Report of the State Comptroller of Israel | November 2024

The Water Authority

Regulation and Oversight of Seawater Desalination Facilities

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Background

According to the June 2023 projections of the Water Authority (Israel's governmental authority for water and sewage), the supply of natural water[1] in Israel is expected to decrease by 2050 (from 1,278 MCM in 2022 to 886 MCM in 2050), while the demand for freshwater[2] is projected to rise (from 1,776 MCM in 2022 to 2,727 MCM in 2050), in line with the anticipated population growth in Israel.

One of the primary methods for increasing water supply is seawater desalination. According to the Water Authority's forecasts, the production capacity of desalinated water is expected to increase from approximately 596 MCM per year in 2022 to a target of approximately 1,700 MCM by 2050.

Desalinated water is produced in desalination facilities, absorbed by Mekorot Water Company Ltd. (Mekorot) from various desalination plants, transferred to its national water supply system, and distributed to its various customers. In 2022, the state purchased desalinated water from the desalination plants for approximately NIS 1.5 billion.

1 Including groundwater and water from surface sources, such as the Sea of Galilee, springs, and streams.

2 High-quality, toxin-free water that is safe for human consumption.

Key Figures

5 plants

5 major seawater desalination plants in Israel as of the audit's conclusion: Palmahim, Hadera, Ashdod, Ashkelon, Sorek A

For over 13 years

the Water Authority has not completed the preparation of a master plan for the water sector, nor has it submitted it for approval by the Water Authority Council (the Council) or the government, as required by the 2010 government resolution[3]

18 High turbidity events

necessitated halting the water supply from a desalination plant in 2023; however, due to the desalination plant operator's failure to report, supply was not halted as required

1,700 MCM

The planned desalinated water production capacity according to the Water Authority by the year 2050. As of the audit's conclusion, the production capacity established in the concession agreements of the five largest seawater desalination plants in Israel was approximately 596.4 MCM

33%

of the freshwater provided in 2022 came from desalination plants

14 incidents

of seawater contamination that resulted in production halts at desalination plants were reported between 2007 and the audit's conclusion. Of these: 8 incidents were caused by microbial contamination, 4 resulted from fuel and oil pollution, and 2 were due to water turbidity during storms and an earthquake

At least once a year

Frequency required for audits of desalination plants under Ministry of Health regulations. However, in the years 2018–2023, no audits were conducted at any desalination plant by the Ministry of Health, as required

NIS 1.5 billion

In 2022, the state paid approximately NIS 1.5 billion to desalination plants for the water it purchased. In 2023, the Desalination Administration imposed agreed-upon compensation of approximately NIS 1.6 million on all desalination plant operators for water supplied that deviated from the standards set in the concession agreements

More than a decade

Of delay by the Ministries of Health, Finance, Agriculture, and Energy, as well as the Water Authority, in implementing public health regulations regarding the establishment of a pilot facility. The conclusions from its operation are intended to determine the feasibility of adding magnesium to desalinated water

3 Government Resolution 2348, Principles for Managing Israel's Water Sector (October 24, 2010).

Audit Actions

From August to December 2023, the State Comptroller's Office examined the regulation and oversight of desalination plants by the Ministry of Health, the Desalination Administration, and the Water Authority. The audit included, *inter alia*, regulation related to desalination plants, inspections and audits conducted by regulators, enforcement measures, incidents of seawater contamination, the addition of magnesium to desalinated water, forward-looking planning of the desalination sector, and preparations for the expiration of concession agreements at desalination plants. The audit was conducted at the Ministry of Health, the Desalination Administration, the Water Authority, the Ministry of Finance – Accountant General's Division, and Mekorot. Supplemental examinations were conducted at the Hadera and Sorek A desalination plants.

