The Journey of Desalination in the Kingdom of Saudi Arabia


أمانة مدينة الرياض
سد وادي نمار
أنشئ في عام ١٣٧٩هـ

المؤسسة العامة لتحلية المياه المالحة
Saline Water Conversion Corporation (SWCC)

The Journey of Desalination in the Kingdom of Saudi Arabia

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بسم الله الرحمن الرحيم

وجعلنا من الماء كل شيء حي

In the name of God,
the most gracious, the most merciful

"And We have made from the water every living thing"

Al-Anbiyā':30

King Abdulaziz bin Abdul Rahman Al-Saud

Founder of The Kingdom of Saudi Arabia

Custodian of the Two
— Holy Mosques —

King Salman
bin Abdulaziz Al-Saud

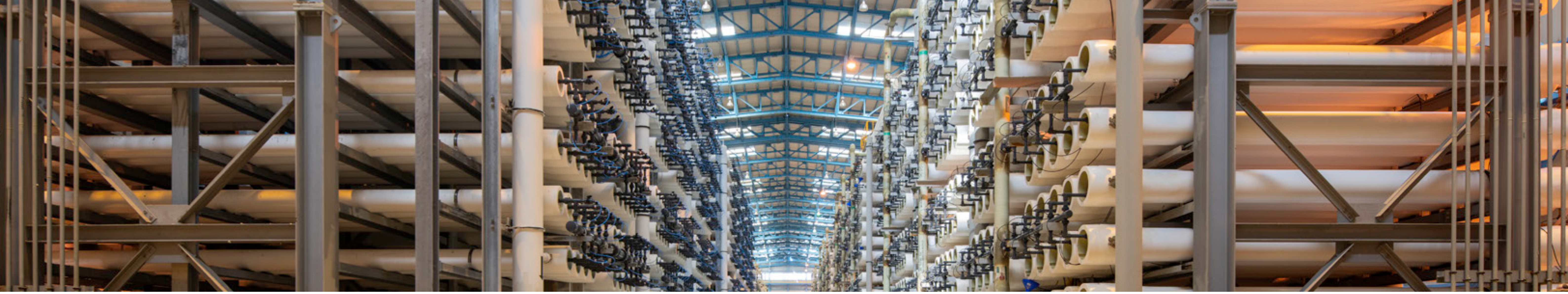
King of Saudi Arabia

His Royal
— Highness —

Prince
Mohammed bin Salman

The Crown Prince, Prime Minister

Contents



Introduction

Water is an important element of life, its artery and essence; it is a great blessing from the Almighty Creator so that humans, animals, and plants can live on this earth. For this reason, there has been great conflict over water among individuals, tribes, and nations.

Water has thus been a major factor in the settlement, endurance, and fame of nations. To be located on a water resource enables a country to meet its needs, feed its economies, and help its agriculture to flourish.

It was the fate of the Arabian Peninsula to be a land without rivers, relying for its water on rains that fall one year and are scarce the next, and on valleys (wadis) and wells that are not sufficient to meet its needs and that may dry up at any time.

Therefore, the Imams of the First and Second Saudi States realized the importance of creating water reserves by renovating existing wells and digging more. Some even tried to introduce modern machinery to extract water from the ground using modern methods.

When King Abdulaziz retook Riyadh, one of his objectives was to provide the citizenry with water by digging additional wells and providing all necessary means to extract water, as he realized its importance to nation-building and human survival and its role in the prosperity and advancement of his homeland.

The year 1964 saw the introduction of many ideas for a permanent and sustainable solution to water distribution in the Kingdom, following its transformation into a vibrant nation of flourishing factories and projects, expanding cities and villages, that made it an attractive destination for people from all over the world.

Many solutions were proposed; among them was a modest proposal based on desalinating seawater. One of the justifications was that Saudi Arabia is located between two large water sources, namely the Arabian Gulf and the Red Sea, which could benefit the renaissance of industry, agriculture, and all aspects of life in the country.

The implementation of this idea was launched through a small office in the Ministry of Agriculture and Water called "Saline Water Desalination." This was headed by His Royal Highness Prince Muḥammad al-Faisal, due to his experience and research in the field of seawater desalination. Nevertheless, other ideas were still being put forward to solve the problem of the water shortage in the Kingdom.

The office proceeded to implement this modest proposal and turn it into reality. It established one plant after another, and water networks spread to cover the major cities. Before two decades had elapsed, this modest idea had transformed into a vast project, which impressed people with its achievements in delivering water to farms on valley floors, houses on the slopes of mountains, and settlements deep in the desert. These were major successes, and the small office became a public water desalination corporation with numerous branches.

At first, the results achieved were modest, but over the years and decades they grew to figures that would give every citizen the right to be proud of the achievements of their country and its leaders. The barren desert became a water network supplying every individual, factory, and field from the east of Saudi Arabia to the west, and from the north to the south, over a vast area exceeding two million km^2.

The leaders of Saudi Arabia made major efforts to support this SWCC and help it achieve all its goals, projects, and plans, as they could observe the steady growth in its work and projects. Due to their support, it achieved continuous successes that were admired by all.

The SWCC was headed by a succession of individuals who led it to the front rank among its counterparts around the world, with its large facilities, its numerous plants, the precision of its implementation, and the speed with which it completed projects. As a result, it received international awards that affirmed the tremendous achievements made by the SWCC and its staff for the sake of the nation's prosperity and the well-being of its citizens.

Fifty years after the establishment of the Saline Water Conversion Corporation, we document its history of achievement, which deserves to be written in golden ink. Its successes and its history are inspiring.

دارة الملك عبدالعزيز
KING ABDULAZIZ FOUNDATION
FOR RESEARCH AND ARCHIVES

Timeline of Notable Events in the SWCC's History

- **1907** — A coal-powered seawater distillation machine is put into operation in Jeddah; it is known as *al-Kandāsa*, derived from the word "condenser"
- **1926** — King Abdulaziz orders the importation of two seawater distillation machines to support the water sources in the city of Jeddah
- **1964** — Prince Muḥammad al-Faisal proposes seawater desalination, among several other ideas, including taking water from nearby rivers and the importation of icebergs
- **1967** — An office for water desalination is established at the Ministry of Agriculture and Water, with Prince Muḥammad al-Faisal appointed as head of the office
- **1968** — The Office becomes the General Water Desalination Directorate
- **1969** — The first two single-purpose desalination plants, which produce only water, are put into operation in the cities of al-Wajh and Duba
- **1970** — The first dual-purpose desalination plant, which produces both water and electricity, is put into operation in Jeddah
- **1972** — The Directorate is transformed into the Agency for Water Desalination Affairs at the Ministry of Agriculture and Water
- **1973** — The first single-purpose desalination plant is put into operation in the city of al-Khobar on the coast of the Arabian Gulf, and the first water Transmission system is established to feed the cities of the Eastern Region
- **1974** — Royal Decree No. M/49 is issued on September 6, 1974, establishing the Saline Water Conversion Corporation (SWCC), with its main headquarters in Riyadh
- **1978** — The SWCC assumes responsibility for the operation and maintenance of its own projects. The Jeddah reverse-osmosis (RO) plant is put into operation, one of the first seawater desalination plants of its kind in the world
- **1981** — Yanbuʿ Plant I and the Yanbuʿ–Madinah Water Transmission System I, the first to supply Madinah, are put into operation
- **1982** — Establishment of the Training Center in al-Jubayl
- **1983** — The al-Jubayl II plant, the largest dual-purpose desalination plant in the world at the time, and the al-Jubayl–Riyadh (A.B) water transmission system, the first closed-water transmission system in the world, are put into operation
- **1987** — Research and Development Center established in al-Jubayl
- **1989** — The Shuʿayba plant, Phase I, and the Shuʿayba water transmission system (A.B) are put into operation, the first to supply Makkah and the Holy Sites
- **2002** — The Supreme Economic Council issues a decision approving the participation of the private sector in establishing, operating, and owning water desalination projects
- **2008** — The first floating plant (on a barge) is put into operation
- **2015** — The Ras al-Khayr plant, currently the largest (dual-purpose) water desalination and electricity generation plant in the world, is put into operation
- **2018** — The SWCC's production increases from 3.5 million m³ to 5 million m³/day, without a rise in costs
- **2018** — Establishment of the Dispatch Center, which monitors water production, transmission, storage, and distribution plants
- **2022** — Daily production capacity increases to 6.6 million m³, making SWCC the largest desalinated water producer in the world
- **2022** — The largest floating water desalination plant in the world is put into operation
- **2022** — Council of Ministers Resolution No. 400 is issued, assigning the establishment, operation, maintenance, and construction of reservoir water and groundwater purification plants to the SWCC
- **2022** — The SWCC achieves a record production of 11.5 million m³/day
- **2024** — issuance of a resolution by the Council of Ministers, chaired by the Custodian of the Two Holy Mosques, No. 918 dated May 7, 2024, transforming the Saline Water Conversion Corporation into a body named the "Saudi Water Authority," which will regulate water services.

Achievements in Numbers

99.2%

The capacity factor for production plants is 99.2%.

33 production plants

Since its founding, the SWCC has worked to create about 80 seawater desalination plants, of which 33 are currently operating using the latest environmentally friendly technologies and renewable energy sources, distributed along both coasts.

50 years

It is 50 years since the founding of the Saline Water Conversion Corporation (SWCC).

99.63%

Availability of production plants stands at 99.63%.

Global leadership

The SWCC has undertaken many initiatives and projects that have become cornerstones in the industry, such as the use of reverse-osmosis technology to desalinate seawater in Jeddah in 1978, the construction of the first closed-water transmission system in the world between al-Jubayl and Riyadh in 1983, and the operation of barges as the first floating water desalination plant in 2008.

139 purification plants

A total of 139 plants for well and reservoir water have been added to the SWCC's portfolio of assets.

The largest desalination plants in the world

The Ras al-Khayr plant, the largest dual-purpose plant in the world; the floating (mobile) plant, the largest floating water desalination plant in the world; and, soon, the largest reverse-osmosis production plant in the world in al-Jubayl.

11.5 million m³

Leaderchip in the desalination, the largest producer, developer, and owner of assets with sole ownership in the desalination and water solutions industry, with a production capacity from various sources that will reach 11.5 million m³/day, is Saudi-operated and has more than 98% Saudi staff.

120 billion

The value of the capital projects portfolio, exceeding 80 projects, including the development of production plants, transmission systems, and water and energy storage.

2.27 kWh

The lowest energy consumption achieved in the world for mobile plants is 2.27 kilowatt-hours/m³, consolidating Saudi Arabia's position as a global leader in the water desalination industry and its technologies.

31 patents

The SWCC has obtained many patents from international organizations, some still in the process of acquisition, through its research arm.

20% renewable energy

The rate of desalination's consumption of renewable energy through the new plants will reach 20% of the plants' total energy consumption, with future expansion plans to increase the percentage of renewable energy of all kinds and applications and cut the equivalent of 19.9 million tons of carbon annually.

2,680 riyals/m³

The lowest contractual cost/m³, enhancing efficiency, effectiveness, and sustainability in the environmental, financial, and production plant, reducing the cost of water production for the Shu'ayba V and al-Shuqayq II plants to an estimated capital cost of 2,680 riyals/m³, and reducing electricity consumption to less than 2.42 kWh/m³.

25.9 million m³

The design capacity for strategic storage, for an average of 2.7 days, with targets to raise the storage rate to 7 days by 2030 and achieve a total storage capacity of 68.4 million m³.

11,800 kilometers

Integrated transmission systems of differing lengths and capacities cover the various regions of the Kingdom, with a total length of 11,800 km and a transmission capacity of 14.8 million m³/day.

The launch of the Arab Center for Research and Excellence in Water Desalination

is a testament to the Kingdom's dedication to developing and innovating solutions that meet the world's needs. This initiative is a clear indication of the Kingdom's global leadership in the water desalination sector and its ability to provide solutions to water scarcity.

Global Prize Innovation in Desalination

The launch of the Global Prize Innovation in Desalination

strengthens the SWCC's exceptional strategic role in driving progress towards sustainable solutions, instilling a culture of innovation and continuous improvement, and placing the Kingdom at the forefront of sustainable water management and related technologies.

مياه SaudiWater INNOVATION مركز الابتكار السعودي لتقنيات المياه

The founding of the Saudi Innovation Center for Water Technologies

will enhance the wheel of growth and development in the water sector in a way that will translate the ambitious goals of the Saudi Vision 2030 into tangible results, along with identifying and addressing water-related challenges in the Kingdom.

The Importance of Water in Life

God made water the backbone and foundation of all life, its essence and strength. He linked it to the survival of every creature on this planet. There can be no life without water. Humans, animals, and plants need it and derive their continued survival from it. God Almighty said: "And We made from water every living thing." [1]

Humankind has always realized the importance of water. People sought out the places where water could be found in order to live near it, realizing that water was a vital element for the continuation of life. Water has thus been a necessary factor in human life for the emergence and progress of civilizations. Anyone who traces the history of earlier civilizations will find that they always developed near rivers, where water is abundant and easily obtainable. Here people built houses, palaces, forts, and castles and began to grow various types of food and plants; water was the foundation and core of all of this. Civilizations thus flourished and became famous; these include the Pharaonic civilization of Egypt and that of Mesopotamia.

The human need for water is not limited to personal use; rather, it covers all areas of life, such as agriculture, industry, and animal husbandry, among other things.

Just as water was the source of the emergence and prosperity of civilizations, so it gave rise to conflict and fighting among peoples. Humankind realized the importance of water to its survival, and water's role in growth and prosperity, and water will therefore remain a source of conflict and strife among peoples as long as humankind remains on this earth.

