

## Water Technology in Israel

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# Leumi

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# Highlights

- While average annual precipitation in Israel equals 1.2bn cubic meters, average annual water consumption equals 2.2bn cubic meters. Bridging the gap is possible thanks to the development of an advanced water sector including water desalination, the use of reclaimed water for agriculture, water purification and an advanced system for water transport.
- Most water consumption around the world (60% – 70%) is absorbed by the agricultural sector. Therefore, water conservation within this sector is a primary goal for economical and efficient management.
- Approximately 80% of total wastewater in Israel is purified and reclaimed for use in agriculture. This is the highest water reclamation rate in the world.
- There is broad cooperation between Israeli companies and government agencies around the world. Through this framework, Israeli companies share their knowledge and carry out various local projects in areas around the world where water shortages exist.

**Source Material:** nrg.co.il; aqwise.com; arad.co.il; themarker.com; haaretz.co.il; Jewish National Fund; Israel Ministry of Environmental Protection; “Technological Forecast Around the Year 2030,” Department for Technological and Social Forecasting, Tel Aviv University; The Israel Export and International Cooperation Institute; Mekorot – the Israel National Water Company; Israel Ministry of Economy; TAHAL Group; “Survey on the Subject of Water Technology and Industry in Israel,” Alex Boch, Israeli Ministry of Industry, Trade, and Employment (currently the Ministry of Economy); <http://www.docdroid.net/LtFlsWa/exporting-israels-water-know-how-tahal-group-on-wwi-june-july-2015.pdf.html>; <http://www.globes.co.il/news/article.aspx?did=1001075623>

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# Water Technology in Israel

## Introduction

According to the UN, by 2050, over 40% of the world population will suffer from water shortages. Therefore, the current situation where water is perceived as an inexhaustible natural resource must change. Governments and international organizations are looking for proven and effective solutions, generating interest in Israel's water sector which is considered to be one of the world's most sophisticated and effective.

The water industry in Israel is characterized by a high level of technology and innovation. Despite, and perhaps because of, the natural shortage of precipitation and sources of water suitable for irrigation and drinking, Israel has succeeded in transforming itself into a superpower in the water industry. In contrast to the neighboring countries in the region that also must deal with water shortage problems, Israeli citizens enjoy a constant and reliable supply of potable water and farmers receive irrigation water in accordance with their needs. The creation of a stable water sector enables the various sectors within Israel – consumers, farmers, industry and others – to consume 2.2bn cubic meters of water per year, even though average annual precipitation in the country equals only 1.2bn cubic meters.

## Water in Israel

### 2.2bn cubic meters

Annual consumption of all types of water in the entire country by all sectors

### 1bn cubic meters

Annual water consumption by the agriculture sector

### 650mm - 720mm cubic meters

Annual water consumption by households

### 587mm cubic meters

Expected annual amount of desalinated water after the desalination plant in Ashdod began operation in 2015

### 400mm cubic meters

Annual quantity of reclaimed water (recycled water) used for agriculture

**TABLE 1**

Source: Ha'aretz newspaper, 2014

the world due to its development of the drip irrigation method which was invented in Israel in the 1960s. Today, Israel is also considered a world leader in the areas of water desalination, water recycling, water security (cyber) and more.

The unique characteristics of Israel, which combine the challenges of dealing with problems associated with water shortages, together with a high level of innovation, R&D investment and a developed high-

applicable research and the development of techniques and patents in water technology. In June 2015, Israel signed a cooperation agreement with the World Bank for the penetration of Israeli water technology into developing countries.

Due to Israel's success in dealing with its own water shortage, the World Bank has agreed to assist in introducing and encouraging the export of Israeli water technologies to developing countries. In addition, Israel established a national plan for advancement of the water industry and renewable energy, led by the Ministry of Economy and in cooperation with additional governmental bodies. The goal of the plan is to develop human resources within the field of water technology, support related academic endeavors and research, implement new water technologies in local markets and assist in the development of Israeli companies around the world. Currently, it is estimated that Israeli water technology exports equal US \$2bn per year. Yet in light of the water crises in many different parts of the world, Israel believes it is possible to substantially increase such exports.

