists decision making towards investment in local wastewater solutions.



Since its development, the ALLOWS tool has been successfully applied to several settlements ranging in population size from small rural localities to cities. Depending on the site-specific characteristics of a settlement, several wastewater management scenarios have been developed with ALLOWS. The economic assessment was carried out for each scenario using local and global cost benchmark data. As a result, cost-efficient wastewater management options were identified for each study area.



Currently around 40% of the total population of Jordan is not connected to wastewater collection and treatment and wastewater disposal rely on cesspits, which are often managed poorly. As a result, infiltration of untreated wastewater contributes to the gradual deterioration of groundwater in Jordan, where water scarcity is a major national concern.

In order to help prioritize implementation areas in Jordan, the ALLOWS tool was also applied to visualize temporal and spatial predictions of population growth for different types of settlements. For Jordan, ALLOWS has confirmed semi-centralized and decentralized solutions as the more suitable approach for rural areas (Ira & Yarka) and a combination of decen-

tralized and centralized solutions as the more suitable approach for the fast-growing urban area of Al-Salt City.



### References and further Reading

- M. van Afferden, J. A. Cardona, K. Z. Rahman, R. Daoud, T. Headley, Z. Kilani, A. Subah, R.A. Müller, "A step towards decentralized wastewater management in the Lower Jordan Rift Valley", *Water Science and Technology*, 61 (12), 3117-3128, 2010.
- M. van Afferden, J. A. Cardona, M. Y. Lee, A. Subah, R. A. Müller, "A new approach to implement decentralized wastewater treatment concepts", *Water science & Technology*, 72 (11), 2015