

KEYNOTE SPEECH BY DR. HAZIM EL-NASER ON WASTEWATER REUSE EXPERIENCE IN JORDAN



Photos from South Amman direct wastewater reuse project started in 2016. This project considers as of the most successful reuse projects in Jordan (photos by Farmer Mr. Jamal Al Fayez and Dr. Hazim El-Naser

KEYNOTE SPEECH FOR
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***“HOW POLICY SHAPED WATER REUSE REALITY IN MENA:
EVIDENCE FROM THE PAST AND RECOMMENDATIONS
FOR THE FUTURE”***

by

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Distinguished guests, ladies and gentlemen

It gives me great pleasure to participate in this important session. I want to begin my remarks by thanking the organizers of this session/The International Water Management Institute (IWMI) for this invitation and the participants for their efforts in sharing their experience with the region. I would also like to compliment the organizers for choosing this critically important and timely subject, “Water Reuse Policies in Mena.”

Ladies and gentlemen,

Our region is one of the world's most water-scarce regions, and as you are well aware of the current water shortages, which reached crisis proportions since the area has one of the highest population growth rates in the world, as well as increasing industrialization, urbanization, poor water governance, regional tensions on transboundary resources, and the impact of climate change, which places additional pressure on the already exhausted water resources.

When talking about water scarcity and water shortages, we have to mention Jordan as the second most water-scarce country worldwide. The situation worsened further with the limited water resources, climate change impact (by 2040, climate change models suggest precipitation will be 15–25% less than today), as well as transboundary issues related to the Jordan River, limited supply options, overpumping of precious groundwater resources, and the rapid increase in population due to influx of refugees from neighboring countries, which have resulted in severe water scarcity challenges.

Jordan is fully aware of the challenges imposed by such conditions and hence is working hard to increase efficacy and utilization of the available water resources through the implementation of the right water policies in the various fields of water management. Since the theme of today's meeting focuses on the reuse of water, I will briefly inform you about Jordan's efforts and experience in this regard.

The first wastewater reuse and management policy was drafted in 1998 and continued until 2016, when it was updated and split into two policies, namely, “Water Reuse and Substitution Policy” and Decentralized Wastewater Management Policy." All the wastewater reuse policies focus on enhancing irrigation water use efficiency and conserving Jordan's limited water resources to meet the increasing demand or to keep the status quo of current irrigated areas. In addition, reuse policies provide frameworks to maximize the treated wastewater (TWW) reuse on technical, institutional, and legislative levels, as proper TWW is indispensable for public health, sustainable resources management, and protection

of the natural environment, to maximize sustainability and socioeconomic impact within a scarce water resource environment.

Today, irrigated agriculture uses about 50% of Jordan's water resources, of which 30% is reclaimed water for indirect use mainly in the Jordan Valley. In 2022, Jordan reuses 90% of its treated wastewater effluent, 197 MCM (10% of the 100% reuse is related to evaporation losses during surface flow from wastewater treatment plants (WWTP) to dams or wadis and a lack of needed infrastructure for irrigation schemes, especially in the northern part of the Jordan Valley). 197 MCM/yr represents 94% of total generated wastewater (210 MCM), a difference from 100% related to evaporation and losses in networks and treatment plants.

Today, the per capita of reuse is about 17 m³/yr out of per capita availability of about 100 m³/yr from all available resources including reuse, overpumping and brackish water, which is one of the highest worldwide. To summarize the successful reuse policy in Jordan and learned lessons for other regional countries to consider, I will mention the following notes:

- Having the right policy closes, does not mean that one can execute it 100%, as such policies confront and struggle with nexus challenges and governance lying within the mandate of other institutions. The non-water element or non-wastewater policy hindering full implementation which can be up to 50%.
- There is a need to create demand/substitution schemes for reusing water in a scarce water environment; otherwise, farmers will go and choose other simply applicable and straightforward options. Jordan is currently prioritizing the usage of TWW for agriculture and allocating fresh water for domestic use. The National Water Strategy 2016-2025 highlighted that all TWW should be used for irrigation. The policy calls for substituting freshwater for treated wastewater, and any increase in irrigational water shall be met mainly through treated wastewater provisions.
- Direct reuse means when TWW is used for agricultural irrigation without blending, being used mainly for forests, fodder crops, and parks (20 MCM out of 197 in 2022). The success of reuse for irrigation in the Jordan Valley and Zarqa River area is classified as indirect reuse (157 MCM in 2022) as the TWW is blended with other fresh surface water sources, mainly surface water.
- Accordingly, Jordan started either constructing new WWTPs or rehabilitating existing ones across the kingdom, with the treatment process including “*a minimum secondary biological treatment, though about 70% of*

the collected wastewater goes beyond and receives tertiary treatment plus removal of excess phosphorus and nitrate concentrations.”

