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The role of regulation in stimulating investment in water security: The Israeli experience

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I. Regulation and Economic Incentives for the Use of Reclaimed Wastewater in Israel

Background

Israel is located at the edge of the desert. The semi-arid climate dictates relatively few rainy days and scarce natural water resources. There are extreme changes in precipitation between years and regions, and series of drought years are common. Agriculture is considered a national interest due to its social, cultural and environmental aspects. Despite the fact that the agricultural sector constitutes less than 2% of Israel's economy, it consumes more than 50% of its scarcest resource - water.

Due to growing population numbers, high quality water resources were diverted from irrigation to urban use. A decision to raise water prices has facilitated this by linking consumer water prices to the amount used, so that above a certain "quota" the price increases substantially. This quota is changed according to the annual available water and national priorities. The agricultural sector is compensated by motivating farmers to use marginal water, mainly reclaimed wastewater (treated sewage effluents).

In order to enable and encourage the use of reclaimed wastewater, Israel has taken a series of regulatory and economic steps to ensure that reclaimed wastewater is a water resource worth using as well as actions to ensure economic viability.

Actions that were taken to ensure wastewater as a viable water resource:

- Regulation and financial support to assist construction of sewage collection and treatment infrastructure. Today 94% of the wastewater is collected and treated.
- Determination of industrial sewage tariffs based on pollutants concentration to encourage pre-treatment and discourage discharge of substances which could prevent using the reclaimed wastewater. In addition, there is a criminal liability for wastewater producers in case they do not meet the regulatory requirements
- Determination of quality standards required for agricultural irrigation with reclaimed wastewater, and tariffs for treating the wastewater to this quality.
- Supply of low salinity water for urban use which results in low salinity treated wastewater - suitable for agricultural use. Despite the additional cost per water unit, the low salinity was defined as a threshold condition for the construction of seawater desalination plants, in order to ensure that effluents are suitable for agricultural use. A government-funded research on the possibilities and effects of irrigation with reclaimed wastewater.

Regulatory steps towards private sector participation in the market of reclaimed wastewater:

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The construction of reservoirs is required to store reclaimed wastewater generated during the winter until the irrigation season in summer. This significantly increases the cost of supplying reclaimed wastewater. An economic analysis of the Israeli water sector determined that expanding the use of reclaimed wastewater generated in winter, is economically beneficial to the market, despite not being economically feasible at the level of individual farmer. For this reason, a government intervention was required to overcome the market failure and ensure the profitability of using reclaimed wastewater.

In the 1980s, the National Water Company (Mekorot) established several large projects for the use of reclaimed wastewater. At the time, the Israeli parliament (Knesset) set Mekorot's water tariffs and farmers were subsidized through tariffs for reclaimed wastewater that were lower than the supply cost.

Since the beginning of the 2000s, a financial support mechanism is operating to encourage the development of infrastructures in reclaimed wastewater projects, developed by the private sector - water associations owned by water consumers, regional councils and companies that specialize in water supply. In order to balance between the economic benefits on the macro and the micro (consumer) level, the government has partially covered the building costs of the infrastructure. The rate of the grant was calculated for each project separately, based on construction cost of the infrastructure and the projected revenues arising from the sale of reclaimed wastewater, which were derived from an estimated target tariff that ensures the full water use in the market. The subsidy was limited to 60% of the infrastructure cost in order to ensure a significant financial participation of the entrepreneur, thus incentivizing responsible management on his behalf. This support was only awarded to “projects of national importance”, as defined by the State. However, the entrepreneur is in sole ownership of the infrastructure, which was constructed under his responsibility.

In 2007, this support mechanism was updated to enable infrastructure expansion, in order to facilitate reclaimed wastewater transfer to neighboring water suppliers. Most of the expansions included increasing the diameter of water supply lines, beyond the diameter required for local supply. The additional cost of the expanded infrastructure was fully funded by the state. This mechanism proved to be an effective tool and, within a short period of time, allowed the transfer of reclaimed wastewater to areas of high demand, although, in several cases, the increased subsidy had negatively affected the entrepreneur's commitment to responsible management of the construction. All the infrastructure, includes fully funded components, remained in the entrepreneur’s ownership, however the water transfer tariff among water suppliers was determined by the Water Authority.

As of 2017, the financial assistance for developing wastewater infrastructures is subject to structural changes in the reclaimed wastewater sector such as establishing larger-scale reclaimed wastewater suppliers, enjoying a relative advantage in the planning, construction and operation of such supply systems. The grant is expected to cover 70% of the cost of the infrastructure.

These actions allowed a significant reduction in the reclaimed wastewater sales tariffs, thereby ensuring their demand and use in agriculture. The price is as low as 0.3$ for a cubic meter of quality suitable for unlimited irrigation and 0.25$ for limited irrigation, in comparison to 0.55$ for high quality water used for agriculture.

In addition, a separate scheme was set up to assist local authorities and industrial plants to use reclaimed wastewater for their needs. This mechanism granted a one-time subsidy based on the amount of reclaimed water utilized in the fourth year of system operation, regardless of the cost for building the system which will allow the use of reclaimed wastewater. This mechanism proved to be problematic due to the fact that in many cases the establishment and operation of the system was gradual and it was difficult to determine the benchmark amount for granting the subsidy.