A water spring in al-Hofuf at the beginning of the 20th century

Water in the Arabian Peninsula


A well on a farm at the beginning of the 20th century

Water in the Arabian Peninsula

Ancient sources confirm that the Arabian Peninsula went through a period in which rain was abundant, grasses flourished, valleys and rivers flowed with water, and agriculture was widespread. The Greek historian Herodotus, who lived in the 5th century BCE, mentioned that a river named the Corys flowed into the Red Sea, and that the king of the Arabs at that time used to bring water from this river through pipes made of bull hides and other skins to reach dry areas, and he had huge storage tanks dug in the country to deposit and store the water.[1]

As the climate altered, drought struck vast areas of the Arabian Peninsula. The southwestern part continued to enjoy a different climate, characterized by moderate temperatures and adequate rainfall. Elsewhere, rainfall was sparse, and civilizations were centered around large wells and abundant springs, such as the well of Haddaj in Dawmat al-Jandal, the wells of Huma in Najran, and a number of springs in al-Ahsa', among others.[2]

The availability of water was the basis for the construction of towns in ancient times. Makkah was a valley without crops when the Prophet Ibrahim, his wife Hajar, and his son Isma'il arrived there on the orders of God Almighty. When they settled in the valley, Hajar looked left and right and found no trace of life. grass or birds in the sky; but when Ibrahim was about to return to Palestine, she grabbed him and said: "Did God command you to do this?" Ibrahim answered: "Yes."

Hajar realized that this was something preordained, and that God wanted them to fulfill something that had been written. Therefore, she let her husband go and, again embracing her young child, continued to look around at the valley.

Not much time had passed before her water ran out, and Isma'il cried out in thirst. His mother ran, frightened, between the mountains of al-Safa and al-Marwa, searching for water, or perhaps a caravan or traveler who could come to her aid in this lifeless valley.

When her hope was at an end, she returned to her son and found him stamping on the ground with his feet and water flowing between them. She ran to protect him and ensure his survival; she did not know that this water would last as long as God had decreed.

When the Jurhum tribe were traveling in search of water, that secret and source of life, they noticed that birds were hovering around a certain spot that they believed to be desolate; when they came there, they found Hajar and her son Isma'il, and near them was an abundant spring of water.

The tribe asked permission from the spring's owner, which she granted, and they began to comfort her in her loneliness, sharing water and food with her. Later, when Isma'il had grown up, Ibrahim returned and built the Sacred House of God with him; this place became the holiest on the face of the earth. This is how the area was transformed when water gushed into it, from a lifeless valley into a place of settlement over the years.[3]


The Well of Zamzam at the beginning of the 20th century

When Islam emerged, among its teachings was the preservation of water, the secret of life and the source of survival, and the substance on which animals and live. God Almighty said: "And We made from water every living thing."[4]

The Prophet urged us to conserve water; on the authority of Abd Allah ibn ʿUmar ibn al-ʿAs, the Prophet (PBUH) said: "What is this extravagance, Saʿd?" The latter replied: "Is ablution extravagant?" The Prophet said: "Yes, even if you are on a flowing river."[5]

Islam also dignifies water by making it one of the greatest alms that a Muslim can offer. On the authority of Saʿd ibn ʿUbada, the Prophet, (PBUH) said: "The greatest of alms is the giving of water."[6]

The Prophet (PBUH) was also concerned to provide water to Madinah as its population grew and its wells began to dry up, except for the well of Ruma, located to the northwest. However, this was owned by a man who refused to allow people to drink from it for free, which caused great difficulty. So the Prophet announced to his Companions: "Who will buy the well of Ruma and attain Paradise?" ʿUthman ibn ʿAffan hastened to buy it and make it a public endowment [*waqf*] from which everyone could drink for free.[7]

Muʿawiya ibn Abi Sufyan, the first Umayyad caliph, also found a solution to water storage in the construction of dams. One of the most famous of his works was the Saisad Dam, built in 677 and located to the northeast of Ta'if.[8]

When there was a shortage of water in Makkah during the time of Harun al-Rashid, the Abbasid caliph, people resorted to carrying water from long distances outside the city. The Caliph's wife, Zubayda bint Jaʿfar bin abi Jaʿfar al-Mansur, decided to alleviate their suffering and that of pilgrims, some of whom were dying of thirst due to the long distance between the wells and the holy city, so she ordered water to be brought from a nearby spring across the mountains and plains to Makkah.[9]

The desert-dwelling tribes of the Arabian Peninsula sought out water sources, moving from one place to another, and fighting with others over territory. They competed for control of water sources, driven by the desire for survival.

In settled areas, people would depend on a well to quench their thirst and supply their farms; when it dried up, they looked for another place, determined by someone who knew how to locate water through his experience and sensitivity. Then professional well diggers would come and excavate the place with hope in their hearts; the digging might last a long time, after which they would find no water and, thwarted, their suffering would begin again.

Even finding water did not put an end to their hardship, as animals were used to draw water, and men would guide them back and forth, which constituted an endless daily task.[10]

In some areas, years of drought might pass, during which the sky would not send forth rain, wells ran dry of water, crops were destroyed, animals died, and people were on the verge of perishing. Such unforgettable years have passed into the annals of history, having been given their own special names.[11]

ʿAyn Zubayda in the 20th century

A well in al-Jubayl, 1924

Water Provision under the First and Second Saudi States

An old image of Wadi Hanifa, 1917

Water Provision under the First and Second Saudi States

The First Saudi State

In 1446, Maniʿ al-Muraydi, the twelfth-generation ancestor of King Abdulaziz, moved from his town in the Eastern Region to live in al-Diriyah on the banks of Wadi al-ʻArd, which later became known as Wadi Hanifa. The region was characterized by abundant water and fertile land, so civilization flourished, and people came to live there; these elements would be an important factor in the later founding of the First Saudi State.[1]

In 1727, a new era of unity began in al-Diriyah, as Imam Muḥammad bin Saud assumed the leadership of the city and began to establish a new regime that would curb rebellions and unite divided hearts. Rapid work began with the leaders of neighboring towns to secure the Hajj route that passed through al-Diriyah. The Imam united al-Diriyah under his leadership, declaring an end to the era of division and fragmentation.

The Saudi state grew to cover a large area, in which urban and economic life flourished, due to the availability of its lifeline, water, which flowed abundantly from wells. Wadi Hanifa too was of great importance in its renaissance, as the land of al-Diriyah contained many palm groves and orchards, distinguished by their quality and fecundity.[2]

Second Saudi State

In 1824, Imam Turki bin Abdullah restored the Second Saudi State, taking Riyadh as his capital. He chose that city because of its wells, farms, and gardens, as well as its many wadis, the most notable of which were Wadi Hanifa and Wadi al-Batha'.[3]

The influence of water on events in the Saudi state

Water has played a major role in the course of historical events, in both war and peace, since the inception of the Saudi state. Water was a peerless commodity in an arid desert environment like that in which the Saudi state was established. Here, with no permanent reliable source of water, everything depended on whatever rain might fall, either destroying everything or giving life to everything.

Indeed, water played a prominent role in the battles to unify the country following the establishment of the Saudi state. Water sources attracted the attention of military commanders, who made them their objectives. A commander could predict his opponent's movements from the water sources available at the time; knowing the probable location of his opponent's camp, he could get there first, secure it, and ensure that the opponent would not reach it. This was a very important source of strength that could tip the balance and grant victory over an opponent.[4]

The tribes of the Arabian Peninsula carried on their longstanding practice of migrating to places where water was available, and they continued to come into conflict, although the power of the Saudi state played a role in defusing many of these conflicts.[5]

The suffering in settled towns and villages also continued, due to the depletion of wells and the onerous methods of drilling and extracting water, all of which testify to the difficult lives early inhabitants of the country led in order to survive.

The Imams' water distribution efforts

Water was one of the most important problems that faced the Saudi state from its founding, and every imam strove to find a solution to it by searching for water sources in every region and town.

This went beyond searching for water and extracting it through traditional methods, to finding solutions for ways to provide water to the state's territories. Imam Faisal bin Turki, one of the imams of the Second Saudi State, expressed to the British Diplomat Lewis Pelly, during the latter's visit to Riyadh on April 6, 1865, his wish to acquire machinery that could extract water better and more powerfully than the traditional methods used at that time. He explained the reality of the situation, namely that rain was scarce and agriculture poorly developed.[6]

Pelly assured the Imam that he would make every effort to meet his request, and upon his return to Britain, he submitted a request for pumps to be presented to Imam Faisal. It was agreed that the Foreign Office would allocate 150 pounds to purchase these pumps to improve water resources, but circumstances prevented this from coming to fruition.[7]

Wadi Hanifa at the beginning of the 20th century

Water Provision in the Early Years of the Kingdom of Saudi Arabia

A view of the Qasr al-Hukm at 1942

The geography of Saudi Arabia

The Kingdom of Saudi Arabia is located in southwestern Asia, between longitudes 34° and 56° east and latitudes 16° and 32° north. It occupies a large portion of the Arabian Peninsula, with an area of about 2 million km^2.[1]

This vast area consists of varying terrain, including mountains, plains, and sprawling deserts. The most notable regions are the following:

1. The coastal plains of the Red Sea and the Arabian Gulf. In the west, there are desert plains dotted with sand and gravel dunes; these contain salt marshes in which there is no agriculture. They are characterized by short valleys through which water flows after rainfall. The most notable of these are Wadi al-Hamid, Wadi al-Layth, and Wadi Fatima.[2] In the east, there are oases rich in water; these contain numerous wells that store water close to the surface of the earth.[3]

2. Mountainous highlands in the al-Sarat Mountains, which extend from the north of the Kingdom to its south. These mountain ranges are characterized by long valleys containing springs fed by groundwater.[4] To the south of these are the Asir Mountains, extending south from the Hijaz (al-Sarat) Mountains adjacent to the Red Sea coast. These mountains are higher than those of the Hijaz, and their valleys are notable for the length of their watercourses and the intensity of their flow.[5]

In the central region are the Tuwayq and Shammar Mountains; several wadis run within these, including Wadi al-Ruma, Wadi Hanifa, and Wadi al-Dawasir.[6]

3. Vast deserts, covering most of the central region from north to south, such as the Great Nafud, the Dahna Desert, and the Empty Quarter. These are enormous areas, the largest of which is the Empty Quarter, in which life is almost non-existent; it extends from the Najd Plateau in the north to the Hadramawt Plateau in the south,[7] one of the largest deserts in the world.

The climate of Saudi Arabia is in general very hot in the summer and cold in the winter. Humidity prevails on the coasts, while areas far from the coasts are arid. The highlands of the Hijaz (al-Sarat) Mountains are characterized by moderate weather, while the rest of the Kingdom's highlands are hot during the day and experience low temperatures at night.[8]

The amount and intensity of rainfall, as well as its frequency, varies from one region to another. When rain does fall, it does not last long, and in most cases it does not meet the population's need for water. Therefore, people would continually raise their eyes to the sky, hoping for the approach of clouds that would bring goodness for them and their farms. If the rain was delayed, they raised their hands to the sky, calling on their Lord and seeking His help.

Saudi Arabia's location in southwestern Asia and in the region north of the equator plays a role in the tropical, hot and dry nature of its climate, and the limited rainfall it receives.[9]

Water sources in Saudi Arabia

The Kingdom of Saudi Arabia was founded in a region with a harsh climate and little rain, as mentioned above. It suffered from water scarcity, despite its vast area. While water sources were available in some areas, they were limited in many others, and the Kingdom is devoid of rivers and lakes due to the nature of its arid climate.[10] However, there are many wadis and springs throughout its territory, which sometimes flow, and then dry up during most of the year, in addition to wells that may dry up if the rain is delayed.

The water sources in the Kingdom of Saudi Arabia are the following:

Valleys (wadis)

The Western Highlands divide Saudi Arabia into two parts: the western part is called Tihama, and the eastern part Najd. The water sources are also divided into western and eastern regions: the western part is distinguished by its large number of wadis compared with the other regions of the Kingdom, and their waters flow into the Red Sea.[11]

Wadis are concentrated near mountainous areas; therefore, we may say that the highest areas have more wadis. The western part of the Kingdom, which is famous for its mountains, is the region richest in wadis.[12] Across the rest of the Kingdom's regions, wadis are evenly distributed throughout.[13]

As a result of the geographical nature of Saudi Arabia, its irregular and discontinuous rainfall, and its arid climate, water occupies an even more important position, prompting residents of these areas to build dams in order to benefit from the waters of the valleys that might otherwise be wasted, by flowing into the sea or being absorbed by the desert sands.[14]

Distribution of valleys in the Kingdom of Saudi Arabia

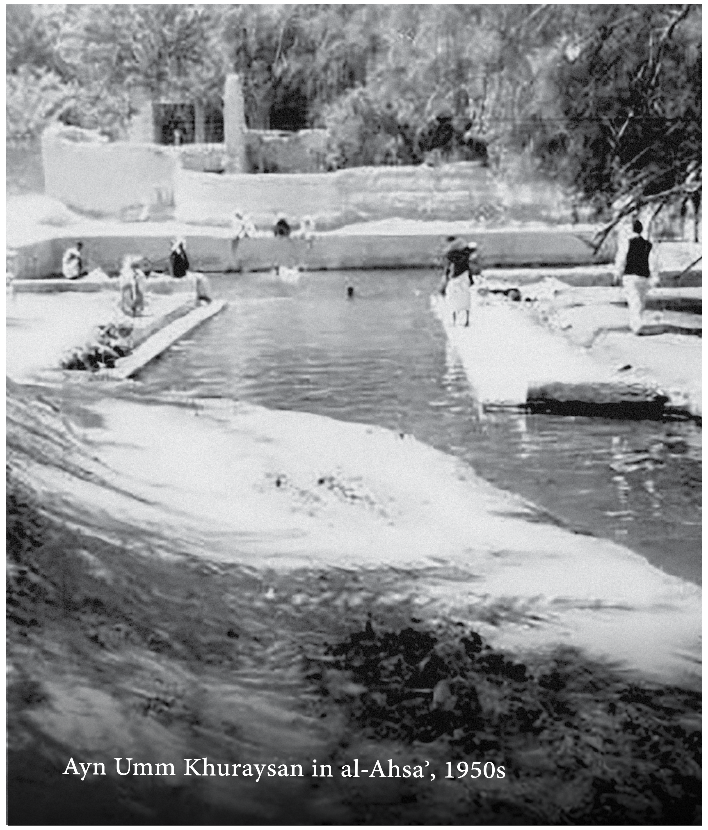
Springs

Springs are one of the most important sources of water, and the population has depended on them for irrigation. In the west of Saudi Arabia, there are a large number of springs; ʻAyn Zubayda is one of the most important springs in Makkah, from which residents and pilgrims alike used to drink.[15]