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The development of this sector was made possible by the advancement and application of progressive technologies in the areas of water desalination, water reclamation for agriculture, water purification, efficient water transport systems and a constant reduction in the amount of water lost during transport. Israel's reputation as a leader in the area of water, with an emphasis on the agriculture sector, has long been recognized around

tech industry, led to many technological developments in the area of water that are used in both the local market and exported to countries around the world.

Since 2004, a center of entrepreneurship has been operating in Israel, focusing on water technology. This center, which was established by Mekorot (the Israel National Water Co.), encourages business ventures and cooperation, the writing of



## Transport and Management of Water Resources

Transport and management of water resources is one of the largest sub-sectors in the water industry, both in terms of the number of employees and in the quantity of exports. The sub-sector is composed primarily of large companies and is less characterized by start-ups. Examples of companies active in this sub-sector include the Tahal Group, Plasson Industries Ltd., Mekorot and Ham-let Ltd. Water transport in Israel is efficient, leading to minimal water loss during distribution. The importance of efficient water distribution can be further demonstrated by the situation in neighboring Jordan where in the capital, Amman, approximately 50% of its water leaks from pipes and does not reach the city residents due to poor distribution.

The success of Israeli companies in the local market led to demand for their goods and services around the world, with an emphasis on projects in developing countries. For example, the Tahal Group is working on large water management projects in Angola, Ghana and Serbia. In Angola, the Tahal Group is working on a project involving the planning and creation of agricultural

and municipal water infrastructure for an agricultural community that is being built. In Ghana, the Tahal Group is working on a project valued at US \$236mm involving the renewal and improvement of the water supply for one of the regions of the country.

infrastructure will be installed (municipal, agricultural, and industrial), with the goal of showing how it improves and makes the city's water management more efficient. If the project succeeds, it will likely pave the way for agreements with more cities in China that face similar problems.

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The recycling of water in agriculture in California is only 5%, whereas in Israel the rate equals 85%

When the project is completed, it is expected to provide potable water to more than half a million people in 50 different communities. In Serbia, Tahal is tasked with designing and building a water factory and water pump for the city of Belgrade. This project, with a three and a half year timeline, is valued at US \$67mm.

Another center of focus for Israeli technology involves the transport and management of water in China, which deals with a shortage of potable water and water pollution problems as a result of mass industrialization. Within the framework of a joint venture called "Water City," the city of Shouguang was selected as the model city in which Israeli water

Advanced countries around the world are noticing Israel's success in the field of water management and recycling. For example, in the US, the state of California is currently suffering from a severe water crisis, primarily as a result of inefficient and failed water management in agriculture. The recycling of water in agriculture in California is only 5%, whereas in Israel the rate is 85%. At a conference held last July in Israel, representatives from California attended hoping to learn from Israeli companies' technological solutions to help alleviate their water problems. The Israeli Ministry of Economy, in accordance with the Israel New Tech government plan, predict that there is likely to be a substantial increase in Israeli water technology exports as a result of future cooperation with the US.



## Water Purification and Wastewater Reuse

The shortage of natural water in Israel has compelled the country to discover methods to reduce the consumption of water and enable the reuse of water. Every year, Israel reclaims 630mm cubic meters of wastewater for agricultural purposes, which accounts for 80% of total wastewater and is the highest rate of wastewater reuse in the world. Furthermore, the cost per cubic meter of treated water in Israel is estimated at 23 cents, which is considered low and highly cost effective. The water purification sector and the reclamation of wastewater includes technology involving



the filtration and purification of water; the treatment and recycling of water; water quality improvement; the reclamation of wastewater for agriculture; the development of technology and equipment for the chemical, biological and physical treatment of municipal and industrial wastewater and sludge; the treatment of dangerous materials in water; removal of oils from water; the prevention of municipal waste from reaching water sources; the chemical, biological and physical treatment of potable water, and water for industrial purposes.