Key Findings

Master Plan for the Water sector – Despite more than 13 years having passed since the 2010 government resolution, and despite repeated remarks by the State Comptroller to the Water Authority in October 2012, October 2015, October 2018, and October 2020 regarding the absence of a master plan for the water sector, as of the audit's conclusion, the Water Authority had still not completed preparation of a master plan. Furthermore, it had not submitted the plan for approval by the Water Authority Council or the government, as required by the 2010 government resolution. The failure to complete the master plan for over a decade, particularly given the need for long-term planning in the desalination sector, could hinder the management of the water sector. As stated by the State Comptroller in 2018: "Such a plan would enable the water sector to be managed sustainably, help avoid future crises, outline policy, and establish priorities for the water sector in the coming years".[4]

Approval of a Long-Term Development Plan for the Desalination Sector Through 2050 – In June 2023, the Water Authority presented the Water Authority Council with the long-term production needs for the desalination sector through 2050. However, as of the audit's conclusion, the Water Authority Council had not yet approved the proposed long-term development plan for the desalination sector through 2050. Approving a development plan through 2050, and even beyond, is essential for

4 State Comptroller, **Annual Report 69A** (2018), Planning and Management of the Water Sector, p. 7.

continuing planning efforts to advance the establishment of desalination plants and to remove statutory barriers, if any, as early as possible.

- **Seawater Contamination at Intake Points –** Contaminated seawater can reach the intake points of desalination plants, polluting the raw water and potentially affecting desalinated water quality. Additionally, contaminated seawater can damage desalination facilities and lead to production halts. From 2007 until the audit's conclusion, 14 seawater contamination incidents resulted in production halts at desalination plants. These production halts lasted from several hours to up to five days. The reasons for the production halts were test results that included microbial contamination, fuel and oil pollution, and turbidity. Microbial contamination of seawater could result, among other factors, from the discharge of wastewater and effluents into rivers or directly into the sea. The Hadera, Sorek A, and Palmachim desalination plants together supply approximately 62% of the desalinated water. When combined with the Sorek B desalination plant, located near Sorek A and expected to begin operations in 2024, these facilities will provide approximately 72% of the desalinated water. The Sorek A, Sorek B, and Palmachim desalination plants are located near the mouth of the Sorek River, and the Hadera desalination plant is located near the Hadera River. According to Water Authority documents, surplus effluents and raw sewage are discharged into these rivers, particularly during periods of heavy rainfall, increasing the risk of raw water contamination. Despite this, as of the audit's conclusion, the Water Authority and the Ministry of Environmental Protection had not yet found solutions to prevent the discharge of sewage and effluents into these rivers.

- **Load Shedding at Desalination Plants –** The concession agreements and the arrangements with desalination plant operators regarding load shedding – namely, the cessation of electricity supply to a plant to regulate electricity consumption in the power grid – do not grant the Water Authority or the Desalination Administration explicit and unequivocal authority to approve or prevent operators from participating in load-shedding agreements whenever Noga – The Electricity System Operator Ltd. (Noga) proposes such an arrangement. Similarly, they are not explicitly authorized to issue directives on prioritizing load shedding among desalination plants based on operational or other considerations. This is beyond the general authority to issue any directive intended to ensure the implementation of the desalination agreement, which could be subject to interpretation in specific cases where the Water Authority might demand that operators refrain from participating in load-shedding arrangements. Thus, in situations where the water sector approaches its limits of supply capacity – such as the load-shedding event at desalination plants on June 2, 2023, during which load shedding occurred at several major desalination plants simultaneously, resulting in their operations being halted for several consecutive hours, the Water Authority and the Desalination Administration did not prevent the operators from implementing the load-shedding arrangements. The explicit and unequivocal regulation of authority is of heightened importance in emergency scenarios, such as security threats, that could disable

desalination plants, whether due to direct damage to the facilities or disruptions to their electricity supply.

- **Climate Change Preparedness –** It was found that the Ministry of Health has yet to conduct the survey it deemed necessary regarding algal toxins and other toxins released into the water by invasive species, given the climate crisis, which may harm the raw water quality of desalination plants. This risk is partly due to the proliferation of these invasive species in the Mediterranean Sea.

- **Supervision, Monitoring, and Reporting on Water Quality –** Although the procedure for supervising water suppliers stipulates that desalination plants with a production capacity exceeding 30 MCM should be inspected at least once a year, in practice, from 2018 to 2023, the Ministry of Health failed to conduct annual inspections at any desalination plant as required by the procedure. Furthermore, the Ministry of Health's central office lacks reports from the regional offices on the execution of these inspections.

