Research Office
Legislative Council Secretariat

Fact Sheet

Seawater desalination in Israel

FS08/14-15

1. Introduction

1.1 Israel is located in the Middle East with a total land area of 22 000 sq km and a population of about 8.3 million. The country is almost entirely comprised of drylands [1], with 60% of its land area covered by the Negev Desert in the south. Faced with limited fresh water supply from natural sources and increasing water consumption, the Israeli government has relied heavily on seawater desalination as a means to provide an alternative and reliable source of potable water for local population. This fact sheet aims to provide the Panel on Development with information on water supply management in Israel, with special reference to the development of large-scale desalination plants in recent years.

2. Water supply management in Israel

2.1 In Israel, the Ministry of National Infrastructure, Energy and Water Resources is responsible for the management of water, energy and other natural resources of the country. Specifically, the Ministry has established the Water Authority as its executive arm for the regulation and management of water resources, including seawater desalination, development of new water resources, preservation of natural water resources, and monitoring of water quality.

2.2 In Israel, water supply falls under the responsibility of Mekorot, a government-owned water company. Founded in 1937, it supplies Israel with 80% of its drinking water and operates a cross-country water supply network known as the National Water Carrier. Mekorot and its subsidiaries have partnered numerous countries in desalination and water management projects.

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[1] Most of Israel is in a semi-arid zone, with distinct short winter (wet) and long summer (dry) seasons, and a low annual rainfall.

2.3 Water scarcity has always been a major concern in Israel. Amid very little rainfall, fresh water from natural sources primarily comes from Lake Kinneret (the only fresh water lake in Israel) and two aquifers.[2] Increasing population, industrial development and agricultural growth have in recent years exerted much pressure on the country's limited natural water resources[3]. Against the above, the Israeli government has adopted an integrated approach to achieve an optimal balance between water demand and supply to support sustainable development in Israel.

2.4 On water supply management, the Israeli government launched a nationwide seawater desalination master plan in 1997 in response to consecutive years of serious drought and over-pumping of natural water resources during the mid-1990s. A number of desalination plants were subsequently built in the 2000s to produce potable water primarily for domestic consumption. According to the Israeli government, the total annual capacity of seawater desalination plants will be increased to 585 million cubic metres ("cu m") by end-2015, accounting for about 80% of domestic water consumption in Israel[4]. Apart from desalination, the Israeli government has also adopted other water supply measures, such as regulating excessive abstraction of water from Lake Kinneret and aquifers as well as promoting extensive use of reclaimed water for irrigation purpose.[5]

3. Seawater desalination plants in Israel

3.1 As mentioned above, the Israeli government launched a long-term, large scale seawater desalination master plan in 1997. The first desalination plant, the Ashkelon Desalination Plant, began construction in 2003 and was put into operation in 2005. This was followed by the commissioning of the Palmachim Desalination Plant in 2007, the Hadera Desalination Plant in 2009, and the Sorek Desalination Plant in 2013. Another desalination plant, the Ashdod Desalination Plant, will come on stream in late 2015 with an annual production capacity of 100 million cu m.

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[2] An aquifer is an underground layer of water-bearing rock. The two major aquifers in Israel are the coastal aquifer and mountain aquifer, which are both along the Mediterranean coastline.

[3] For example, water-consuming agricultural sector grew by an annual average of 6% between 2000 and 2013.

[4] The remaining 20% comes from Lake Kinneret and the two aquifers.

[5] In Israel, water consumption originates from three major sectors – agriculture, domestic use and industrial use, with their respective shares at 58%, 35% and 7% in 2013. At present, about 70% of wastewater is recycled for irrigation in the agricultural sector. As agriculture is the largest water-consuming sector of the country, using recycled water from wastewater for irrigation helps save the limited potable water for domestic use.

3.2 The Ashkelon, Hadera and Sorek plants are currently the largest in Israel, each with an annual capacity of over 100 million cu m[6] with the adoption of the reverse osmosis technology[7] to produce desalinated water. They have been constructed under the public-private partnership arrangement, with the winning bidders awarded the contracts to design, construct and operate their respective desalination plant under a 25-year build-operate-transfer agreement. Throughout the contract period, the Israeli government purchases agreed annual volume of desalinated water from the desalination plants, and the purchase price is made up of a fixed component and a variable component varying with factors such as energy and operation costs. In 2015, the Sorek plant charges the lowest, at US$0.52 (HK$4.03) per cu m, compared with US$0.65 (HK$5.04) charged by the Hadera plant and US$0.7 (HK$5.43) by the Ashkelon plant.[8]

Ashkelon Desalination Plant

3.3 The Ashkelon Desalination Plant is located in the Ashkelon city, a southern coastal city in Israel. The plant was built at an estimated cost of US$212 million (HK$1.6 billion). It started operation in late 2005 with an annual production capacity of 120 million cu m that can meet about 16% of total domestic water consumption in Israel. The Ashkelon plant comprises two sub-plants, which are of the same production capacity and can operate independently.

Hadera Desalination Plant

3.4 The Hadera Desalination Plant is located in the northern coastal city of Hadera. It began construction in 2007 aiming to produce 100 million cu m of potable water per year. Shortly after coming on stream in 2009, the Hadera plant underwent expansion to increase its annual capacity to 127 million cu m that can meet about 17% of total domestic water consumption in Israel. The estimated total project cost, including the expansion cost, amounted to US$377 million (HK$2.9 billion).