- Gradual introduction with strict reuse regulations and proper health safety plans and monitoring are the basics for success. This shall include intensive routine water quality sampling and E. coli detection as required in JS 893/2006 and its updates and preventing the use of TWW for irrigation of uncooked vegetables, as well as safe use and storage of this non-conventional resource. Management and cost of TWW reuse are relatively higher than conventional resources, as concerned regulatory authorities must keep monitoring and measurements from the farm's gate to wholesale and beyond.
- Farmers' awareness, dialogue, knowledge transfer, training on practicing proper reuse irrigation technologies, and cropping patterns are of great importance in addressing cultural and social concerns. Farmers unions and NGOs shall participate in all stages of planning reuse projects to enhance acceptance and highlight added values.
- Although irrigation with TWW has been used since the early 1980s in Jordan, direct use is still lagging due to social acceptance and strict water reuse regulations. Direct reuse is applied mainly for fodder crops, golf courses, or trees (no fruit trees) around WWTPs, with about 10% of the total reuse amounts.
- In South Amman wastewater direct reuse program (900 ha), as shown by photos above, partial success of the project is related to banning of drilling of groundwater wells, which created demand for TWW.
- Industrial reuse is limited to availability or lack of fresh water, but in general, industries refrain from using treated wastewater due to fears of health issues; however, the real reason is that water cost contributes a very low percentage in comparison to other production input elements vs. the high price sale of their final products. For example, mining industries in South Jordan are currently using partially reused water but prefer and afford the use desalinated water for their industrial processes instead of fully switching to reuse despite the huge difference in cost.
- Governments in general are lacking knowledge and courage for strong business models to improve resource productivity, within the concept of circular economy systems related to wastewater treatment and reuse for agricultural production, green energy recovery through biogas units, application of biosolids as natural fertilizers, protection of the environment and enhancing public health.

- Electricity companies are reluctant to take over or operate digesters and biogas units which force water authorities from applying such technologies and thereby affecting sludge content and its quality. In North Jordan (Al-Shalalah WWTP) negotiations with the electricity companies took over five years. In addition, electricity companies offer very low price per kwh in their take off agreements which through out the feasibility of such projects.
- In the case of Aqaba reuse experience, promotion of win-win concept with the industries and Aqaba municipality for irrigation of the roadsides, has been instrumental. Industries were convinced that by using certain percentages of their demand with tariff reduction by up to 30% will save a lot of financial resources on their side. Such agreements were possible provided government change treatment process from natural stabilization ponds into extended aeration activated sludge technology with filtration.
- In the case of direct reuse program downstream of Jordan's largest wastewater treatment plant (As Samara WWTP) serving 65% of Jordan's population, the use of lumpsum contracts rather than tariff encouraged farmers to grow fodder crops not any other for a total of 300 to 500 ha.
- Management and discharge of biosolids after treatment is a real challenge due to confrontation with agricultural regulations and policies when it comes to landfill or application for range land. Today As Samara WWTP produces 127 t/d of stabilized sludge (biosolids) equivalent to 46,000 tons/yr. accumulated within the plant premises for the last 25 years without proper use.
- Finally, tariff is not the right demand management tool for encouraging water direct reuse, as storage of treated wastewater over a long period can easily jeopardize water quality and treatment efficacy, in case, farmers refrain from using it. On the contrary, at the initial stages of reuse programs, governments are urged to grant incentives (in terms of infrastructure provision to farmers) to facilitate, encourage, and maximize benefits of reuse.

Ladies and gentlemen

I would like to thank you all once again for your efforts and hope that our deliberations during today's meeting will be constructive.