- **Random Spot Checks of Water Quality by the Water Authority and the Desalination Administration –** A review committee appointed by the former-Minister of Energy in May 2019, following prolonged deviations in water quality at the Sorek A desalination plant (the Review Committee), determined, among other findings, that the state had not sufficiently utilized its tools for conducting random spot checks of water quality. The Review Committee recommended, among other measures, that the Desalination Administration conduct "proactive, high-frequency, and variably-timed inspections of product quality at desalination plants." The audit found that, despite more than four years having passed since the submission of the Review Committee's recommendations, as of the audit's conclusion in December 2023, the Water Authority had not conducted random spot checks at a "high frequency", as recommended by the Review Committee. The Water Authority informed the State Comptroller's Office that, after the audit's conclusion, random spot checks had commenced at all desalination plants, with the sampling frequency increasing to approximately ten samples per month at each facility. Additionally, despite the advantages of using an automatic sampler, which enables random spot checks at any time of day without being constrained by the working hours of Desalination Administration personnel, it was found that, as of the audit's conclusion, the Desalination Administration had not installed remote automatic samplers at four of the five largest desalination plants. Physical access was still required for conducting random spot checks at these facilities.

- **Enforcement by the Ministry of Health –** It was found that in all five examples reviewed in the audit– failure to report that the product water tank at Desalination Plant D was open to hazards, such as bird droppings found inside it; reporting violations by Desalination Plant B, noted by the Ministry of Health in 2022 and 2023; failure of Desalination Plant C to immediately report a diesel fuel spill near the desalination plant in October 2020; a delay in Desalination Plant D's immediate reporting of a malfunction

in May 2023 that caused an increase in turbidity levels in the supplied water; and failure of Desalination Plant C to immediately report multiple events in which operations were halted for more than 12 hours, including failure to report on return-to-normal procedures. In these cases, the operators did not fulfill their obligation to report malfunctions, irregular phenomena, or deviations from threshold values immediately after discovery; nor did the Ministry of Health implement enforcement measures, such as filing indictments, and settled for holding discussions with the operator and sending correspondence clarifying that the operator did not act as required and outlining the necessary action to be taken. It should be noted that the current enforcement tools available to the Ministry of Health, such as imprisonment or fines, require criminal proceedings, which may take considerable time and do not provide effective deterrence against violations of the reporting obligations. Failure to meet reporting obligations to the Ministry of Health may impair the Ministry's ability to instruct the operator to take action to ensure the quality of water supplied from the desalination plant and prevent risks to public health.

- **Enforcement Measures by the Desalination Administration** – In 2023, 18 high-turbidity incidents occurred at Desalination Plant B, which required, in addition to reporting to the Ministry of Health, halting the supply of water from the plant. However, the operator reported only a portion of these incidents, only after being asked to do so, and failed to halt the water supply from the plant as required. Although under the concession agreement, the Desalination Administration was entitled to demand agreed-upon compensation from the operator for each of the 18 incidents in 2023 where turbidity levels exceeded the permitted thresholds outlined in the concession agreement, as well as the levels requiring reporting to the Ministry of Health that were not reported in a timely and proper manner, amounting to several hundred thousand shekels, it ultimately demanded compensation of only several tens of thousands of shekels. The Water Authority responded to the State Comptroller in May 2024 that, in the Desalination Administration's professional judgment, the range of remedies implemented was balanced and provided an adequate response to these incidents. The operator informed the State Comptroller in July 2024 that the plant had begun operating concurrently with planned rehabilitation work aimed at addressing the turbidity issue, which is expected to be resolved once the rehabilitation is completed.

- **Agreed-Upon Compensation for Water Quality Violations –** The revenue of desalination plant operators from state water purchases amounted to approximately NIS 1.5 billion in 2022, for 540 MCM supplied from desalination plants that year. The audit found that the agreed-upon compensation amounts imposed by the Desalination Administration on operators for water supplied at quality levels not meeting the thresholds set in the concession agreements are low, and do not provide effective deterrence. For example, the total agreed-upon compensation imposed by the Water Authority on all operators from 2018 to 2023 ranged from approximately NIS 0.35 million in 2018 to approximately NIS 1.6 million in 2023. Low compensation amounts may fail

to deter operators from violating concession agreements, raising concerns that an operator might, for cost-benefit reasons, prefer to pay the agreed-upon compensation rather than ensure water quality compliance as stipulated in the agreements. In the absence of compensation amounts that serve as an effective enforcement measure, the quality of water supplied to the national water system could be compromised. However, it should be noted that agreed-upon compensation amounts have increased compared to those stipulated in the concession agreements for the first desalination plants.

