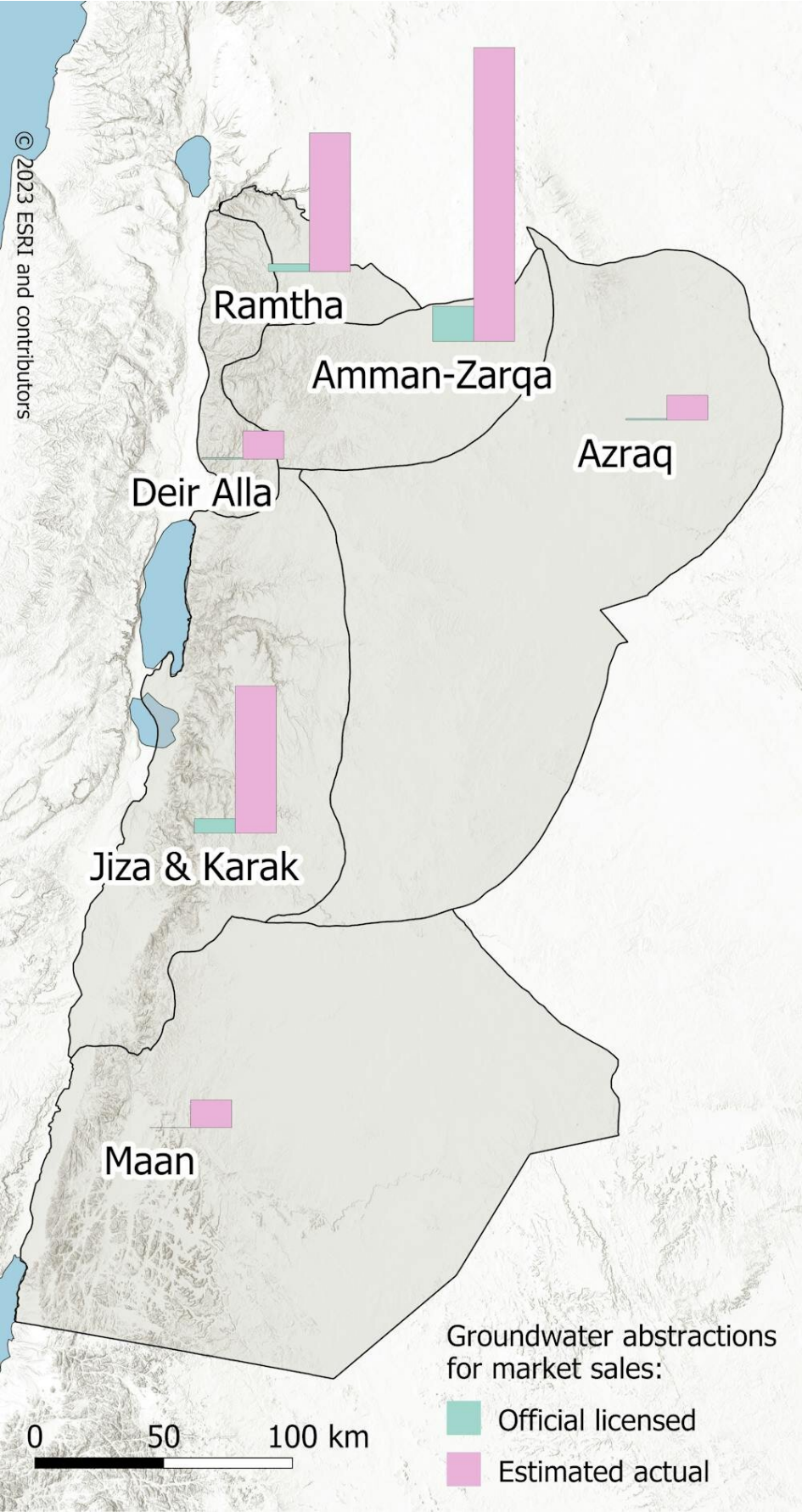


Climate crisis sees rise in illegal water markets in the Middle East

June 26 2024, by Christian Klassert and Samer Talози



Actual groundwater abstractions for tanker water sales based on our analyses (pink) substantially exceed the licensed groundwater abstractions (green) in Jordan's six monitored groundwater basins. Across the entire country, we estimate that ten times more tanker water was illegally abstracted than well licenses permit. Credit: Credit: UFZ

In Jordan's cities, green tanker trucks supplying water are a common sight. The average Jordanian only receives one and a half days of access to piped water per week. When taps run dry, citizens and business owners pick up the phone to order a water delivery to fill their rooftop or basement storage tanks.

These trucks are usually not sent by the local water utility, however. Rather, they are operated by individual vendors who source their water from private wells with a license to sell drinking water or, increasingly, without one. This is the story of the rise of illegal water markets in the Middle East, as the climate crisis leads to more intense and frequent droughts.

When the government struggles to supply enough water

Water delivery via road is increasingly relevant in major cities worldwide. In parts of the world, urban water networks have deteriorated to such a degree that [1 billion people](#) already face frequent public water supply interruptions. This has led to a [proliferation of informal water markets](#). In many water-scarce countries, [truck drivers](#), well owners, or both operate without a license to evade charges and try to obscure their activities. Whether these markets [alleviate or exacerbate water stress](#) is a

question research has yet to answer.