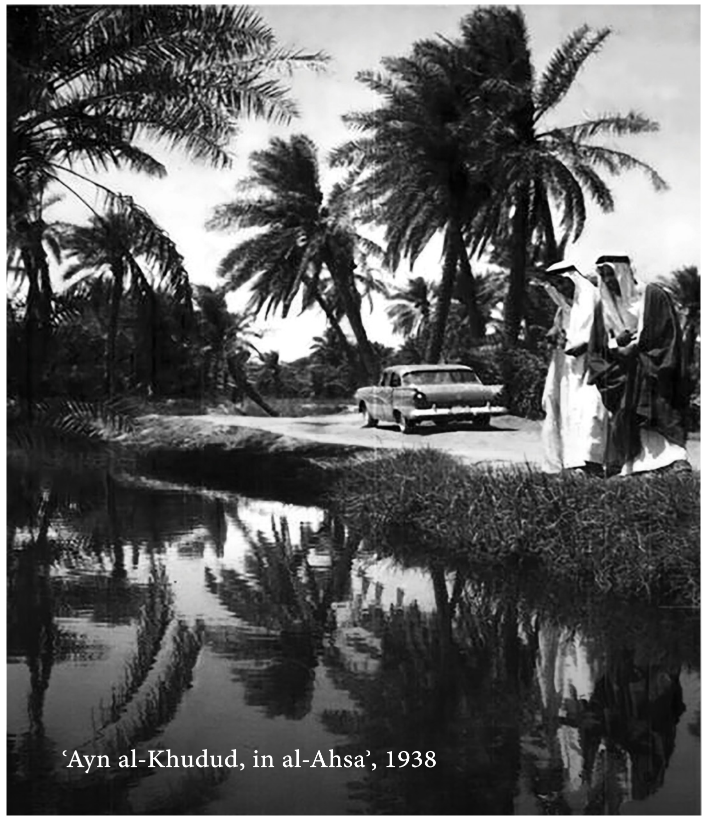
Wadi Fatima, meanwhile, contains 360 springs, including ʻAyn al-Madiq, ʻAyn al-Jadida, ʻAyn al-Rayyan, ʻAyn al-Haniyya, ʻAyn Wasit, ʻAyn al-Fayd, and ʻAyn al-Qashshashiyya.[16]

In Madinah there are 24 springs, most notably ʻAyn al-Zarqa and ʻAyn al-Shuhada, which its residents depended on.[17] Jeddah is devoid of running springs, and it suffered greatly from water scarcity. It used to meet its irrigation needs by relying on springs a short way outside the city, such as ʻAyn al-Ghuri in the north of al-Rughama, and ʻAyn al-ʻAziziyya in the east of Jeddah.[18]

There are numerous springs in the other regions of the country, for example in al-Ahsa', al-Kharj, al-ʻAflaj, and al-Qasim. Al-Ahsa' was famous for its springs abounding in water; the most famous of them were ʻAyn al-Khudud, ʻAyn al-Haql, ʻAyn Ghusayba, ʻAyn al-Taʻadid, ʻAyn Barabar, ʻAyn al-Hara, ʻAyn al-Jawhariyya, ʻAyn Mansur, ʻAyn Umm Sabʻa, and ʻAyn Najm in al-Hofuf.[19] Despite the importance of springs in Saudi Arabia and the abundance of their water, they are unstable sources: they may dry up due to lack of rain, which puts the people in a difficult situation if they depend on them for their livelihood.[20]



Ayn Umm Khuraysan in al-Ahsa', 1950s



ʻAyn al-Khudud, in al-Ahsa', 1938

One of Springs in the Eastern Province, in 20th century

Wells

Humankind began digging wells to access water, the ease or difficulty of this access depending on the type and hardness of the soil, and the proximity or distance of the water, as groundwater is not all located on one level in the earth.[21] Since wells are the first means by which people can obtain water, digging them is an especially urgent task, particularly in Saudi Arabia due to the lack of permanent water sources.[22]

When a well needed to be dug, men were sought out who had knowledge of and experience in locating water and who could determine whether it was fresh, salty, or brackish, as well as how much was present, among other things. They were known as "water diviners" [*suwwās al-mā'*], and they were sometimes mistaken—but they often succeeded, and in return they received a sum of money or a gift, according to the agreement between the two parties.[23]

The digging of wells is another craft that people have practiced since ancient times, often professionally. Usually, wells were dug with the help of neighbors or relatives, who contributed without remuneration; the owner of the well paid for the food for his workers while they were digging. Some neighbors and relatives would help each other out with this task, and they would take it in turns to provide food.

The digging process was carried out using primitive tools such as mattocks [*fārū'*], shovels [*misḥāt*], iron poles—used as levers—and the *haym*, a large ball of iron on a stick, used to break rocks. Some of the diggers might wear pieces of leather when breaking rocks to protect them from the sparks that could fly off.

The depth of a normal well ranges from 30 to 40 meters, or deeper than that in some areas, while the average diameter is from 4 to 6 meters.[24]

Water was extracted from wells by means of buckets [*dalw*, pl. *dalā'*], or by water scoops [*sāniya*, pl. *sawānī*] drawn by animals, whether camels, bulls, or donkeys. There would also be a man who supervised this process and followed the progress of the animals. The animal was tied to the bucket using strong ropes, and moved along a special course that descended in relation to the level of the well. If the animal went up to the head of the well, the bucket fell in and filled with water. If it went down the sloping course, the bucket rose to the mouth of the well and tipped the water into a special channel, which would in turn take the water to a storage tank in order to water the garden.[25]

One of the most famous wells in the Western Region is the Well of Zamzam, the waters of which still flow to this day. It was given this name due to its abundance of water. The other nearby wells include Bi'r al-Atwa, which is located southwest of Makkah, and the wells of Maymun, Badhdhar, Jurab, Dumm, Suqam, Sajla, al-Sunbula, al-Muhsayna—also known as Bi'r Muhsin—Bi'r al-Zahr, al-'Asqalani, and al-Ja'rāna.

This is in addition to a number of wells in Shi'b 'Amir, including Bi'r Abu Dayya, named after the teknonym of a historical person; Bi'r al-Tammara, so named because of the presence of date sellers there; and Bi'r al-Hamam, named after the pigeons that nest on its sides.

The city of Madinah contains a number of wells, some of which are fresh and some brackish, such as Bi'r Aris, also known as the Well of the Ring [*Bi'r al-Khātim*] because the ring of the Prophet (PBUH) fell into it. It is located west of the Quba Mosque and is 12 meters deep. Another is Bi'r Ruma; its water is very fresh and pure, and to this day the well still supplies the residents of the city. This well was purchased by 'Uthman ibn 'Affan, who made it an endowment [*waqf*] for all Muslims. Today it is among the endowments of the Prophet's Mosque, Another well in Madinah is Bi'r Ghurs, which is 4 meters in diameter and 4 meters deep and is located in the Qurban area.

In addition to the above, there are Bi'r Ha', Bi'r Buda'a —the water of which is fresh, although the wells adjacent to it are brackish—and Bi'r al-Saqya, which is 6 meters in diameter and 14 meters deep.[26]

Jeddah's wells were located beyond the city walls. They included the wells of al-'Asila, al-Sahifa, and al-Sharafiyya; their water was fresh, and was preserved in large ceramic jars that were able to hold large quantities and keep their contents cool. Due to the distance of these wells from the city proper, a group of Bedouins used to bring the water into Jeddah; they had relationships with some of the people, to whom they would bring the water directly, and it was sold at the highest prices, or the watermen would bring it for a fee.[27]

In the Eastern Region there is the freshwater Bi'r Wabza and the wells of al-Naqira, the most famous of which is Bi'r al-Saddaniyya. The latter also included the wells of Al-Nu'ayriyya and Bi'r Nata'—which contained abundant water—Bi'r al-Marwa, and Bi'r al-Zarnuqa. Among the most famous wells are Bi'r Harbiyya and Bi'r al-Shari'a.[28]

Between the Central and Eastern Regions are the wells of al-Wasi', which are numerous and widely dispersed. People have divided them into three groups, and each group has a name. In the north, they call them al-Rafi'a, while those in the center are called al-Marir due to the bitterness [*marara*] of their water; those in the south are called Sanam.[29]


Bi'r al-Khatim, in Madinah 1904

In the Central Region, there are a number of wells in Hafrat al-'Atsh, while in al-Hafayir, there are six wells located in a depression surrounded by highlands. There are the wells of al-Thulayma' and those of Nasah, which are very bitter, except for one called al-Maghra'.

The 24 wells of Abu Jafan are located between al-Ahsa' and Riyadh, but they are closer to Riyadh. The most famous of them is Bi'r al-Qamis. In the Central Region, the wells in Wadi Hanifa reach a depth of about 20 meters, while in al-Kharj the depth of the wells ranges from 11 to 15 meters, and in al-Majma'a from 11 to 21 meters.[30]

In the Northern Region, Bi'r Haddaj has earned renown. It is located in Tayma', and is known for its abundance of water. Because of the great love of the people of Tayma' for this well, a generous man there is called "Haddaj Tayma'." Bi'r Samah is located in Ha'il, on the southern side, and is known for the freshness of its water. In general, there are a large number of wells in the Northern Region, and their water varies between salty and fresh.[31]

The Southern Region is characterized by a large number of wells, including the following: in 'Asir are Bi'r Umm al-Dabba', Bi'r bin Sarar, Bi'r al-Badi'a well, Bi'r al-Danan, Bi'r al-Ariniyya—formerly known as Bi'r al-Sidra—and Bi'r al-Fil. As for Najran, Bi'r Hima is the most famous well there.[32]

Water in the Kingdom of Saudi Arabia

Cement pipes used to transmit water from ‘Ayn al-‘Aziziyya to the city of Jeddah, 1946

Provission of King Abdulaziz to Provide Water in the Kingdom of Saudi Arabia

1902–1953

In a bold venture in 1902, King Abdulaziz managed to retake the city of Riyadh. He then began working on two fronts: the first was to repel the forces that wanted to nip his project in the bud, and the second was to unify the cities and regions and gather together a country that had been exhausted by discord and division following the end of the Second Saudi State.[1]

Water was—and still is—the backbone of stability and the main factor in a nation's prosperity. Therefore, King Abdulaziz paid great attention to the provision of water, especially since a portion of his people were not settled. Since ancient times, the tribes had been nomadic, moving in search of water, and King Abdulaziz wanted to provide them with water sources, to ensure their stability and thus the recovery of land through agriculture, and a prosperous living.

When this idea formed in his mind, he sent preachers to the tribes to teach them the precepts of the Islamic religion and encourage them to settle in the region, until the idea took root in their hearts. He gave land in which there was a well to every tribe wishing to settle; this began in 1911 from al-Artawiyya, east of Burayda and near al-Dahna; successive settlements [*hujar*] were then established, until a large number of Saudi tribes had left the wandering life behind. Within 15 years, the number of *hujar* reached about 200, meaning that during this period at least 200 wells were dug or renovated for this purpose.[2]

King Abdulaziz also encouraged the digging of wells by providing people with machines and equipment. He made it easy for farmers to pay for these, each according to his ability. Furthermore, artesian wells spread throughout the desert areas during his reign, such as Bi'r al-Hani and Bi'r al-Shamlul in the al-Suman Desert.

King Abdulaziz focused his attention on al-Kharj, a large and fertile oasis; he ordered an Iraqi and then an Egyptian mission to be brought in to coordinate and exploit the water tables, but neither mission was successful in completing its task.

The King did not give up, but rather ordered American technicians to be brought in. They succeeded in drying out the mosquito breeding-grounds and repairing the waterways. After they completed their mission, agriculture grew more stable in al-Kharj, and an agricultural school was established there.[3]

The Eastern Region, especially al-Ahsa', is one of the most water-rich areas in Saudi Arabia. It is home to 'Ayn Najm, located in al-Hofuf, which runs with hot mineral water; His Majesty had it renovated.[4]

King Abdulaziz also paid significant attention to the Two Holy Mosques in the west of the Kingdom, including the springs there, the most important of which are those in Makkah, because of their importance in providing water for pilgrims. One of the most famous springs from which the people of Makkah draw water is 'Ayn Zubayda, which dates back to the Abbasid Caliphate. After King Abdulaziz entered Makkah in 1924, he ordered that money be allocated to take care of it and repair it properly. He ordered its output to be increased to cover a wider area, as well as the changing of the old sewers and their replacement with pipes.