Mekorot is considered a world leader in the amount of recycled water and its quality. One notable example of this is the “Third Pipeline Enterprise” project. Mekorot established a system in the late 1980s for the purpose of purifying sewage water from the center of the country and transporting the treated water to the Negev desert region for agricultural purposes. As the water flows from the center of the country to the Negev desert region, it is subjected to technology specific to the aquifer, without it mixing with groundwater suitable for drinking. Mekorot pumps the water and supplies it to farmers in the Negev desert region in accordance with demand, enabling the farmers to enjoy the economic benefits of this system.

Another prominent example is the “Geulat Ha’Yarkon” project. The purpose of this undertaking is to create a general framework for the rehabilitation of the previously polluted Yarkon River in the Dan region. Through this project, water initially consumed in homes flows into the Yarkon River and is recycled and treated for use in regional gardening and agriculture.

Israeli developments in the field of wastewater treatment include technologies related to innovative membranes that streamline and reduce the costs of filtration and desalination processes, as well as chemical, biological and physical purification processes. In the field of chemical purification, methods can be found that utilize oxidation processes for purification. In addition, advanced solutions were developed for land salinization problems as a result of the wastewater purification process.

Chemical purification methods are effective in breaking down a wide range of organic compounds. For example, oxidation causes a breakdown of organic compounds that exist in water and converts them into carbon dioxide and water, killing pathogens and leaving the water sterile. Another chemical purification method relies on ionized plasma gas that breaks down pollutants. The bulk of research and development in this field currently focuses on improving the energy efficiency of various devices for creating plasma. The purification process through the use of plants (artificial wetlands) streams polluted water through shallow pools of water plants combined with gravel. As the water passes across this artificial wetland, chemical, biological and physical processes occur, leading to particles separating and pollutants dissolving, resulting in improved water quality.\*

One of the Israeli companies instrumental in the field of physical purification is Atlantium Technologies Ltd. They developed an instrument that transports water through a glass pipe upon which UV

rays are projected. The breakup of the rays in the pipe enables maximum purification of water from bacteria. This is an environmentally friendly process that can purify a large amount of water in a short time using a low level of energy. The market for the purification of water using UV rays has been growing in recent years, at the expense of more traditional technologies that involve the use of chlorine.

Another company active in the field of wastewater treatment is Aqwise. This company supplies solutions for increasing the effectiveness of the wastewater treatment process that enable a rapid, timely and cheaper upgrade of existing facilities while establishing new facilities with lower physical land use. Aqwise’s unique technology, Attached Growth Airlift Reactor (AGAR), combines a fully open and protected biomass carrier with a highly efficient aeration and mixing design. This results in superior effective surface area for biomass growth and optimal oxygen transfer efficiency.

Amiad Water Systems is an Israeli company active in water filtration. The company developed unique technology for cleaning filters, which uses less than 1% of water from the water process for cleaning purposes. This percentage is the lowest among the competing automated cleaning processes. Its suction-scanning technology combines focused flush with automation to provide a comprehensive cleaning of the filtration screen area. The success of this technology has established Amiad as a global leader in providing water filtration solutions.

\* Source: *The Israel Export & International Cooperation Institute*

## The Irrigation Sector and Water Equipment for Agriculture and Gardening

The global irrigation market is considered the most mature market among the markets involving water technology products, which includes monitoring facilities of computerized irrigation, use of water timers, automatic filtration devices, drip irrigation and smart sprinklers. The growth trend being experienced in this market is expected to continue in the coming years due to the anticipated increase in the global population, bringing with it a shortage of water as a result of an increase in the required amount of potable water. This shortage will require water conservation in the municipal, industrial and agricultural sectors. Moreover, water use in the agricultural sector accounts for 60% - 70% of water consumption around the world. Reducing use of fresh water irrigation will be of great importance to solving the potable water shortage.

There are three main companies in Israel today creating irrigation inputs: Netafirm, Plastro-Gvat and NaanDan Irrigation (these three companies were each acquired by overseas companies in recent years). The Israeli irrigation industry, of which 80% of its output goes to exports, accounts for 30% of the international irrigation market. Netafirm is known primarily for drip irrigation, one of the largest Israeli organizations in its field. One of the rising companies in the Israeli irrigation market is CropX, which developed a program that streamlines irrigation such that each section of a field receives the optimal composition and quantity of water and fertilizers, preventing the mismanagement of water and the pollution of land from the overuse of chemicals.