Failure to Implement a pilot for Adding Magnesium to Product Water – Although the regulations stipulated the Establishment of a pilot facility to examine the feasibility of technologies for adding magnesium to water, aimed at obtaining reliable results regarding the feasibility of various technologies by September 2018, the Ministry of Health, Ministry of Finance, Ministry of Agriculture, Ministry of Energy, and the Water Authority – whose representatives were required by the regulations to participate in a steering committee to determine the framework for the pilot facility – did not significantly advance its establishment, and there is no projected timeline for its commencement. This is despite the Ministry of Health's position that adding magnesium to desalinated seawater is necessary.

Palmachim Desalination Plant – Preparation for Concession Expiry – Despite the concession for the Palmachim Desalination Plant being set to expire in 2029, the lengthy period required to establish a desalination plant, and the significant complexity involved in preparing for the concession's expiry – stemming from the private ownership of both the long-term lease rights to the land and the plant itself – no significant proceedings had been conducted as of the audit's conclusion by either the Accountant General's Division or the Desalination Administration with the landowners or the plant owners to reach agreements on the concession's termination.

Preparation for the Concession Expiry of the Ashkelon Desalination Plant – As of the audit's conclusion, the Water Authority had Begun preparing for the concession expiry of the Ashkelon desalination plant in May 2027. Among other steps, it initiated statutory procedures to upgrade the plant and expand its production capacity.

Key Recommendations

- It is recommended that the Water Authority complete the master plan for the water sector, submit it for approval by the Water Authority Council, and, once finalized, present it for government approval, as required by the government resolution. It is further recommended that the Water Authority Council work to approve a long-term development plan for the desalination sector, at least through 2050, in line with its policy, and consider making decisions regarding an even longer planning horizon.

- It is recommended that the Water Authority explicitly and unequivocally define its authority to approve or prevent the implementation of load-shedding arrangements, including considerations related to the operational and managerial needs of the water sector. This should include requiring desalination plant operators to seek its approval for implementing load-shedding arrangements. For example, this authority could be established in future agreements with the operators or through regulatory procedures under the Water Regulations. If the Water Authority believes that its general authority under the Water Law to ensure continuous water supply permits it to prevent operators from participating in load-shedding arrangements based on operational and water sector management considerations, it is recommended that a clear and approved position on this matter be adopted. This position should be sanctioned by the Water Authority Council and publicized, including a requirement for operators to seek approval for any activation of load-shedding arrangements, ensuring that such authority can be exercised immediately when needed. Until the expiration of the current concession agreements, it is recommended that the Water Authority establish a solution requiring operators to seek its approval for load-shedding arrangements during the term of the agreements. This could be achieved through procedures, mutual agreements, or other mechanisms. Additionally, it is recommended that the Water Authority present this issue for discussion by the Water Authority Council.

- It is recommended that the Ministry of Health's headquarters and regional offices supervising desalination plants develop a multi-year inspection plan for each desalination plant and that the headquarters monitor its implementation. It is further recommended that the Ministry of Health establish criteria for the frequency of routine inspections required at the various desalination plants, beyond the minimum frequency of once per year, based on the experience gained from supervising the operators. Additionally, it is recommended that the Ministry of Health instruct the regional offices to conduct microbial and chemical laboratory tests as part of their inspections, monitoring, and supervision of desalination plants.