The water supplied all the holy sites, so spring water was available in the streets of Makkah and along pilgrim routes. A hydraulic machine was used to bring water from the spring's watercourse up to Mina, whose reservoirs were filled annually a month before Hajj. The water of 'Ayn Zubayda came to supply all the neighborhoods in Makkah in 1925.[5]

King Abdulaziz closely monitored 'Ayn Zubayda before the Hajj season, appointing a supervisory body for it, the members of which were selected with the King's approval. It looked after the spring throughout the year, repairing it and clearing its pipes, storage tanks, and ducts of dust and objects that might block its course or pollute it, such as fallen stones and other matter. Because this spring was vulnerable to heavy rains and strong winds, which might lead to its breakdown or a decline in its efficiency, it was repaired quickly and without delay. Before the Hajj season, the King would send his men to Mina and Arafat, to the pilgrims' routes and water sources, to assess whether they needed repair, development, or construction, and to take all precautions so that pilgrims could perform their rituals in comfort.[6]

The King constantly inspected the repairs at 'Ayn Zubayda. When he entered Makkah in 1924, the people's water supply stopped due to a collapse in the spring's watercourse; he did not hesitate to have it repaired quickly, assigning those in charge of its affairs to deal with it and providing them with some of his men for support.

Provission of King Abdulaziz to Provide Water in the Kingdom of Saudi Arabia


A well in Hofuf in 1924

During King Abdulaziz's reign, a number of reservoirs were constructed, the most important of which was a large reservoir for the spring in 1929 that could hold more than 1,000 tons of water. The King also ordered the authority responsible for the spring to explore other sources that might exist between the springs of Makkah and could be connected to it.

The work at 'Ayn Zubayda was not limited to delivering and repairing the spring's water, but also included cleaning the waterways and providing electric night-lighting for the drinking-places at the Holy Sites in Makkah: Muzdalifa, 'Arafat, and Mina, alongside other lamps made of green-tinted glass so that pilgrims could find and access the water sources.[7]

In order to provide comfort for the pilgrims and supply them with water, in 1927 King Abdulaziz ordered research in Mina regarding the possibility of digging several wells there. A number of specialists managed to drill three wells from which water flowed, distinguished by its sweetness and abundance.[8]

King Abdulaziz made great efforts to locate resources that would benefit the country. To do so, he sought the help of American geological experts to search for artesian wells in the west of Saudi Arabia for the benefit of pilgrims and desert-dwellers. In 1931, the mining expert Karl Twitchell was brought to Jeddah, and the government provided him with everything necessary to facilitate his mission. However, his search for wells in the Western Region did not yield satisfactory results.[9]

In 1936, as part of the government's efforts to locate and exploit groundwater reserves, King Abdulaziz approved the creation of a Saudi private company in Madinah under the name of the Artesian Wells Company. Its goal was to dig artesian wells, import all the necessary modern tools and machinery and place them on the market, and revive agricultural lands. To encourage this major undertaking, His Majesty exempted the machinery imported by this company from customs duties, and the company succeeded in establishing many abundant wells in the city.[10]

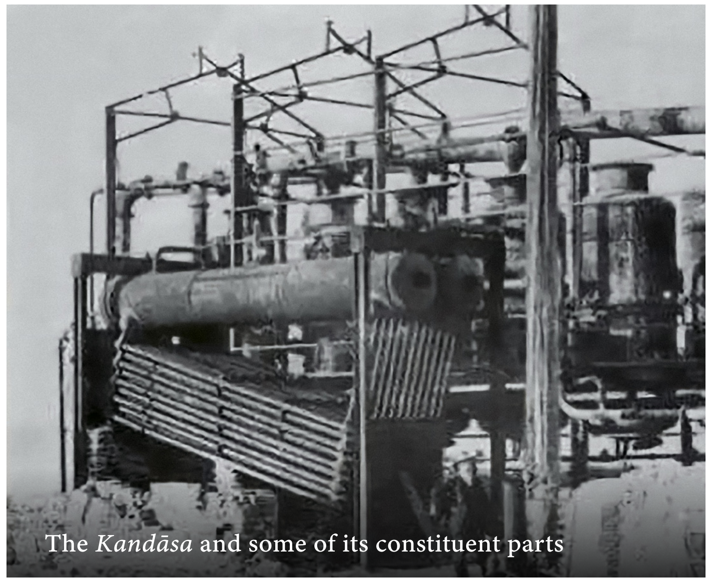
The King's interest was not limited to springs and wells, but also included the building of dams. In 1942, he ordered the construction of a dam at the top of the city of Makkah to protect pilgrims and residents from the torrents and flooding that might be caused by heavy rains.

In 1949, he ordered the construction of another dam in the al-'Adl region, out of his concern to ensure that flooding did not reach the Grand Mosque (as had happened more than once). The construction of this dam took three months, and was completed in 1950.[11]

In Jeddah, the water problem was one of the most pressing issues that King Abdulaziz focused on at that time. He expended great effort and considerable sums to solve it, especially following the increase in the city's population, which exacerbated the problem and worsened the scarcity of water. The importance of

Provission of King Abdulaziz to Provide Water in the Kingdom of Saudi Arabia

The *Kandāsa* of Jeddah in 1946, the first water desalination plant



The *Kandāsa* and some of its constituent parts

the water issue in that city can be seen from the fact that Twitchell's search for water sources began there.

Among the springs that the people of Jeddah used for their water demands was ʿAyn al-Waziriyya, an ancient spring located to the east of the city. King Abdulaziz sent specialists to reconstruct and repair it, clean its sewers and wells, and explore its water reserves so that it could supply the people of Jeddah; he also assigned it its own administration.

In addition, he ordered the importation of a wind turbine from the United States to be placed on top of the well to draw up water when the wind blew, and an electric machine to be used when the wind was calm. Despite these efforts, ʿAyn al-Waziriyya did not meet the water demands of the people of Jeddah, and its water did not flow throughout the year.[12]

In 1907, Jeddah acquired a machine for desalinating sea water, known as *al-Kandāsa*,[13] a name derived from the word "condenser."[14]

The *Kandāsa* purified the saline seawater to make it suitable for drinking; it functioned using coal. Due to the interruption in the coal supply in 1925–1926, firewood was used as a substitute, which weakened the machine and led to its eventual breakdown.[15]

When King Abdulaziz unified the Hijaz, he ordered that the *Kandāsa* be repaired, but the use of firewood instead of coal made this impossible.[16]

In 1926, the King ordered the importation of a machine that could produce about 300 tons of water per day; however, after it was imported and installed, it transpired that its output did not cover the population's needs. The King therefore ordered another machine to be brought in to support it.

The mining expert Twitchell recorded that, when he began his study of water sources in the Kingdom in 1931, the *Kandāsa* was producing 135 tons of water per day. This means that the two *Kandāsa* imported by King Abdulaziz could produce about 270 tons per day. These two machines continued working until 1947, and the people of Jeddah relied on them for water for 20 years.

The *Kandāsa* units transported the fresh water they produced to the "storage tanks" [*tawānik*]. There were eight of these, about 20 meters away from the units itself. The water was transported using pipes, and the contents of the storage tanks were measured using a scale, which was a light wooden pole on which depths were marked.[17]

The government appointed an administration to monitor the machines, and a committee to supervise them and submit recommendations and proposals to the government regarding their repair and development.[18]

However, these two machines broke down from time to time due to the intense pressure placed on them and the need to operate beyond their capacity. The government therefore resorted to finding other solutions, including

ام القرى — صحيفة ٣

لاجل الماء

لقد كان اكبر هم عظمة السلطان منذ دخل جدة أن يبحث عن مسألة الماء واتخاذ الاحتياطات اللازمة لتوفيره في جدة لاجل اهلها ولاجل الحجاج ومما نذكره شكراً لله تعالى أن الشريف عليا في آخر ايامه لم يكن لديه دراهم لطلب فحم او غيره من اجل الآلة المقطرة (الكنداسة) وقبل رحيله بيوم واحد انتهى الفحم وليس في صهاريج جدة شيء من الماء وليس في جدة شيء من الفحم للآلة المقطرة وجلس الناس بعد أن امضى اتفاق التسليم لا يدرون ما يعملون ليتداركوا الماء لشربهم ولا سبيل للتدابير السريعة المنقذة من الهلاك الا انتظار رحمة الله وما هي الا برهة قليلة من الزمن حتى ارسل الله رحمته بغيث من عنده دام وقتاً طويلا امتلأت به نصف صهاريج جدة تقريباً . فحييت النفوس واستبشر الناس بهذا الفأل الحسن

وخوفا من تكرر الضيق أمر عظمة السلطان بدرس مسألة الماء واتخاذ قرار في شأنه وبمعاينة آلة التقطير (الكنداسة) الحاضرة تقرر ان الخراب الذي فيها لا بد من اصلاحه اصلاحا كاملا وانها ولو اصلحت لا يمكنها أن تعطي الماء الكافي المطلوب لذلك تقرر جلب آلة مقطرة جديدة تعطي من الماء في اليوم والليلة ما يقرب من الثلاثمائة طن من الماء ثم تصلح الآلة الحاضرة فتعطي ما يقرب من المائة طن وبذلك يمكن تدارك الماء اللازم في جدة على الدوام للأهلين وللحجاج وقد بدأت المخابرة فعلا مع بعض الشركات الخارجية للمفاوضة في جلب آلة تقطير جديدة وعن قريب يتم هذا المشروع الجليل بحول الله وقوته وهو من اهم المشاريع الحياتية للحجاج ولاجل البلاد

Umm al-Qura newspaper,
"For the sake of water," issue 54, January 8, 1926, p. 3

لجنة جديدة للكنداسات

بالنظر لما شوهد من كثرة نفقات الكنداسات
وعدم كفاية وارداتها لتلك النفقات فقد صدر
الامر السامي بتشكيل لجنة خاصة تبحث في
أحوال وارداتها ونفقاتها وتقدم للحكومة
اقتراحاتها وتوصياتها فيما يتعلق بالاصلاح
الواجب ادخاله عليها .

Umm al-Qura newspaper, "A new committee for *Kandāsas*," issue 364, December 4, 1931, p. 3

Installing cement pipes used to transmit water from ʻAyn al-ʻAziziyya to Jeddah, 1946

transporting fresh water to Jeddah using huge storage tanks carried on top of large cars; the water was brought from Makkah and the wells nearby it.[19]

Jeddah suffered from water scarcity to the point that, when some foreign consuls sent their servants to fetch water, the latter would return empty-handed. Due to the intense clamor of men, women, and children for water, it was even one of the most popular gifts at that time.[20]

The people of Jeddah had no option but to resort to new springs outside the city. This idea was adopted by the merchant Muḥammad ʻAbdullah Rida, and other traders gathered to donate for this purpose. They brought in a specialist to search for potential water places; however, King Abdulaziz ordered that the government take over the project, and gave the merchants back their money. He ordered the Minister of Finance, ʻAbdullah al-Sulayman, to monitor the project and ensure its completion, whatever the cost and as quickly as possible. It was decided that the waters of Wadi Fatima would serve as the source of irrigation for Jeddah, and seven of its springs were chosen.[21]

The King signed a contract with the British company Gellatly Hankey to deliver water to the city.[22] He also met with the owners of the lands on which the Wadi Fatima springs chosen for the project were located, and explained to them the project's importance and the great service they would be doing to the people of Jeddah and what he would do for them in return.

They were satisfied with the offer of double financial compensation, as well as the fact that the task of supplying water would not affect their own agricultural lands, and that a price would be taken from the water of each spring; consequently, they agreed to the proposal.

One of the conditions of the agreement was that the restoration and repair of the valley's springs would begin first; the expense of the repair operations would be shared between King Abdulaziz and the owners, with the exception of ʿAyn al-Barqa, which would be at the King's sole expense. The project took one and a half years, between 1946 and 1947.[23]

Other companies also contributed to the project, such as D. Balford & Brothers of London, who were the engineers and consultants on the design of the project, and the Misr Reinforced Cement Works Company in Cairo, who were the engineers responsible for laying the pipeline. The land excavation operations for the pipelines, meanwhile, were assigned to the Bin Ladin Company.[24] King Abdulaziz allocated 6 million Saudi riyals for its completion.[25]

The completion of this project had a great impact on the people of Jeddah, and it was a major achievement for King Abdulaziz's government. A large celebration of the occasion was held in Jeddah on November 18, 1947. It was opened by Crown Prince Saud bin Abdulaziz, celebrating the arrival of the water, and was attended by state dignitaries and ambassadors of foreign countries.[26]

The spring was also called al-ʿAziziyya, in reference to King Abdulaziz, who was responsible—after God—for ending Jeddah's suffering from water scarcity during this period.[27]

From the beginning of the project, ʿAyn al-ʿAziziyya was assigned its own administration; the administration of ʿAyn al-Waziriyya was abolished and combined with it under the name of the ʿAyn al-ʿAziziyya Administration in Jeddah. In 1952, the administration of this spring and that of ʿAyn Zubayda were combined into one elected body.[28]

King Abdulaziz's interest in ʿAyn al-ʿAziziyya continued: during his reign a large reservoir was built to store water in excess of Jeddah's needs and dispense it at useful public facilities. A number of drinking-fountains were also established on the road from Wadi Fatima to Jeddah for the benefit of passers-by and travelers.[29]

In fact, ʿAyn al-ʿAziziyya played a tangible role in the development of Jeddah. The steady flow of water to the city influenced its development and the expansion of its urban area, which had formerly been confined within its ancient walls. Having solved the water problem, the city began to look to other necessities: it developed its streets, created parks, planted trees, and introduced electricity, so that its trade grew and its economy expanded.[30]

Jeddah was not the only region to suffer from water scarcity or to import a *Kandāsa* as a partial solution to its water problems: both Yanbuʿ and Jazan received desalination machines imported by the Saudi government.