In conclusion, these processes have led to the fact that nowadays more than 87% of the wastewater in Israel is reused, and more than 40% of the water used for agricultural irrigation is reclaimed wastewater. There are regional transmission systems that allow the transfer of treated wastewater from the production areas in the cities to areas of use in the agricultural periphery. Environmental damages are prevented by using the reclaimed wastewater for irrigation, instead of disposal to the environment. Since the early 2000s ,subsidizing 60% to 70% of the investments at a total cost of 800 million $, yielded an annual use increment of 200 million cubic meters of reclaimed wastewater.

II. Economic regulation to encourage the use of low-quality groundwater in Israel

Background

The Israeli water sector is based on four main water sources: groundwater that is extracted from aquifers through wells, surface water that is extracted from rivers and the Sea of Galilee, desalinated seawater, and reclaimed wastewater.

Groundwater production is carried out by the National Water Company (Mekorot) and by hundreds of private water producers - local authorities, water and sewage corporations, water consumer associations, farmers, industrial plants etc. According to Israeli law, all water sources belong to the public and as the responsible governing body, the Water Authority manages these sources for the public. This administration is characterized by a strict regulation that is designed to ensure water supply for the entire population on the one hand, while preserving water as a resource on the other hand. The regulation includes mandatory licensing mechanism for water producers and suppliers, and other economic tools that direct the water sector.

Due to regulatory changes that upgrade the drinking water standards and due to the continuous decline of water quality in the aquifers, water from many water wells has been disqualified for the drinking water supply, due to low water quality. Until the late 90s, most of the disqualified wells were abandoned. The abandonment of the wells led to difficulties in water extracting from the aquifers, need to adapt local water supply systems, damaged the reliability of water supply and security, and it increased water supply costs.

Incentives for using low-quality groundwater

Since 2000, the Water Authority has begun to work on preserving the water extraction from wells that were earlier disqualified for the use as drinking water. Within this framework, private producers are given economic and operational incentives to treat the extracted water in a way that it can be supplied as drinking water or, alternatively, to use it for uses that are suitable to the water quality. This activity was incorporated as part of an extensive plan for the management of the Israeli water sector - a plan set out in a government decision, including the allocation of resources to utilize low-quality groundwater, reclaimed wastewater and the development of seawater desalination.

There are appropriate technologies for removing contaminants from extracted groundwater; however construction & operational costs are high. An economic examination of the entire Israeli water sector made it clear that there was an economic benefit in the operation of these technologies, but a regulatory change was needed to ensure that the profitability for water producers is given. This change began in 2000 and since then there have been several changes and improvements in the regulatory scheme.

In order to ensure an optimal utilization of the various water sources, the Israeli water sector uses regulatory tools to balance between the cost of production from the various water sources and the water tariff for the consumer. Over the years, the tools have been modified but their main components remain similar – producers that extract water from a source with low production costs are participating in the production costs for water extraction from expensive sources. The participatory mechanism has changed over the years, but it is usually based on a levy imposed on cheap production. It should be noted that most of the wells that were disqualified for the use as drinking water, derived from the coastal aquifer - a source of which extraction is inexpensive compared to other water sources.

Assistance schemes for the extraction of low-quality groundwater

The establishment of treatment facilities to remove contaminants - assists in the removal of a wide range of pollutants. The facilities remove the contamination from the extracted water before it is supplied to consumers. Today in Israel, treatment facilities operate in a variety of technologies for the removal of pollutantsplants: reversed osmosis, selective electrodialysis, activated carbon adsorption, ion exchange and biological treatment. Such facilities have relatively high construction costs, in addition to operating costs for energy, chemicals and skilled manpower to operate these plants. In order to facilitate the construction of these plants, the Water Authority offered a financial grant for the construction as well as an exemption for 10 years from the payment of levies for water production.

This method ensured a fixed amount of revenues for each unit of water provided for the 10 years' period, regardless of the type of pollutant, the intensity of the contamination and the size of the treatment facility.

However, owners of large facilities that treated light-polluted water (having thus lower treatment costs) were better off. Therefore, in 2017 this issue was addressed by updating the incentive mechanism and today it is determined according to a matrix of the type of pollutant and the size of the facility. In addition, in the first three years an increased subsidy is granted - intended to ensure an accelerated capital return on constructing the infrastructure, thereby reducing the financial risk for the producer. Following the cancellation of the levies in 2017, the benefit is being made compared to the cost of supplying alternative water without treatment. Today, 45 private treatment plants produce about 25 million cubic meters of high quality water per year. The cost of this subsidy for the government is NIS 90 million (about USD 25 million) per year.

Dilution plants - for high levels of chloride and nitrate in drinking water, it is possible to obtain approval for diluting various water sources, provided that the final mix meets the required quality. Where a water source with a low concentration of pollutants is nearby, a dilution system can be created accordingly. The cost of dilution systems is usually lower and insignificant in comparison to installing a treatment facility. In order to facilitate the construction of dilution facilities, the Water Authority offers exemptions from the production levy in an amount that is equal to the cost of constructing this infrastructure. After the construction period, assistance is provided at a low rate of 0.15 NIS (about USD 0.04) in order to stimulate further production. Currently, 40 wells – that are operated by private production companies - are currently connected to dilution nodes, which produce about 12 million mcm of high quality water per year. The subsidy cost is approximately 7 million NIS (about USD 2 million) per year.

Summary

Economic incentives combined with the appropriate regulation ensure a continuous functioning of groundwater wells for drinking water, even with a deteriorating water quality in aquifers. The conservation of such system contributes to the ability to utilize the aquifer as a sustainable water source, preserve secure water supply to consumers and reduce the economic cost of water production.