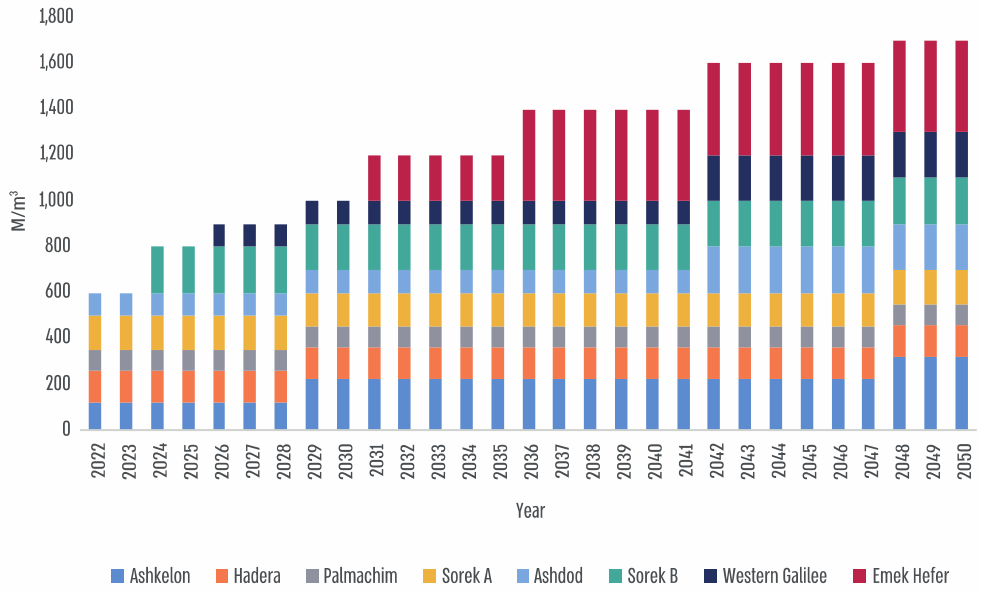
- It is recommended that the Water Authority act without delay to implement the Review Committee's recommendation to conduct high-frequency spot checks. To enable spot checks at any time using an automatic sampler, it is further recommended that the

Desalination Administration promote the deployment of automatic samplers at each of the major desalination plants, and prepare for the installation of automatic samplers at desalination plants planned for construction in the coming years, such as the Sorek B and Western Galilee plants.

It is recommended that the Ministry of Health initiate a legislative process to establish appropriate and effective enforcement powers in cases where desalination plant operators violate reporting obligations. These powers could include the authority to impose administrative fines or financial penalties. It is further recommended that the Desalination Administration utilize all enforcement measures at its disposal in cases of non-reporting of deviations, to achieve effective deterrence and prevent recurring instances of non-reporting and repeated supply of non-compliant water to the national water system.

It is recommended that the Ministry of Health advance an amendment to the Public Health Regulations to establish an updated schedule for the pilot facility's development and a decision on the addition of magnesium to desalinated water, including the method of financing its implementation. It is further recommended that the Ministry of Health, the Water Authority, the Ministry of Finance, the Ministry of Agriculture, and the Ministry of Energy complete the establishment of the pilot facility in order to assess the feasibility of various technologies for adding magnesium to desalinated water and reach a decision on the matter. Additionally, it is recommended that during the interim period – until a decision is made regarding the addition of magnesium to desalinated water – the Ministry of Health should publish information for the public regarding the absence of magnesium in desalinated water, the potential effects of this deficiency, and dietary or alternative recommendations to address it. This is intended to promote public health and prevent illnesses that could endanger human life.