The Yanbuʿ *Kandāsa* arrived in 1929, increasing the comfort and well-being of the people, pilgrims, and all those traveling there; the Jazan *Kandāsa* arrived in 1944. The output of the Jazan machine was similar to that of the Yanbuʿ *Kandāsa*. If not, it is unlikely to have been more productive, as otherwise the sources would have mentioned it favorably.[31]

Cement pipes used to transmit water from ʿAyn al-ʿAziziyya to Jeddah, 1946

King Abdulaziz also sent experts and specialists, headed by Shaykh Salih Qazzaz, Director of Agriculture and Director General of Hajj Affairs, out on a mission to study the water situation and springs in Yanbuʿ al-Nakhl, and to alleviate the water crisis for the people there by implementing a project to deliver water from Yanbuʿ al-Nakhl to Yanbuʿ al-Bahr. This mission was carried out successfully.[32]

The city of Madinah did not suffer from water shortage. It relied for its irrigation on ʿAyn al-Zarqa'; during the reign of King Abdulaziz, the course of the spring was paved, from its source in Quba to the interior of the city, except for some rocky parts that did not need this treatment.[33] A water storage tank was also built so that water could reach the entire city, including the remote areas, through pipes.[34]

Likewise, Ta'if was self-sufficient, because it was home to many springs and wells that were cared for, cleaned, and renovated. However, as the population increased, it was necessary to take precautions to avoid any potential water crisis. Three reservoirs were therefore established in the center of the city: one for the north, one for the middle, and one for the south, each with numerous outlets so that people would not overcrowd them. Exploration continued, and many artesian wells were drilled.[35]

Also during King Abdulaziz's reign, care was taken to restore and repair the old dams in Ta'if; new dams were also built to make use of rainwater for agriculture, irrigation, and feeding the wells and springs. Ta'if's agricultural products were thus able to meet a large portion of the state's needs.

One of the most important dams to be built was the Wadi ʿAkrama Dam, on which digging work began in 1949;[36] it was completed in 1957.[37]

Water was not only the government's concern: the people also felt significantly responsible because of the hardship and fatigue they experienced in obtaining water. Some notables and merchants made contributions and donations for this purpose. ʿAyn Zubayda in Makkah and ʿAyn al-Zarqa' in Madinah received the greatest share of donations and gifts, in the hope of reward for serving pilgrims and visitors. Newspapers published lists of the names of donors and the amounts donated in each issue. The donations were not only of money: some of them were in kind, such as sheep and bags of rice, given to the workers who carried out the digging operations.[38]

In addition to all this, most of these projects were carried out at His Majesty's private expense; it is clear that King Abdulaziz spared no effort in his quest to provide water to his people, as the stability of society and the renaissance of the economy depended on it. It is worth noting that the Western Region of the Kingdom received the largest share of his attention, due to his intense interest in the Two Holy Mosques, the Holy Sites, and their pilgrims.


أم القرى

كنداسة لثغر ينبع

كان من اهتمام جلالة الملك المعظم انه قبل سفره الميمون اصدر امره الكريم بوجوب شراء آلة مقطرة للماء ونصبها في ثغر ينبع تأميناً لراحة الحجاج الوافدين اليها وعناية بالمسافرين الى المدينة عن طريقها

وقد علمنا ان المفاوضات التي قامت بها الحكومة مع احدى الشركات الكبيرة اصبحت على وشك الانتهاء وقد وضع مشروع الاتفاقية وعرض على مجلس الشورى فصدقه

اما الكنداسة الجديدة فانها من طراز ميرس واطسن وتخرج في النهار مئة طن من الماء العذب وستكون جاهزة للعمل في اوائل شهر شوال المقبل

Umm al-Qura newspaper, "A *Kandāsa* for Yanbuʿ's gate," issue 199, October 19, 1928, p. 2

Provission of King Saud to Provide Water in the Kingdom of Saudi Arabia

1953–1964

King Saud shared his father's interest in providing water to all regions of Saudi Arabia. Although Makkah had sufficient water in this period, he was keen to ensure that there would be more than enough, so that residents and pilgrims would benefit, as would the city's farms, gardens, and public facilities. He therefore ordered that water be brought from 'Ayn al-Laymun, one of the large springs in Wadi Fatima, 70 kilometers from Makkah. The work continued for several months, until the water reached Makkah on June 1, 1957.[39]

The King also completed, at his own expense, a project to deliver water to the residents of Jabal Abu Qubays, after they sent him a telegram requesting financial assistance to complete it.[40]

It was also decided in 1964 to dig 13 artesian wells and use the water of ‘Ayn al-Qashshashiyya in Makkah, in addition to repairing Makkah's internal water network. The cost of this project amounted to 300,000 Saudi riyals.[41]

In Madinah, he ordered the construction of a water project and a new reservoir in 1958. He also ordered that new water sources be sought out and included in the project, having determined the city's need for this. A freshwater well was duly discovered, the capacity of which at the time was estimated at 50,000 Tin daily.[42]

During King Saud's reign, Jeddah met its needs using the water of ‘Ayn al-‘Aziziyya, while Ta'if was experiencing a water shortage due to the lack of rain. The king therefore sent a mission of experts and technicians to search for and explore water sources and dig artesian wells for the city, as well as springs that could supply it with water, whether from the nearby Wadi Waj or from elsewhere.

On August 1, 1957, the mission succeeded in finding water from ‘Ayn al-Muthanna; it was connected to the course of ‘Ayn al-Ta'if, which relied on it for its water supply.[43] The King's efforts were not limited to this: in 1958, he ordered the formation of a committee to visit the cities located on the road between Ta'if and Riyadh to study the possibility of providing water there, as while traveling from Ta'if to Riyadh he had assessed their needs due to the water shortages they were suffering.[44]

The King's interest took in all the cities in the Western Region that were suffering from water shortages. Water was delivered to Rabigh in 1959,[45] and in 1955 he ordered that water be delivered to the al-Aqifa area in Yanbu‘, after its residents complained to him of the need to supply water to their remote region.[46]

In the same year, he ordered that water be brought to Umluj from the wells located in its northeast at a place called Samnah.[47] In 1958, the king donated 50,000 riyals to provide the necessary tools, which were brought from Damascus, to dig an artesian well for the residents of al-‘Ula.[48]

King Saud's concerns also extended to the Kingdom's southern regions: in 1955, he ordered water to be delivered to the cities of al-Qunfudha and al-Layth in the southwest by digging artesian wells, and he tasked the Bin Ladin Company with laying the necessary pipes for this. In 1954, the King inaugurated a project to supply water to Jazan from artesian wells located in Wadi al-Matara, 20 kilometers away. In 1955, three storage tanks were built that could hold 725,000 gallons of water, and were connected to a number of outlets spread throughout Jazan.[49]

King Saud paid great attention to the Central Region, and major projects were built there during his reign, including a vast project that delivered water from the Wadi al-Hayir region to its south; the wadi's water began pouring into the large reservoir in Riyadh on March 14, 1956, in such quantities that the surplus was used to irrigate nearby farms.

During the construction of this project, King Saud made field visits to Wadi al-Hayir to personally inspect the production sites and pumping stations to Riyadh. He estimated the capacity of this project to supply Riyadh with water at 10 million gallons of water per day.

One of the results of this project for the residents was that the price of a ton of water decreased from two riyals to one riyal. Many artesian wells were also dug in the al-Hayir area to provide water for the city and all neighboring areas.[50]

In 1955, King Saud ordered the completion of a project supplying water from Thulayma to al-Sih in the al-Kharj region, provided that a pipeline would also be extended to reach the al-Yamama region, which is close to al-Sih.[51]

In 1958, the King also inaugurated a water project in Darma and al-Muzahimiyya, which was established at the expense of his son, Prince Musa‘id, who made it into an endowment for his father. In fact, King Saud was keen to provide water to all the areas that he felt were in need, especially during his official visits. He recommended that 75,000 riyals be spent to dig an artesian well to supply the residents of al-Zulfi with water. He also ordered the digging of six artesian wells in the Sudayr area.[52]

In the al-Qasim region, a large celebration was held in Burayda in 1955 on the occasion of the arrival of water from the nearby al-‘Aziziyya spring. Artesian wells were also dug in al-Rass, and water was delivered there in 1960.[53]

Among the most important projects during King Saud's reign was the Wadi Hanifa Dam project to the northwest of Riyadh, which was intended to make use of rainwater to feed the wells in the region and increase agricultural production in the Kingdom. It was completed in 1960.[54]

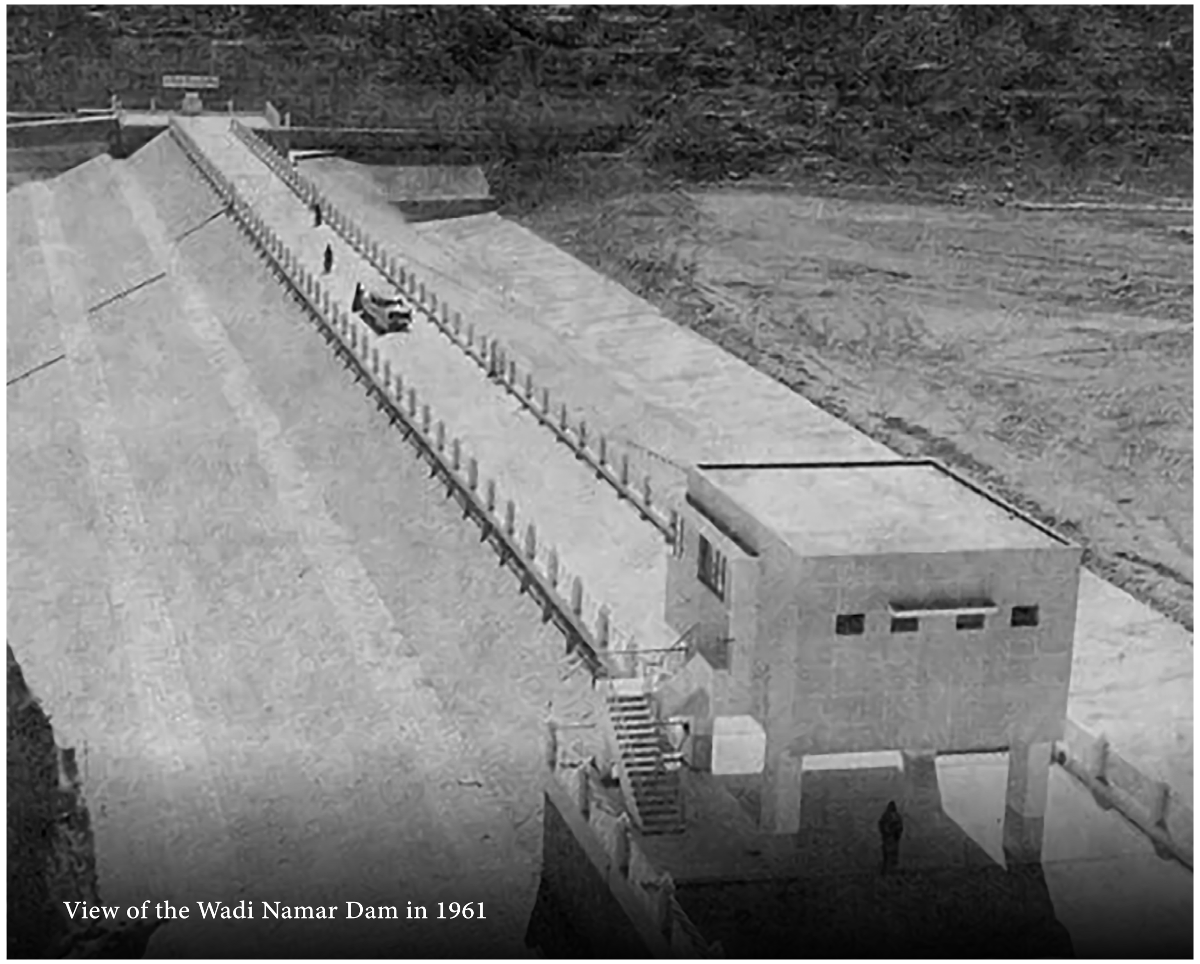
In 1961, the King ordered the digging of wells in Wadi Nassah as a new source to supply Riyadh with water. Six wells were drilled for this purpose, and a pipeline was laid to connect them to the al-Hayir pipeline.

The King was also keen to complete the Wadi Namar Dam project to the south of Riyadh, to which he made field visits. The cost of building the dam amounted to about 2 million riyals; the King opened it in January 1961.[55] A dam was also built in Wadi Laban al-Waq‘, west of Riyadh, in 1959.[56]

As for the Eastern Region, in 1957 King Saud ordered that al-Hofuf and al-Ahsa' should

Wadi Hanifa Dam in 1960

King Saud at the opening of the Wadi Namar Dam in 1961


View of the Wadi Namar Dam in 1961

have a separate water source, in addition to the spring water that the al-Ahsa' region made use of, and away from its watercourses. He assigned the Bin Ladin Company to dig artesian wells and deliver water in new pipes to the city. The King was keen to complete this project and monitored it himself to avoid delays to its progress.[57]

In the north of Saudi Arabia, in 1957 King Saud ordered the governor of Tabuk to begin work on digging an artesian well to meet the needs of residents and pilgrims passing through the area on their way to Makkah, with its water delivered to the entire city.[58]

In 'Ar'ar, the Badna Electricity and Water Company was established to supply the city with electricity and water, as well as Rafha' and Turayf, and to help the country advance. To encourage this national project, King Saud exempted the company from paying customs duties on its imports for this project.[59]

During the reign of King Saud, the state spent 200 million riyals annually in all regions of the Kingdom, whether on studies and research in order to locate water sources or for projects implemented on the ground.[60]

King Saud made tremendous efforts in the field of water provision, and most of these projects were carried out at His Majesty's own expense. Not a year of his rule passed without ongoing work, research, studies and projects for this purpose; these were not easy, as they cost the state budget considerable sums for the sake of the country's continuous and uninterrupted development.

