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Policy Brief

Decentralized Wastewater Treatment Systems (DWATS) as a
Climate Change Adaptation Option for Agriculture in Jordan

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Acknowledgments

This policy brief "Decentralized Wastewater Treatment Systems (DWATS) As A Climate Change Adaptation Option for Agriculture in Jordan", developed under the leadership of the Resident Coordinator's Office, aims to formulate recommendations for policy-makers and feed into ongoing national initiatives and reform processes, and to empower different stakeholders and offer them tools for advocacy as means to achieving climate justice. In addition, the series aims to familiarize a wider audience with international norms and standards and the work of the United Nations in Jordan.

The brief was developed by the United Nations Environment Programme (UNEP), United Nations Development Program (UNDP), World Food Programme (WFP), the Food and Agriculture Organization (FAO), United Nations Children's Fund (UNICEF) supplying photos, and with inputs and support from the UN Resident Coordinator's office.



Background and Objective

In response to the projected impacts of climate change, the Hashemite Kingdom of Jordan submitted its first Nationally Determined Contribution (NDC) in 2015 and updated it in 2021. In this document, Jordan put forward the use of non-conventional water resources¹ as an adaptation option.

Climate change will negatively impact Jordan's agriculture, with the rural poor the most likely to bear the brunt of these impacts. The NDC and the commitments contained therein can thus act as a means for achieving climate justice, promoting adaptation, and protecting lives and livelihoods.

This policy brief will explore the potential use of decentralized wastewater treatment systems (DWATS) as a non-conventional water source and adaptation option.



Water pipes in the water barehole in Al Jafr, about 300 KM from Amman, South of Jordan. The barehole provides water for sheperds and their herds that travel in the desert. The barehole is located about 30 KM from both cities of Ma'an and Al Jafr. The water barehole is generated by solar power. ©UNICEF / Nadia Bseiso

¹ Non-conventional water resources are those not obtained from natural sources such as fresh surface water or groundwater



Jordan's National Context

Impact of climate change on agriculture

Major climate change risks associated with agriculture in Jordan, as identified in the Third National Communication (TNC), are: rise in temperature, increase in rainfall, droughts, flash floods, heatwaves, and shifts in the rainy season. Future climate projections developed for different basins in Jordan estimate an increase in air temperature of 1.5°C and a 15% decrease in precipitation by the year 2050 as a likely scenario². With 93% of field crop area and 62 % of fruit tree area being rainfed, agricultural production in Jordan is highly sensitive to climate change. Additionally, increased evaporation due to elevated temperatures could increase crop irrigation requirements by 5 to 20%³. These negative impacts will be disproportionately distributed as the rural poor are expected to bear the larger share of loss and damage due to their greater dependence on agriculture, lower adaptive capacity, and bigger share of food-related expenditure. Moreover, these impacts might increase the numbers of farmers migrating from rural areas to urban centres, leading to more reliance on food imports and thus directly impacting food security. Furthermore, women in rural and remote areas will be particularly affected also considering the difficulties they face in gaining access to income-generating activities, but also a lack of participation in decision-making processes at the community level.⁴

A small dam, Kabida in Al Jafr, collects rain water and is used by locals to solve their water issues. In 2021, the dam was dry due to insufficient rain to fill it. Al Jafr, Jordan 2021 ©UNICEF / Nadia Bseiso



² Jordan's Third National Communication on Climate Change, 2014

³ Ibid

⁴ CEDAW/C/JOR/CO/6 paras 49, 50, 51, 52; CEDAW General Recommendation No. 34 (2016) on the rights of rural women



In Jordan, the World Food Programme's livelihoods and resilience activities support vulnerable Jordanians and Syrian refugees by providing employment opportunities and developing their productive capacity. © WFP/Mohammad Batah

Water scarcity and associated vulnerabilities

As the second most water scarce country in the world⁵, Jordan's annual renewable resources of less than 100 m³/capita are far below the global threshold of severe water scarcity of 500 m³/capita⁶. National water resources and water balance are severely stretched due to competitive demand for domestic, irrigation, industrial, and environmental protection usage, over abstraction, inefficient distribution systems, and the impact of climate change. In 2017, the estimated water demand for industry, agriculture, and municipal use was 1,053.6 million cubic meter (MCM).

Agriculture leads all economic sectors in Jordan in terms of water consumption by about one half of the total water supply and municipal usage contributing significantly to the other half⁷. The agriculture sector is not only the largest consumer of water in Jordan, but also the most inefficient one. Improving water efficiency in agriculture, through continuing the practice of drip irrigation and application of treated wastewater, could potentially reduce water consumption by up to 168 MCM per year in Jordan⁸.

The financial return and livelihood opportunity from water use for agricultural purposes logged at a mere 0.51 USD/m³ and 148 persons/m³, respectively, compared to more efficient usage in tourism (35.5 USD/m³, 1693 persons/m³) and industrial (56.4 USD/m³, 3777 persons/m³) sectors in 2014.⁹

While production has increased in recent years, the agricultural sector's ability to generate revenues and create jobs remains constrained by a shortage of good-quality irrigation water (91% of Jordan has a dry climate), inefficient water use, mismanagement, and degradation of limited land resources, poor farm management practices, inequalities, large variations in seasonal rainfall and increasing frequency of drought, high production and marketing costs, weak research and extension services and information systems, and poor crop diversification¹⁰.