Due to its recent success, one of CropX's investors, The Innovation Endeavors Fund, decided to contribute US \$9mm in funding. Another example of Israeli

innovation in this field is from the start-up company AutoAgronom, which was bought in 2014 for US\$20m by China's Yuanda Enterprise Group. The systems developed by AutoAgronom use sensors in order to sample and conduct diagnoses of land and automatically operate the irrigation and fertilization systems in accordance with its findings such that the systems are regulated by the plant itself, rather than the estimates of the farmer.

### Control and Monitoring Systems

Guaranteeing the safety of drinking water is the basis for the prevention and control of water-borne diseases and the maintenance of public health. Drinking water is susceptible to damage and pollution by various factors such as industrially manufactured chemicals that find their way into the water system. As a result, it is necessary to monitor and treat most of the water sources and reservoirs before their use so that the water will be suitable for drinking.

Another company in this field is Blue I Water Technologies. In 2014, this company received a grant from the Israeli Chief Scientist to support the development of the water quality monitoring system called Smart LEA (Low Energy Analyzer). The system is used for independent, on-line monitoring that runs on batteries and was specifically designed to work with low energy consumption. The device can measure a variety of water quality parameters such as chlorine, acidity-pH, turbidity and conductivity. It operates with precise sensors to collect water quality data and transfers the data via a wireless network to the control center of the water network. This solution is unique, as the system requires low maintenance and the calibration is performed remotely. The Smart LEA system has garnered great interest in countries such as China and the US.

One of the largest and most well-known companies on a global level is Arad Technologies. The company has a network

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## The success of Israel's management of its water sector has led to increasing interest from around the world in Israeli technology.

Whereas most existing water monitoring products collect and present the raw data that is used for manual analysis, Israeli company, TaKaDu, created a system for monitoring and forecasting activity within water networks in a cloud environment. TaKaDu's solution provides its users with insight into glitches and other suspicious events that occur within the network in real time. The system uses this raw data - readings during each delivery, pressure gauges and water quality sensors that are installed in the water network - and transposes it with additional information such as weather and holidays, with the help of advanced statistical processing for the purpose of in-depth understanding of changes in the network behavior.

of representatives and distributors in Israel, Spain, the US and China. The company operates in the area of water gauge reading from a distance and its products are divided into four main categories: products measuring household water usage (used by various water authorities), the measurement of water transport that is used for measurement and control of transmission lines of various diameters and different technologies, products measuring agricultural usage and computerized data collection systems (AMR and DialogG3) that were developed by the Arad Technologies company intended for automatic collection and monitoring of water and electricity consumption data.



## Activity of the Jewish National Fund (JNF) in the Water Sector

The Jewish National Fund (JNF) advances a number of water related projects across Israel.

**Reservoirs** — the JNF has built 230 reservoirs across the country where water is collected and then transferred to fields and orchards.

**Fight against desertification** — the JNF has acquired worldwide recognition for its expertise in fighting desertification. Thanks to special planting techniques that are intended to make efficient use of water, JNF foresters have succeeded in planting forests in places where no one had thought possible. For this reason, Israel is the only country in the world where there are more trees today than there were 100 years ago.

**Constructed wetlands** — artificial wetlands are shallow pools with local flora that imitate the activity of natural wetlands. The facility serves as a habitat for the growth of bacteria, which breaks down traces of pesticides, hormones and chemicals and improves water quality.

**Water purification through bio-filters** — approximately 200mm cubic meters of rain water is wasted each year in Israel and washed into the sea. Toxic substances from city streets are swept away with the runoff water, polluting the coast of Israel. The idea behind using bio-filters is the utilization of the runoff water. A bio-filter facility includes a number of layers. The top layer is covered with plants that help to purify the water. Within the lower sealed oxygen layers, bacteria evolves encouraging the purification processes. A purification facility using bio-filters has been set up in Kfar Saba.