The SWCC during the Reign of King Faisal

1964–1975

Since the beginning of the 1960s, providing sufficient water in all the regions of Saudi Arabia has become an inescapable need. The development of the Kingdom in all aspects, especially economically and socially, has required significant quantities of water. The direct relationship between these factors placed the issue of water provision among the government's main concerns during this period, as King Faisal bin Abdulaziz indicated in a speech to the public in 1964.[1]

Under the leadership of King Faisal, the Saudi government intensified its efforts to search for more water. During his reign, several agreements were concluded with foreign companies to explore and assess water usage and agriculture in all regions of the Kingdom, for which a huge budget was allocated. The Kingdom was divided into eight regions for the purposes of study and survey, as follows:

1. Region I: The region of the Great Nafud, namely al-Qasim, Wadi al-Sarhan, al-Jawf, Sakaka, and Tabuk.

2. Regions II & III: The southern Tuwayq Mountains, including al-Aflaj, Wadi al-Dawasir, Tathlith, and the area extending from the eastern part of the 'Asir Mountains to Ta'if in the north and to Wadi Bisha, Zahran, and Ghamid in the south.

3. Region IV: The Eastern Region, including al-Ahsa', al-Qatif, and Harad.

4. Region V: Riyadh, including a large part of al-Kharj in the south and Sudayr in the north.

5. Region VI: The Western Region, including Tihama and Jazan.

6. Region VII: The Empty Quarter.

7. Region VIII: The central part of Najd, known as the Arabian Shield [*al-Dar' al-'Arabī*].[2]

One of the most significant studies, which led to a number of important projects, was the agreement signed in 1965 by the Minister of Agriculture, Hasan al-Mishari, with the Parsons Company to carry out all necessary activities to develop surface and groundwater resources, determine their quantity and quality, and devise a plan to develop and expand the agricultural sector in the Northern Region of Saudi Arabia, from Wadi al-Sarhan to the al-Qasim region. The area covered by the study totaled 300,000 km^2, and it would cost 34 million Saudi riyals, on condition that the work was completed in no more than 42 months for the entire region, and no more than 18 months in the al-Qasim and Wadi al-Sarhan regions specifically.[3]

In 1965, the Minister of Agriculture also signed an agreement with the French company Sogreah to conduct research and studies into water sources in the Riyadh and Sudayr regions. The area covered by the study totaled 105,000 square kilometers, from the south of Al-Kharj to the north of Sudayr, with a length of 750 kilometers and a width of 300 kilometers. The agreement stipulated the following terms:

1. To identify and estimate the water resources in the area agreed upon.
2. To study and develop the water reserves of the city of Riyadh for the long term.
3. To study the possibility of developing agriculture and pastures in the area agreed upon.
4. To establish guidance projects and train employees for this.
5. To study the possibility of water desalination in the area agreed upon.

The costs of this agreement totaled 2 million US dollars, equivalent to 9 million Saudi riyals, provided that the work agreed upon would be completed within 36 months of its signing. The agreement included drilling deep wells to determine groundwater reservoirs and experiments with rainwater injection.[4]

As a result of these government studies of the Riyadh region, it was decided to construct five dams to provide water to the area. The government contracted with a national corporation for this; the first dam was located on Wadi Huraymila', the second next to Mulham, and the others in Ghubayra, Hariqa, and Saghar, successively, in the al-Diriyah region.[5]

Alongside the existing projects in the Riyadh region, in 1967, the Greater Riyadh Project was established, aiming to purify and distribute water to supply the city of Riyadh. It was divided into two phases:

1. Phase I: Water purification and cooling.

2. Phase II: Distribution and construction of the line network.[6]

The cost of the project's Phase I amounted to 107 million riyals, and that of Phase II 65 million riyals. The Minister of Agriculture also signed an agreement with the Greek company Biocat to install home connections to the Riyadh water network to deliver water direcly to homes; the contract was worth 2,837,800 riyals. This agreement and its implementation formed the final stage of the water project in Riyadh during this period.[7]

The Saudi government continued to focus its efforts on searching for and developing water sources using all possible means. In 1966, it signed an agreement with the French company Sogreah to carry out research and studies on water resources and the development of the agricultural sector, pastures, and fish stocks in the region along the Red Sea coast. With a length of 1,600 km and an average width of 120 km, the total area covered by the study amounted to 194,000 sq km. The value of this contract was about 2.9 million US dollars, equivalent to 13,050,000 Saudi riyals; it stipulated that the study was to be completed within a period not exceeding 42 months.[8]

The Minister of Agriculture, Hasan al-Mishari, signs an agreement with the Parsons Company, 1965

The Minister of Agriculture signs an agreement with the Greek company Biocat in 1966

سمو ولى العهد المعظم

يفتتح مشروع تنقية مياه الرياض

افتتح حضرة صاحب السمو الملكى الامير خالد بن عبد العزيز ولى العهد ونائب رئيس مجلس الوزراء يوم امس بالملز مشروع تنقية وتوزيع مياه الرياض وذلك بحضور عدد من اصحاب السمو الملكى الامراء والوزراء و كبار موظفى الدولة وأعيان البلاد . كما شهد الحفل جمهور غفير من ابناء الشعب .

وبعد انتهاء الحفل الذى اقيم بهذه المناسبة غادر سموه الكريم وصحبه المكان بمثل ما استقبل به من الحفاوة والتقدير.

هذا وقد اصدرت وزارة الزراعة والمياه بيانا بهذه المناسبة عرضت فيه تفاصيل هذا المشروع الحيوى الكبير الذى كلف مبلغ (١٠٧) ملايين ريال للمرحلة الاولى التى تم تنفيذها و(٦٥) مليون للمرحلة الثانية التى يجرى تنفيذها .

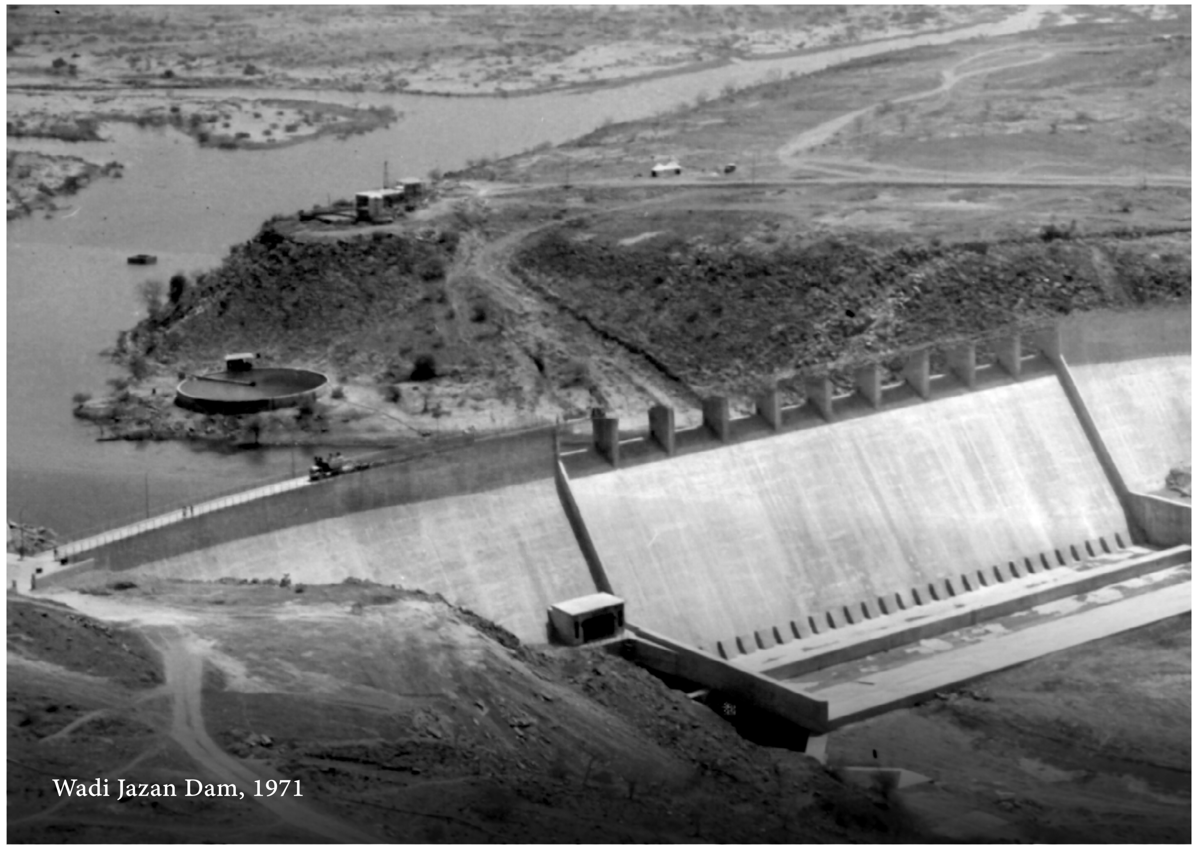
Umm al-Qura newspaper, “His Highness the Crown Prince inaugurates the Riyadh water purification project”: issue 2271, May 16, 1969, p. 1

The government also carried out surveys and studies of water in the Kingdom’s Southern Region; perhaps the most significant goals of the extensive geological studies and water-related research in various regions were: studying the climate in each area selected; collecting information about it; and estimating the quantity, type, and distribution of surface- and groundwater.[9]

Studies in the Southern Region demonstrated the need to construct a dam in the Jazan Valley to control flooding and derive continuous benefit from rainwater. The dam would also improve the irrigated lands in the valley covering an area of 45,000 hectares, including 60 villages. The Ministry of Agriculture and Water therefore signed a contract with the Italian consulting company Italconsult in 1965 to complete studies, designs and other documents for the dam. The value of this agreement totaled 1,183,000 Saudi riyals.[10]

In 1967, the Minister of Agriculture, Hasan al-Mishari, signed a contract with the German company Hawker to implement the project at a cost of 32,757,000 Saudi riyals.[11]

He also signed an agreement with Italconsult, which had researched and designed the dam, to supervise its implementation for a period of one year. The value of the agreement amounted to 666,000 US dollars.[12] Work on the dam continued until it was completed and opened in 1971.[13] In addition, in 1968, the Ministry of Agriculture signed a cooperative agreement with the UN Food and Agriculture Organization to establish an irrigation and drainage network and a model farm for experiments behind the Wadi Jazan Dam. The value of this project amounted to 24 million riyals; the FAO contributed 4 million, while the remaining cost was borne by the Saudi government.[14]



Wadi Jazan Dam, 1971

One of the major dam projects to be built in southern Saudi Arabia during the reign of King Faisal was the Abha Valley Dam, located in the west of the city of Abha. The costs of studying, designing, supervising and implementing this project amounted to 52 million riyals, and it was opened in 1974.[15]

King Faisal sought to deliver water to areas that were suffering from water scarcity.[16] One of the most important such areas was Jeddah; despite the state's implementation of the 'Ayn al-'Aziziyya project to supply the city with water, this no longer met its needs, due to the increase in its population and its continued development. The 'Ayn al-'Aziziyya administration delegated the task of searching for water sources to supply the city's needs to two Austrian experts, Dr. Dauner and Dr. Doller.

In 1964, the Huda al-Sham region was chosen, due to its abundance of water and its proximity to Wadi Fatima, as it would be easy to lay pipes to 'Ayn al-'Aziziyya. Studies and surveys began in the area, but they failed when it was shown that the amount of water extracted would be 3 million gallons per day, and that local farms would be damaged. The 'Ayn al-'Aziziyya administration therefore altered its proposal and asked the experts to search for another source. The choice fell on Wadi Khulays, located to the northeast of Jeddah. It is a fertile area with abundant water, and there was an oasis on its northwestern edge that was rich in trees and had plentiful drinking water. The matter was submitted to King Faisal, and he gave his assent.[17]

The 'Ayn al-'Aziziyya administration brought water from the wadi's springs, such as 'Ayn al-Khawar, 'Ayn al-Mahjuba, 'Ayn Abi 'Ajab, 'Ayn Umm al-Dar, and 'Ayn Khulays as well as from the Bi'r Jamjum well; two additional wells were also dug. All of these springs and wells were rented from their owners. As for the sterilization of the wadi's water, this took place in 'Ayn 'Ajab, where there was a special plant for sterilizing spring and well water with chlorine to kill germs, rendering the water clean and drinkable. The 'Ayn al-'Aziziyya project was the first to carry out water purification in the Kingdom. The water pipes of the Khulays Project reached Jeddah in 1967; 'Ayn al-'Aziziyya and its projects thus supplied more than enough water to the city.[18]

Abha Dam, 1974

The other regions of the Kingdom also received their share of attention. One major project established during the reign of King Faisal was the improvement of irrigation and drainage in the city of al-Ahsa'. The agricultural lands in the al-Ahsa' region had been damaged by flooding and excessive spring water, which resulted in the formation of swamps and high water levels. Therefore, in 1966 the Ministry of Agriculture signed an agreement with the German company Philip Holzmann for this purpose, worth 182 million Deutschmarks (208 million Saudi riyals). Among the most significant terms of the agreement were the following:

1. To establish a comprehensive drainage network that would transport wastewater to desert regions away from agricultural areas.
2. To establish a comprehensive irrigation network.
3. To provide the main irrigation channels supplying the agricultural area with water from 38 springs and wells.
4. To provide sufficient spring water to all agricultural areas and fertile lands located within the project zone.
5. To control the springs and wells in the area and repair breached wells to prevent a rise in water levels in the soil and the consequent loss of water resources.
6. To reclaim some agricultural lands.
7. To use modern plants in agriculture.
8. To increase the production value of agricultural lands.[19]

This project included al-Hofuf, al-Mubarraz, and 48 villages in al-Ahsa'; King Faisal inaugurated it with a popular celebration in 1971.[20]

It was clear from previous studies and research by the Saudi government in various regions that the Kingdom needed a new water source, different from the natural sources it had previously been using. The government would not hesitate to pay large amounts to be able to supply water in a way that would keep pace with and support its development on all levels.