This is because the nature of illegal markets—they operate covertly—makes it tricky to analyze them. However, our team at the [FUSE project](#) has successfully connected models developed by economists and hydrologists to map out illegal water markets in Jordan, the world's [fifth most water-scarce country in the world](#). To ration its scarce water resources, Jordan introduced scheduled piped water supply interruptions in 1987. Since then, Jordanians have seen the average public water access duration [fall from 7 to 1.5 days per week](#).

Trucked water up to 23 times more expensive

[Our study](#) shows tanker trucks play a much greater role in Jordan's water supply than previously thought. One in every six to seven liters in the country is transported via road. This indicates that Jordan's cities are already severely affected by extensive water shortages.

We found that more than half of the water that businesses use is currently supplied by tanker trucks, including the majority of the water used by hotels, stores and restaurants.

Tanker water also serves as a critical lifeline for households facing water shortages. Most Jordanians use rooftop storage tanks to bridge scheduled interruptions of tap water. Public water access, however, is unequally distributed. Some neighborhoods receive just six hours of piped water per week. When storage tanks are depleted or when tap water is interrupted, tanker deliveries are relied upon to fill the gap.

This lifeline is very costly: households pay up to 23 times as much for tanker water as for piped water, and the main reason is the cost of transportation. Tanker trucks drive 29 kilometers on average to buy water from rural wells and deliver it. This makes water delivery via road

much more energy-intensive and expensive than piped water provision. We estimate that the transportation alone on average requires 18 kilowatt hours of energy per cubic meter of water sold, or 3 to 6 times as much energy as seawater desalination, itself an energy-intensive process, causing additional carbon emissions.

Most tanker water sold in Jordan is sourced illegally. The map below shows that the amount pumped from Jordan's aquifers for tanker truck deliveries is [10 times greater](#) than the quantity allowed by well licenses.

The illegal nature of these abstractions can hamper efforts to enforce groundwater conservation rules. Monitoring a large number of widely dispersed wells is difficult, and an interview study conducted in 2015 found evidence of [numerous cases of land owners intimidating government employees](#). This is particularly problematic because Jordan's groundwater levels are declining rapidly. The total amount of tanker water sold per year is equal to 34% of the groundwater abstracted beyond sustainable yields, exacerbating resource depletion.

Growing dependence

In the future, we expect that the dependence of Jordan's households and businesses on water deliveries will increase substantially. The country's population will continue to grow rapidly while [its water resources dwindle](#). Jordan's unstable regional environment exacerbates [water scarcity](#) and impedes promising solution projects, such as the long-held plans to desalinate Red Sea water.

Jordan's population is projected to double by 2050. Over the same period, the country's groundwater levels are falling by around 1 meter per year, and its surface water resources are expected to be reduced by 20%. This will make it increasingly difficult for water utilities to provide sufficient water for all.

Consequently, household reliance on water deliveries [will increase 2.6-fold by mid-century](#) unless the urban water supply situation is improved. Total water-market sales grow by more than 50%, imposing further pressure on the country's groundwater resources.

Despite the growing role of water markets, many households risk losing access to tanker water deliveries. Today, nearly all households receiving less than 40 liters per person per day of piped water purchase tanker water. By 2050, we estimate that the price of water deliveries will rise by one third, as groundwater levels decline and transport distances grow. Under this cost increase, only two thirds of water-stressed households will still be able to afford water deliveries.

Safeguarding access

Jordan is currently attempting to regain control over unregulated tanker water pumping by [closing illegal wells](#). This approach has been successful in reducing unlicensed abstractions from irrigation wells. We argue that transferring this policy to tanker wells jeopardizes households' water access as long as equitable and reliable public water access for all is not ensured.

Tanker deliveries are not an ideal solution to Jordanians' water needs. Providing most water supply to businesses via road causes excessive emissions. Mitigating uncontrolled groundwater abstractions is a sensible policy objective. Closing illegal tanker wells, however, will not reduce unmet urban water demands. Instead, this policy could inadvertently impede household access to an essential water supply source.

As a long-term objective, Jordan should aim to complement investments in water supply augmentation with improvements to its urban water supply networks. This could address urban water shortages and unequal water access as the underlying causes for the emergence of Jordan's

water markets. A [recent study](#) of a large-scale investment to improve urban water supply in Jordan has shown, however, that effective enhancements of piped water supply hours are [difficult to achieve](#).

Until equitable and reliable piped water access is ensured, the legalization of tanker water supply for households may provide a promising path for reducing uncontrolled groundwater abstractions while safeguarding essential water access.

The challenge of deteriorating urban water infrastructure, supply interruptions, and informal or illegal water markets is not unique to Jordan. Lebanon has recently seen a growth in the share of its population relying on [tanker](#) water deliveries [from 26% to 44%](#), after its public water supply duration fell from 49 to 22 hours per week. Arid countries around the world [face similar issues](#). By adopting policies that reconcile household access to water deliveries with sustainable groundwater management, Jordan could lead by example.

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