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6 For comparison, Hong Kong has recently planned to build a desalination plant in Tseung Kwan O. The desalination plant is scheduled for completion in 2020 with an annual capacity to provide 50 million cu m of fresh water or 5% of the total fresh water supply, expandable to 100 million cu m or 10% in the future.

7 See FS07/14-15 for details of the reverse osmosis technology.

8 The purchase prices of desalinated water in Israel are not directly comparable with the estimated unit production cost of the proposed Tsueng Kwan O desalination plant (HK$12-13 per cu m) as their cost components are not the same.

3.5 The Hadera plant comprises two sub-plants, the East and West plants, which are of the same production capacity and can operate independently to ensure operation reliability. It is also designed to have an independent natural gas power plant and energy recovery devices.

Sorek Desalination Plant

3.6 The Sorek Desalination Plant is located in the Tel Aviv District, a coastal city in the central-west Israel. It was built at a cost of US$400 million (HK$ 3.1 billion)[9]. Commissioned in 2013, the Sorek plant is the largest seawater desalination facility in Israel, with an annual capacity of 150 million cu m to provide 20% of total domestic water consumption in Israel.

3.7 The Sorek plant has its own independent power plant to generate energy for operation. Excessive energy produced is sold to the national power grid. The independent power plant runs on natural gas with less carbon dioxide emission, and its fuel cost is about 7% cheaper than that of a coal-driven power system. Furthermore, the Sorek plant is designed with energy recovery devices throughout the desalination process to achieve energy efficiency.

[9] The Sorek plant is owned by IDE Technologies Ltd and Hutchison Water International Holdings Pte Ltd (a subsidiary of Hong Kong-listed Hutchison Whampoa Limited).

References

1. Central Bureau of Statistics. (2014) *Israel in Figures 2014*. Available from: http://www.cbs.gov.il/www/publications/isr_in_n14e.pdf [Accessed September 2015].

2. Egozy, Y. & Faigon, M. (2013) *The Operation Principle of the Hadera Seawater Desalination Plant and Advantages of the Pressure Centre Design*. Available from: http://www.ide-tech.com/wp-content/uploads/2013/09/The-Operation-Principle-of-the-Hadera-Seawater-Desalination-Plant-and-Advantages-of-the-Pressure-Center-Design.pdf [Accessed September 2015].

3. Israel Ministry of Environmental Protection. (2010) *State of the Environment in Israel: Indicators, Data and Trends*. Available from: http://www.sviva.gov.il/English/Indicators/Documents/StateOfTheEnvironmentInIsrael-IndicatorsDataTrends2010.pdf [Accessed September 2015].

4. Israel Ministry of Environmental Protection. (2012) Integrated Water Management. *Environment Bulletin*, vol. 38, May, pp. 18-21. Available from: http://www.sviva.gov.il/English/ResourcesandServices/Publications/Bulletin/Documents/Bulletin-Vol38-May2012.pdf [Accessed September 2015].

5. Israel Ministry of Foreign Affairs. (2011) *One of the Biggest Desalination Plants to be Built in Sorek*. Available from: http://mfa.gov.il/MFA/InnovativeIsrael/Economy/Pages/Desalination_plant_Sorek_23-May-2011.aspx [Accessed September 2015].

6. Israel Water Authority. (2010) *Sea Water Desalination in Israel: Planning, Coping with Difficulties, and Economic Aspects of Long-term Risks*. Available from: http://www.water.gov.il/hebrew/planning-and-development/desalination/documents/desalination-in-israel.pdf [Accessed September 2015].

7. Israel Water Authority. (2015a) *Water Sector in Israel – IWRM Model*. Available from: http://www.water.gov.il/Hebrew/ProfessionalInfoAndData/2012/02-Israel%20Water%20Sector%20-%20IWRM%20Model.pdf [Accessed September 2015].

8. Israel Water Authority. (2015b) *Water Sector in Israel – Zoom on Desalination*. Available from: http://www.water.gov.il/Hebrew/ProfessionalInfoAndData/2012/05-Water%20Sector%20in%20Israel%20-%20Zoom%20on%20Desalination.pdf [Accessed September 2015].

9. Lokiec, F. (2011) *Sorek 150 Million M3/Year Seawater Desalination Facility Build, Operate and Transfer (BOT) Project.* Available from: http://www.ide-tech.com/wp-content/uploads/2013/09/Sorek-150-Million-m3year-Seawater-Desalination-Facility-Build-Operate-and-Transfer-BOT-Project.pdf [Accessed September 2015].

10. Organisation for Economic Cooperation and Development. (2015) *Water Resources Allocation: Sharing Risks and Opportunities*. Available from: http://www.oecd.org/israel/Water-Resources-Allocation-Israel.pdf [Accessed September 2015].

11. Water Technology Net. (undated) *Ashkelon, Israel*. Available from: http://www.water-technology.net/projects/israel/ [Accessed September 2015].

12. Water Technology Net. (undated) *Hadera Desalination Plant, Israel*. Available from: http://www.water-technology.net/projects/hadera-desalination/ [Accessed September 2015].

13. Water Technology Net. (undated) *Sorek Desalination Plant, Israel*. Available from: http://www.water-technology.net/projects/sorek-desalination-plant/ [Accessed September 2015].

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