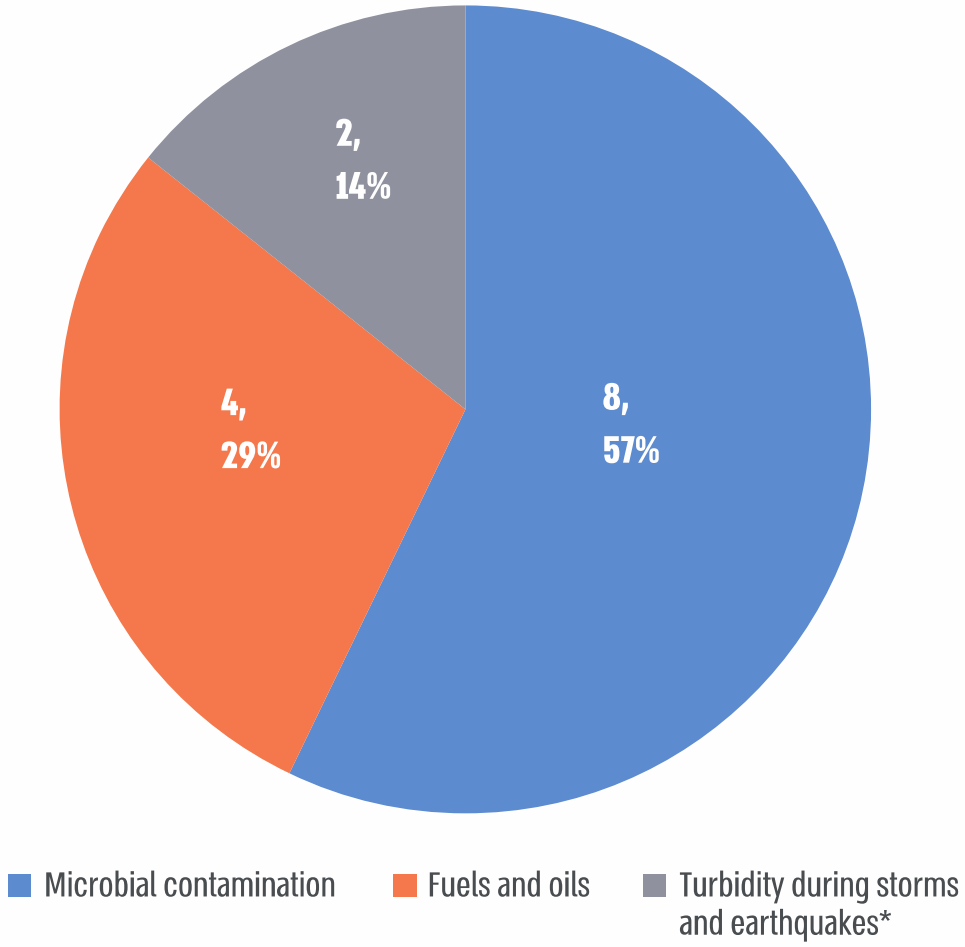
Planned Desalination Capacity Through 2050 According to the Water Authority's Forecast*



Source: Water Authority presentation, presented to the Council in June 2023.

* As of the audit's conclusion, the Sorek B and Western Galilee desalination plants were under construction, whereas the Emek Hefer plant was in the planning stage.

Contamination Incidents that Caused Production Halts as Directed by the Ministry of Health due to Raw Water Quality, by Type of Contamination, 2007–2023



Based on documents from the Water Authority and the Ministry of Health, processed by the State Comptroller's Office.

* In turbidity events caused by storms and earthquakes, microbial deviations were detected in the raw water.

Summary

According to the Water Authority's forecasts from June 2023, the supply of natural water is expected to decline by 2050, while the demand for freshwater is anticipated to increase in line with the projected population growth in Israel. One of the primary methods for increasing water supply is seawater desalination.

Within the next decade, the concession agreements with two desalination operators, whose facilities have a combined production capacity of 205 MCM under these agreements, are set to expire. The Accountant General's Division in the Ministry of Finance and the Desalination Administration must begin preparing now for the end of these concessions, particularly regarding the Palmachim facility. Due to the complexities arising from the private ownership of the long-term lease rights to the land and the private ownership of the desalination facility itself, decisions regarding its continued operation and expansion are not solely in the hands of the state. The Accountant General's Division and the Desalination Administration must address the matter and make decisions well in advance. Delaying such decisions could result in a constrained timeline that forces rushed actions and a less-than-optimal decision-making process. This, in turn, could increase the costs passed on to consumers through water tariffs.

The Ministry of Health, the Water Authority, the Accountant General's Division in the Ministry of Finance, and the Desalination Administration must address the deficiencies identified in this report. It is recommended that the Ministry of Health, the Water Authority, the Accountant General's Division, and the Desalination Administration conduct a structured process of lessons learned based on the findings highlighted in this report, and the experience gained thus far from engagements with desalination operators. This process should cover various aspects, such as enforcement measures, agreed-upon compensation amounts, incentives, required inspection frequencies, performance indicators, threshold values under agreements, and compliance with reporting obligations. The conclusions from this structured lessons-learned process could serve as input for decisions regarding the terms of future agreements with operators who will manage desalination plants after the current concessions expire, as well as for additional desalination plants to be established in the future, including their regulation and supervision.