## Summary

The water shortage problem that Israel has had for most of its existence has led to the development of advanced technologies that promote efficiency and water conservation. Today, after the construction of desalination plants along the coast of Israel, the Israeli water sector enjoys a surplus supply of water. The success of Israel's management of its water sector has led to increasing interest from around the world in Israeli technology: desalination facilities, water recycling, transport, irrigation monitoring, and even water security (cyber) are all areas in which Israel is considered a world leader.

The water crisis that engulfs many countries including, among others, parts of the US and China, are increasing interest in Israeli water technology. It can be assumed that in the coming years a substantial increase is expected in the export of these technologies.

Wastewater projects in the US are likely to be the biggest driver of spending growth over the next years as efforts continue to upgrade the nation's aging sewer systems. This will present an opportunity for Israeli companies to take part in the projects. It is estimated that the US is losing approximately 30% of its water due to leakage of sewage. In China, India and countries in Southeast Asia, significant assets will also be invested in water technology in the coming years.

The WATEC conference held in mid-October 2015 in Tel Aviv focused on the environment and water innovation in Israel. Many specialists from Israel and around the world participated in the conference. The latest developments from the field of water technology were presented alongside efforts to advance cooperative activities and new business endeavors, serving to boost Israel's presence in the global water technology market.



# Leumi Water

## The Leumi Group

Leumi is part of the Leumi Group, one of the largest banks in Israel and a major influence and contributor to Israel's economic and industrial development since the bank's establishment in 1902. With total assets under management of over \$311 billion, the Leumi Group serves as a gateway for investors and businesses worldwide, providing unparalleled access to Israeli-generated products and research for our private banking clients, and strong foreign exchange and trade finance capabilities for our commercial banking clients. Working with Leumi, these global advantages become yours as well.

## About Us

Leumi is a full-service commercial and private banking institution providing financial services to middle and upper-middle market firms, as well as a full range of private banking solutions to domestic and international clients. Leumi also offers a broad range of securities and insurance products through its brokerage subsidiary, Leumi Investment Services Inc. Leumi in the U.S. has a BBB+ rating from S&P.

## The Changing Water Landscape

Water has always been a precious commodity, but a rising population and increased demand for both clean drinking water and crop irrigation has become a challenge. Coupled with outdated infrastructure and changing regulations for water quality, water and its related industries are fast becoming a focus in U.S. This landscape is changing dramatically and technological disruptions are at the crux for both new and existing market players.

## Leumi's History with Water

Over the last few decades, Israel's booming high tech field has focused on water technologies and innovations. Israeli companies have become world leaders in water transformations. Israeli companies have been at the forefront of water purification and wastewater reuse for agriculture, efficient water transport, seawater desalination, and conservational water irrigation. The companies engaged in these sectors are active both in Israel and globally.

## The Power of Partnership

The Leumi Group has been a driving force behind Israel's economic and industrial development, including breakthrough progress in water-related infrastructure and technology. The Leumi Group has been active in the water space for over 30 years, keeping up with the latest trends, innovations and research, and has developed partnerships with solution providers in the industry. Leaders in the field have trusted us with providing the financial services and products they need to build and run successful multinational enterprises.

## Relationship Banking

As a middle market bank we have a dedicated team of local professionals and offer a boutique relationship management approach focused on solutions tailored specifically for our clients. We leverage our global expertise in the water sector to partner effectively with you to structure the best solutions for your needs, along with guidance and support to help you navigate through different economic environments. Leumi is well positioned to facilitate US market entry for international companies and international expansion for US based companies with our full range of products and solutions.

So whether you require a refinance of existing debt, working capital facilities, treasury services, or funds to acquire a new facility, you can count on us to deliver complete financing solutions to meet your specific needs.

Leumi is a member of AWWA and WEF.

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America must spend \$255bn in the next five years  
to prevent deterioration of water infrastructure.  
We plan to spend half that amount.

— Seth M. Siegel, "Let there be water"

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