The contribution of agriculture to Jordan's GDP declined from 40% in the 1950s to 4.8% in 2018. Despite this drop, farming remains important to the Jordanian economy, owing to the fact that it is not only a major source of food, particularly dairy products, fruits and vegetables, but also a source of livelihood for around 25-30% of the total poor population¹¹.

⁵ Ministry of Water and Irrigation Annual Reports: 2016 and 2017

⁶ National Water Strategy 2016-2025

⁷ National Green Growth Action Plan – Water Sector

⁸ National Green Growth Action Plan – Water Sector

⁹ National Water Strategy 2016-2025

¹⁰ Badran and others. 2018. Strategic Review: Achieving Sustainable Development Goal 2 (Zero Hunger) in Jordan by 2030.

https://docs.wfp.org/api/documents/WFP-0000104937/download/?_ga=2.148580343.1703306510.1560093169-591208273.1534415095



The Change We Want to See

Wastewater treatment can be applied as either a centralised or decentralised system. In centralised systems, wastewater facilities are located near urban centres and usually involve substantial infrastructure for treatment and transport of large amounts of effluent. Decentralized wastewater treatment systems (DWATS) are smaller scale facilities found at community or site-specific levels and operate independently of centralised systems.

Due to the continuous decrease of water resources in Jordan, finding alternative sources of water and improving existing water services as an adaptation option is critical. The National Adaptation Plan (NAP) has emphasized the expansion of DWATS as one of the prioritized adaptation measures for the water sector. It is also considered by the Jordanian Ministry of Water and Irrigation as a necessary and viable measure for adaptation to agricultural water scarcity¹².

In terms of applicability, DWATS can be seen as a viable source of water for irrigation. Jordan currently operates 34 wastewater treatment plants that produce a total of 164 MCM of treated wastewater per year, accounting for 14% of total water supply¹³. In 2014, the total amount of treated wastewater reused in agriculture was approximately 123 MCM, about 25% of the total amount of water used for irrigation (497 MCM). Therefore, the concept of using treated wastewater in Jordan is not new.

Increased water availability is the clearest benefit of this technology. Jordan's Green Growth Action plan indicated that wastewater recycling can reduce the gap between demand and supply of water in Jordan by as much as 48%¹⁴. In terms of public health, the cost of inadequate disposal of wastewater and groundwater contamination that can be avoided by DWATS. Economic benefits can accrue from increased farm productivity - stemming from increased water availability - and lower costs from reduced fertilizer use and cleaning of cesspits¹⁵.

In terms of policy, Jordan has already made recognized achievements in wastewater management:

- The Jordanian Water Strategy (2008-2022) set the expansion of decentralized wastewater treatment as one of its goals¹⁶.
- It considers treated wastewater as a valuable source of water for irrigation¹⁷ and proposes it in different policies.
- Policies such as the Water Reallocation Policy and the decentralized wastewater management (DWWM) Policy – are all part of the National Water Strategy 2016 – 2025.
- The decentralized wastewater management policy for communities up to 5,000 inhabitants is in place and in the process of enactment.

However, a degree of rigidity seems to have been built into the system. The application of these policies is affected at times by weak coordination between several government institutions with overlying responsibilities, as well as the lack of institutional and staff capacity. Furthermore, the price of treated wastewater for irrigation is set administratively and may not reflect true cost of operation. Finally, DWATS in small Jordanian communities is disadvantaged as an option by scattered populations, small size, inability to afford DWATS tariffs, and the lack of social acceptance for wastewater reuse¹⁸.

Creating an enabling environment for expanding DWATS is a crucial element to guarantee the sustainability of these decentralized services, especially when it comes to finance. One of the principal institutional barriers for sustainable DWATS in Jordan is the unavailability of sustainable finance models. Several models that de-risk investment in DWATS and lower borrowing rates exist and have been applied globally, and include a combination of grants, public funds, guarantees, and credit facilities. Other financial barriers to DWATS adoption include high capital costs and low revenue streams, additional infrastructure costs, low credit availability for smallholder farmers, high interest rates, and questions around willingness to pay.

¹² Authority, J.W., 2019. Decentralized wastewater management in Jordan. Annual report December.

¹³ Ministry of Water and Irrigation. 2017. Jordan water sector — Facts and figures. MWI, Amman.

¹⁴ MoEnv. "Water Sector Green Growth National Action Plan 2021-2025," 2020. Amman, The Hashemite Kingdom of Jordan.

¹⁵ Ministry of Environment, The National Climate Change Policy of the Hashemite Kingdom of Jordan 2013-2020, SECTOR Strategic Guidance Framework, <https://globalnaps.org/wp-content/uploads/2018/08/climate-change-policy-of-jordan.pdf>

¹⁶ Water for Life Jordan's Water Strategy 2008-2022

¹⁷ Van Afferden, M., Cardona, J.A., Rahman, K.Z., Daoud, R., Headley, T., Kilani, Z., Subah, A. and Mueller, R.A., 2010. A step towards decentralized wastewater management in the Lower Jordan Rift Valley. *Water Science and Technology*, 61(12), pp.3117-3128.