Unloading pipes as part of the Khulays Project, 1967

Connecting and installing pipes during the Khulays Project, 1967

The beginning of desalination during King Faisal Reign

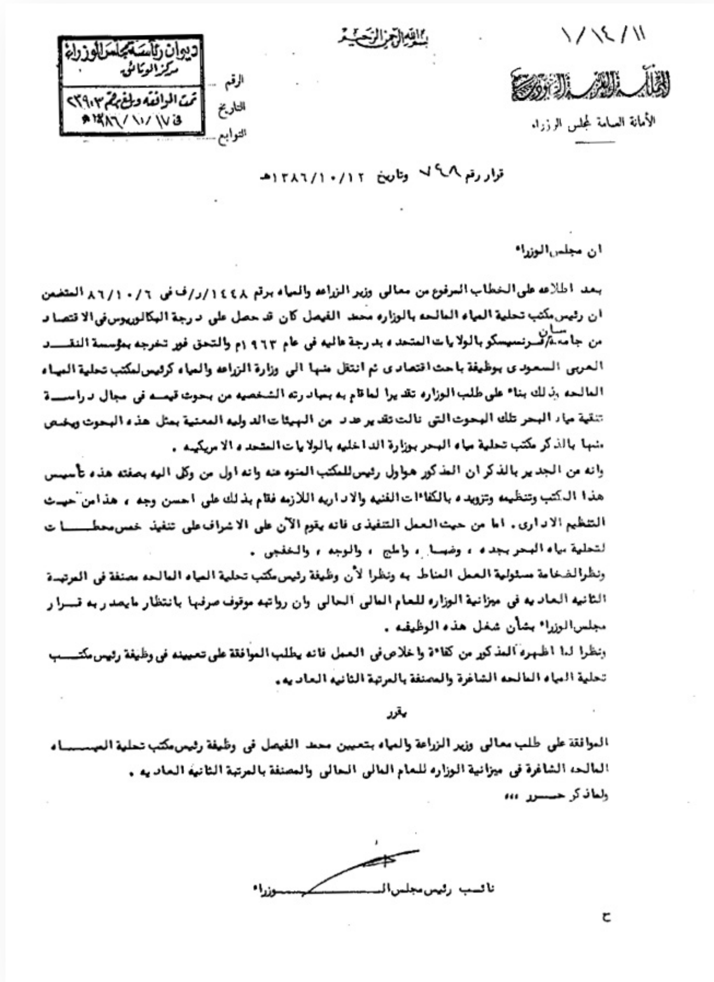
The idea of desalinating seawater was initiated by the government of Saudi Arabia at the beginning of 1964, at the suggestion of Prince Muḥammad al-Faisal. Several other ideas were put forward, including importing water from India, the Shatt al-Arab, the Nile, or East Africa; however, all of these suggestions were rejected due to their impracticability.

The water desalination proposal, on the other hand, was accepted due to the availability of appropriate technologies, especially since the project's vision was not limited to providing drinking water, but rather included benefits to agriculture, industry, and other fields.[21]

The desalination project was launched in Saudi Arabia as a temporary solution at a time when alternative proposals were still coming in; among them was the proposal by the "Water Prince," Prince Muḥammad bin Faisal bin Abdulaziz, to import an iceberg from the Antarctic to Jeddah for use as a source of water and to reduce the temperature.

Several studies were conducted and five conferences were held on this topic, the first of which took place in Oxford in 1976, gathering approximately 200 scientists and experts in snow and hydrology as well as engineering. These studies recommended continuing with the proposal, but the project did not see the light of day due to its rejection by the Saudi government.[22]

Although SWCC started as a modest and temporary proposal, over time it proved its success and worth as a strategic option. Its plants reached the highest stages of innovation and development, and it became a pioneer in the seawater desalination industry and the largest producer of desalinated water in the world.[23]



بسم الله الرحمن الرحيم

١/١٤/١١

المملكة العربية السعودية

الأمانة العامة لمجلس الوزراء

ديوان رئاسة مجلس الوزراء
مركز الوثائق
تمت الموافقة وبلغ برقم ٢٩٠٣٢
في ١٣٨٦/١١/١٧هـ

الرقم
التاريخ
التوابع

قرار رقم ٧٤٨ وتاريخ ١٣٨٦/١٠/١٢هـ

ان مجلس الوزراء

بعد اطلاعه على الخطاب المرفوع من معالي وزير الزراعه والمياه برقم ١٤٤٨/ر/ف في ٨٦/١٠/٦ المتضمن ان رئيس مكتب تحلية المياه المالحه بالوزاره محمد الفيصل كان قد حصل على درجة البكالوريوس في الاقتصاد من جامعة سان فرنسيسكو بالولايات المتحده بدرجة عاليه في عام ١٩٦٣م والتحق فور تخرجه بمؤسسة النقد العربي السعودي بوظيفة باحث اقتصادي ثم انتقل منها الى وزارة الزراعه والمياه كرئيس لمكتب تحلية المياه المالحه بذلك بناء على طلب الوزاره تقديرا لما قام به بمبادرته الشخصيه من بحوث قيمه في مجال دراسة تنقية مياه البحر تلك البحوث التي نالت تقدير عدد من الهيئات الدوليه المعنية بمثل هذه البحوث ويخص منها بالذكر مكتب تحلية مياه البحر بوزارة الداخليه بالولايات المتحده الامريكيه .

وانه من الجدير بالذكر ان المذكور هو اول رئيس للمكتب المنوه عنه وانه اول من وكل اليه بصفته هذه تأسيس هذا المكتب وتنظيمه وتزويده بالكفاءات الفنيه والاداريه اللازمه فقام بذلك على احسن وجه ، هذا من حيث التنظيم الاداري . اما من حيث العمل التنفيذي فانه يقوم الآن على الاشراف على تنفيذ خمس محطات لتحلية مياه البحر بجده ، وضبا ، واملج ، والوجه ، والخفجي .

ونظرا لضخامة مسئولية العمل المناط به ونظرا لأن وظيفة رئيس مكتب تحلية المياه المالحه مصنفة في المرتبة الثانيه العاديه في ميزانية الوزاره للعام المالي الحالي وان رواتبه موقوف صرفها بانتظار مايصدر به قرار مجلس الوزراء بشأن شغل هذه الوظيفه .

ونظرا لما اظهره المذكور من كفاءة واخلاص في العمل فانه يطلب الموافقة على تعيينه في وظيفة رئيس مكتب تحلية المياه المالحه الشاغرة والمصنفة بالمرتبة الثانيه العاديه .

يقرر

الموافقة على طلب معالي وزير الزراعة والمياه بتعيين محمد الفيصل في وظيفة رئيس مكتب تحلية المياه المالحه الشاغرة في ميزانية الوزاره للعام المالي الحالي والمصنفة بالمرتبة الثانيه العاديه .

ولما ذكر حرر ،،،

نائب رئيس مجلس الوزراء

ح

Resolution No. 748, October 28, 1965, p. 1
Source: Document from the National Center for Documents and Archives

Phases of the creation of the Saline Water Conversion Corporation

The starting point of the SWCC came in 1967, when an office for water desalination was established at the Ministry of Agriculture and Water, with Prince Muḥammad al-Faisal appointed as head.[24]

His Highness was chosen due to his experience and previous research related to the field of water, including desalination, which had been acclaimed by international bodies; indeed, his selection was an example of "the right man in the right position."[25]

In 1968, the office was turned into the General Administration for Water Desalination at the Ministry of Agriculture and Water; Prince Muḥammad al-Faisal continued as its head. The success of this administration was enough for it to be transformed in 1971 from an administration to the Agency for Water Desalination Affairs at the Ministry of Agriculture and Water, after which it continued its previous activities under the leadership of Prince Muḥammad al-Faisal.[26]

Following the pioneering successes achieved by the agency and the expansion of its activities, the Council of Ministers issued a resolution on September 6, 1974, to establish an independent water desalination institution administratively reporting to the Minister of Agriculture and Water, to be named the Saline Water Conversion Corporation, with its headquarters in Riyadh and with a high-level governor appointed by royal decree.

The primary goal of this institution was to supplement natural water resources by desalinating saltwater in all the regions of the Kingdom whose needs were not being met by natural sources. The SWCC would be allowed to produce supplementary electrical power whenever necessary.[27]

The SWCC was given a board of directors that managed its affairs, set its general policy, and monitored the latter's implementation. It consisted of the Minister of Agriculture and Water as Chairman, the SWCC's own Governor as Vice-Chairman, and members from several ministries, namely the Ministry of Trade and Industry, the Ministry of Interior for Municipal Affairs, the Ministry of Finance and National Economy, and the Ministry of Petroleum and Mineral Resources, as well as the Chairman of the Central Planning Authority.

Its powers to implement and manage water desalination projects in the Kingdom were also specified; they included:

- Expansion, operation and maintenance.
- Training Saudi citizens within or outside the Kingdom to research, implement, operate and maintain desalination projects.
- Concluding agreements and contracts for the sale of water and electrical energy with the entities in charge of distribution, whether governmental or private; the SWCC would determine the prices and terms of sale in consultation with the competent government authorities, in accordance with the directives of the Council of Ministers.
- Conducting studies, research, and experiments on its own or through third parties with the aim of improving and developing the means and methods of production.
- Preparing, implementing and monitoring a phased program, including the necessary investments in the Kingdom for study, implementation and operation, and in the training and qualification of Saudis for these roles.[28]

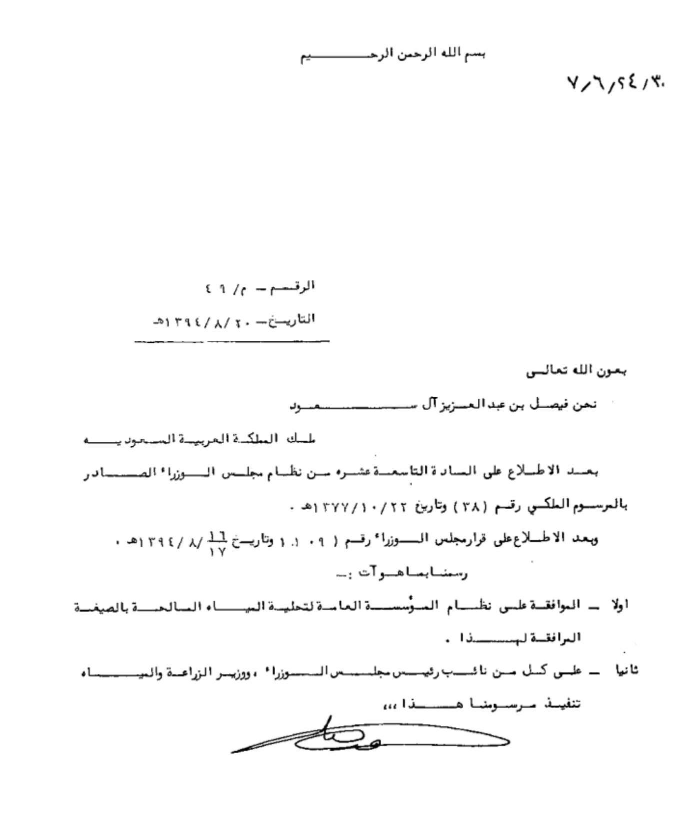
On November 27, 1974, Prince Muḥammad al-Faisal was appointed Governor of the Saline Water Conversion Corporation. Among his major duties was represent the SWCC in its relations and agreements with other entities and before the judiciary, within the limits of the powers granted to him; he was also tasked with proposing and overseeing plans and programs. He was also responsible for all of the SWCC's employees and for the implementation of all decisions of the Board of Directors, among other powers.[29]

The budget of the SWCC in 1975 was estimated at 2,207,574,227 Saudi riyals.[30] The initial costs for establishing plants on the eastern and western coasts amounted to about 20 billion riyals.[31]

What began as a small idea for a complete solution thus transformed into an independent entity that played an important role in the lives of Saudi citizens, and solved a problem that had for many centuries been a source of anxiety, conflict, and struggle for survival.

This SWCC allowed Saudi citizens to move forward in building their state, accelerating towards its renaissance and increasing its prestige, as water was no longer a stumbling block in their path or a preoccupation and source of anxiety.

Saudi Arabia had now made huge progress in the field of water provision since the SWCC's establishment during the reign of King Faisal; it had a stable source of water on which it could rely to support its progress and development. Due to the importance of water desalination, the industry was integrated into the development plans that were launched in 1970.


بسم الله الرحمن الرحيم

٣٠/٢٤/٦/٧

الرقم — م/ ٤٩

التاريخ — ١٣٩٤/٨/٢٠هـ

بعون الله تعالى

نحن فيصل بن عبد العزيز آل سعود

ملك المملكة العربية السعودية

بعد الاطلاع على المادة التاسعة عشرة من نظام مجلس الوزراء الصادر بالمرسوم الملكي رقم (٣٨) وتاريخ ١٣٧٧/١٠/٢٢هـ .

وبعد الاطلاع على قرار مجلس الوزراء رقم (١١٠٩) وتاريخ ١٦/١٧ /٨/١٣٩٤هـ .

رسمنا بما هو آت :-

أولا — الموافقة على نظام المؤسسة العامة لتحلية المياه المالحة بالصيغة المرافقة لهذا .