¹⁸ Al-Karablieh, et al. 2019. Decentralized wastewater management in Jordan: A Compendium for Designers, Authorities and Practitioners

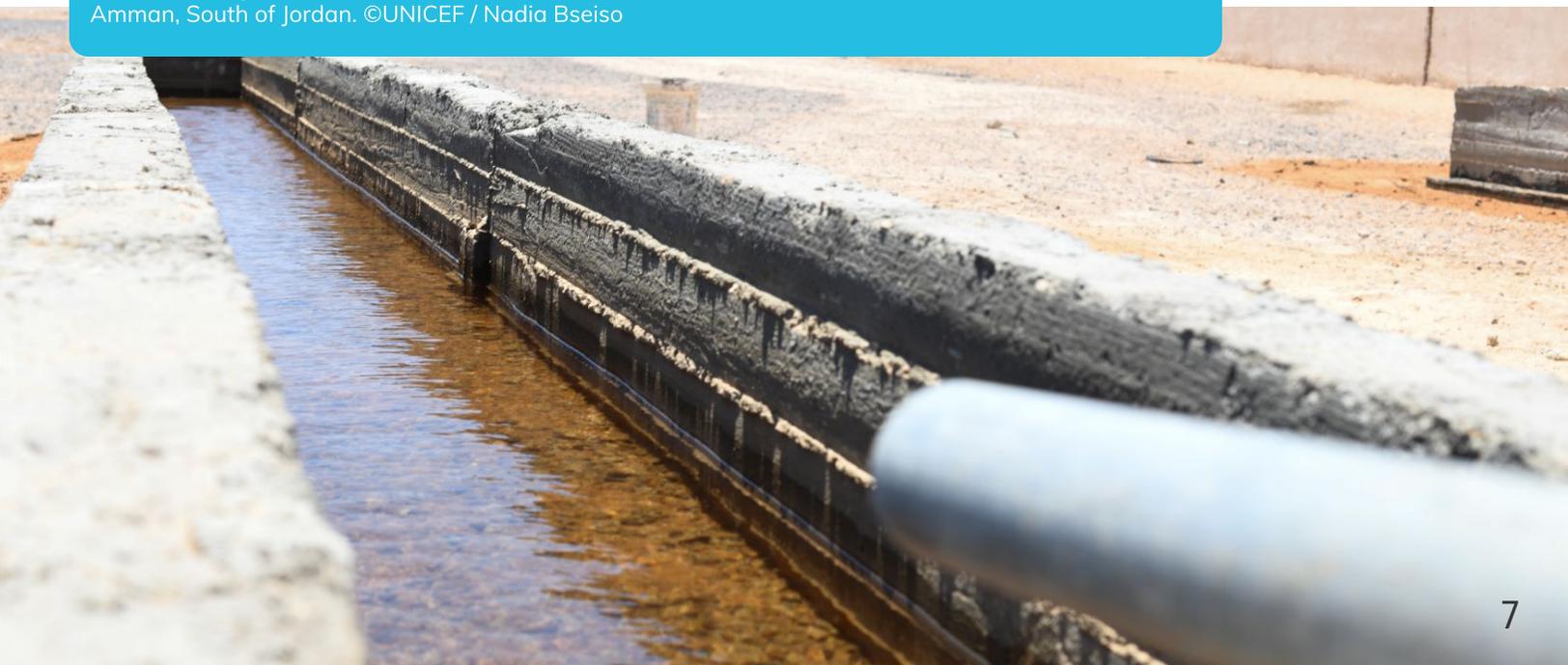


Recommendations

The below are recommendations which the UN in Jordan assesses as particularly relevant to use DWATS and especially in Jordan's agriculture:

- Continue to include DWATS as a technology option in national adaptation and water policy reviews and reforms and promote the application of innovation research that can address the issues of high cost and maintenance issues.
- Explore various ownership models for DWATS facilities, including a mix of public and private, and encourage the formation of associations for wastewater treatment users to inform policymakers and create a dialogue on water quality, supply, and pricing.
- Provide regular capacity building and education on wastewater management and usage for farmers to inform them on the benefits and applicability of DWATS.
- Investigate and trial de-risking of DWATS investments through various finance options involving local and international entities.
- Invest in additional research to better understand specific challenges faced by small producers in adopting DWATS.
- Review standards for treated wastewater to ensure adequate levels quality of DWATS water supply.
- Ensure that DWATS initiatives include a strong focus on incentivizing efficient water use practices.
- Promote a multi-stakeholder approach for DWATS initiatives, ensuring access to information and meaningful participation by marginalized stakeholder groups as well as women and youth.

Water drinking area were herd can drink water from the water barehole in Al Jafr, about 300 KM from Amman, South of Jordan. ©UNICEF / Nadia Bseiso





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