ثانيا — على كل من نائب رئيس مجلس الوزراء ، ووزير الزراعة والمياه تنفيذ مرسومنا هذا ،،،

Resolution No. m/49, September 06, 1974
Source: National Center for Documents and Archives, Constitution of the Saline Water Conversion Corporation

الرقم أ/١٩٤ ـ التاريخ ١٢/١١/١٣٩٤ هـ
بعون الله تعالى ..
نحن فيصل بن عبد العزيز آل سعود
ملك المملكة العربية السعودية

بعد الاطلاع على المادة الأولى من نظام الوزراء الصادر بالمرسوم الملكى رقم م/١٠ وتاريخ ١٨ـ٤ـ١٣٩١ هـ

وبعد الاطلاع على المادة الثانية من نظام المؤسسة العامة لتحلية المياه المالحة الصادرة بالمرسوم الملكى رقم م/٤٩ وتاريخ ٢٠ـ٨ـ١٣٩٤ هـ

وبعد الاطلاع على قرار مجلس الوزراء رقم ١٩١٤ وتاريخ ٢٩ـ١٠ـ١٣٩٤ هـ .

امـرنا بما هو آت :ـ

أولا ـ يعين الأمير محمد الفيصل محافظاً للمؤسسة العامة لتحلية المياه المالحة بالمرتبة الممتازة .

ثانيا ـ على نائب رئيس مجلس الوزراء ووزير الزراعة والمياه تنفيذ أمرنا هذا . التوقيع : فيصل

الرقم أ/١٩٧ ـ التاريخ ١٣/١١/١٣٩٤ هـ
بعون الله تعالى ..

Umm al-Qura newspaper, “Two Royal Decrees,”
issue 2553, December 6, 1974, p. 12

بسم الله الرحمن الرحيم

المملكة العربية السعودية
الأمانة العامة لمجلس الوزراء

ديوان رئاسة مجلس الوزراء
مركز الوثائق
تمت الموافقة وبلغ
في ٢٠/٦/١٣٩٥هـ

الرقم ....
التاريخ ....
التوابع ....

قـرار رقم ٨٢٣ وتاريخ ٢٩/٦/١٣٩٥هـ.

ان مجلس الـــوزراء .

بعد الاطلاع على المادة (٤٣) من نظام مجلس الوزراء الصادر بالمرسوم الملكي رقم ٣٨ وتاريخ ٢٢شوال ١٣٧٧

وبعد الاطلاع على المرسوم الملكي رقم م/٤٩ وتاريخ ٢٠/٨/٩٤هـ. الصادر بالموافقة على نظام المؤسسة العامـة لتحلية المياه المالحـة ،وعلى البيانات الخاصة بايرادات ومصروفات المؤسسة المذكوره للسنة المالية ٩٥/٩٦هـ.

يقـــرر مايلـــي :

١ ـ تقدر ايرادات المؤسسة العامة لتحلية المياه المالحة للسنة المالية ٩٥/ ٩٦ بمبلغ(٢ر٢٠٧ر٥٧٤ر٢٢٧)ـ الفين ومائتين وسبعة ملايين وخمسمائة واربعة وسبعين الفا ومائتين وسبعة وعشرين ريالا ،وفقـا للجـــدول حرف (أ) المرافق لهذا القرار .

٢ ـ تقدر مصروفات المؤسسة العامة لتحلية المياه المالحة للسنة الماليه ٩٥/ ٩٦ بمبلغ(٢ر٢٠٧ر٥٧٤ر٢٢٧)ـ الفين ومائتين وسبعة ملايين وخمسمائة واربعة وسبعين الفا ومائتين وسبعة وعشرين ريالا ،وفقـا للجـــدول حرف (ب) المرافق لهذا القـــرار .

٣ ـ تصرف نفقات المؤسسة العامة لتحلية المياه المالحة وفقا للنظام والتعليمات الخاصة بها .

٤ ـ لا يجوز الارتباط باى مصروف ليس له اعتماد فى الميزانية ، ولا يجوز الارتباط بما يجاوز الاعتماد . كما لا يجــــوز استعمال الاعتماد فى غير ما خصص له او اصدار امر بالصرف بما يجاوز الاعتماد المقرر .

٥ ـ لا يجوز اجراء مناقلة من باب الى باب فى هذه الميزانية الا وفقا لاحكام المادة (الرابعة) من المرســــوم الملكى رقم م/ ٤٧ وتاريخ ٢٠/٦/٩٥هـ. الصادر بالمصادقة على الميزانية العامة للدولــه .

٦ ـ نظـم مشروع مرسوم ملكـى بذلك صورتـه مرافقة لهذا .

ولما ذكـر حرر .....

رئيس مجلس الـــوزراء

Resolution No. 823, dated July 08, 1975
Source: National Center for Documents and Archives

Production plants

The SWCC relied on plants of two kinds: single-production (single-purpose) plants, which solely produced fresh water, and dual-purpose plants, which both produced fresh water and generated electrical power.[32] Dual-purpose plants have economic benefits and are used in urban areas and exploited for the Kingdom's industrial development.[33]

The desalination plants on the western and eastern coasts operate using a number of technologies, namely:

- multi-stage flash (MSF) technology
- multiple-effect distillation (MED)
- reverse osmosis (RO).[34]

Plants on the western coast

Jeddah

In 1965, the western coast witnessed the construction of the first desalination plants, as Jeddah was home to the first large desalination plant using MSF technology, dual-purpose for producing both water and electricity, due to its urgent need for such a plant. The Kingdom concluded an agreement with the United States regarding seawater desalination in Jeddah for the production of large quantities of fresh drinking water.[35]

The agreement stipulated that the US government would assume responsibility for negotiating with experienced and competent American companies to develop engineering and architectural studies and designs, and to supply the necessary equipment and machinery, in order to finance and supply the project, while training Saudi personnel to manage and maintain it.

The agreement was divided into two phases:

Phase I: The design and engineering phase.

Phase II: Construction and initial operation.

The estimated cost at the beginning of the agreement was set at approximately 14 million US dollars.[36]

In 1967, a ceremony was held to celebrate the start of work on the Jeddah desalination plant project, attended by the US Secretary of the Interior, Stewart Udall, the Saudi Minister of Agriculture and Water, Hasan al-Mishari, and the Director of the Water Desalination Office, Prince Muḥammad al-Faisal.[37]

To set up the plant, in 1967 the Director General of Water Desalination, Prince Muḥammad al-Faisal, signed a number of agreements with Jack Hunter, Director General of the US Office of Saline Water, and Johan Jacques, representing the Dutch Continental Engineering Company, to act as the general contractors for the project.

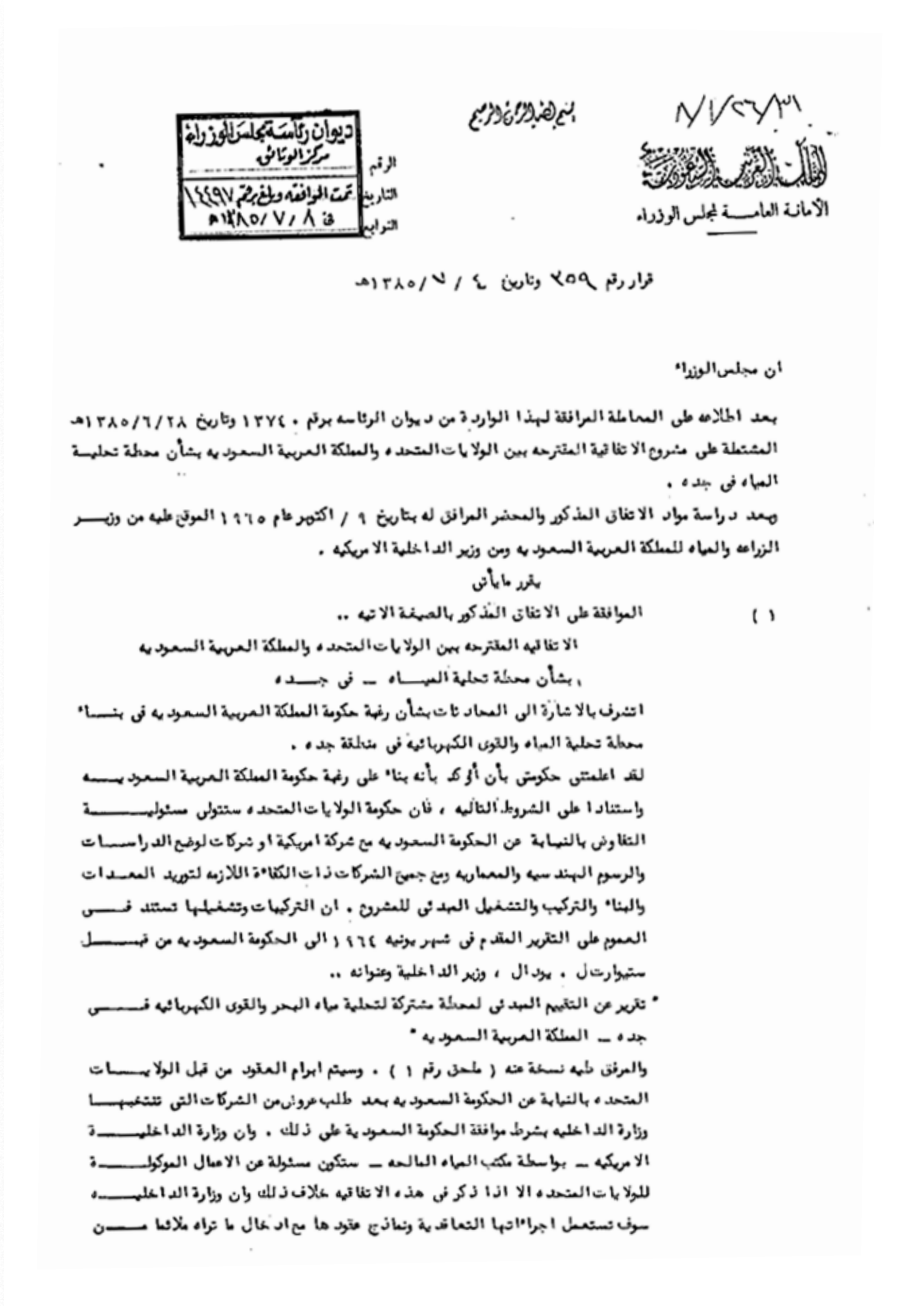
He also signed agreements with:

- the American companies Aquachem, which manufactured desalination units, and Burns Andrew, to design the project and supervise the plant's implementation;
- Ishikawajima-Harima (IHI) Heavy Industries, to supply the necessary steam boilers; and
- the German company AIG to provide generators and turbines.[38]

The Saudi government exempted the machines and equipment for the Jeddah plant from customs duties and taxes, in order to expedite the work. The Jeddah plant began operating in 1970.[39] It had a production volume of 18,925 m^3, and it produced 50 megawatts of electricity. The plant was decommissioned in 1982.[40]

Duba and al-Wajh

In 1967, a project was also established to create two small single-purpose plants, producing only fresh water, in the cities of Duba and al-Wajh using MSF technology. An agreement was concluded for this purpose with the American company Aquachem, with a contract estimated at 3,789,180 riyals. A ceremony was held in al-Wajh in 1968 occasion of the start of the project, under the patronage of Prince Muḥammad al-Faisal;[41] the project concluded in 1969.[42] The output of each plant reached 198 m^3/day;[43] the company Conam Services assumed responsibility for operating and maintaining the two plants. Al-Wajh Plant was decommissioned in 1979, while the Duba Plant was decommissioned in 1988.[44]



ديوان رئاسة مجلس الوزراء
مركز الوثائق
تمت الموافقه وبلغ برقم ١٤٤٩٧
في ٨ / ٧ / ١٣٨٥هـ

بسم الله الرحمن الرحيم

المملكة العربية السعودية
الأمانة العامـــة لمجلس الوزراء

قرار رقم ٣٥٩ وتاريخ ٤ / ٧ / ١٣٨٥هـ

ان مجلس الوزراء

بعد اطلاعه على المعاملة المرافقة لهذا الواردة من ديوان الرئاسه برقم ١٣٧٤٠ وتاريخ ١٣٨٥/٦/٢٨هـ المشتملة على مشروع الاتفاقية المقترحه بين الولايات المتحده والمملكة العربية السعوديه بشأن محطة تحلية المياه في جده .

وبعد دراسة مواد الاتفاق المذكور والمحضر المرافق له بتاريخ ٩ / اكتوبر عام ١٩٦٥ الموقع عليه من وزير الزراعه والمياه للمملكة العربية السعوديه ومن وزير الداخلية الامريكيه .

يقرر ما يأتي

١) الموافقة على الاتفاق المذكور بالصيغة الاتيه ..

الاتفاقيه المقترحه بين الولايات المتحده والمملكة العربية السعوديه

بشأن محطة تحلية المياه — في جـده

اتشرف بالاشارة الى المحادثات بشأن رغبة حكومة المملكة العربية السعوديه في بناء محطة تحلية المياه والقوى الكهربائيه في منطقة جده .

لقد اعلمتني حكومتي بأن أؤكد بأنه بناء على رغبة حكومة المملكة العربية السعوديه واستنادا على الشروط التاليه ، فان حكومة الولايات المتحده ستتولى مسئوليـــة التفاوض بالنيابة عن الحكومة السعوديه مع شركة امريكية او شركات لوضع الدراسات والرسوم الهندسيه والمعماريه ومع جميع الشركات ذات الكفاءة اللازمه لتوريد المعدات والبناء والتركيب والتشغيل المبدئي للمشروع . ان التركيبات وتشغيلها تستند في العموم على التقرير المقدم في شهر يونيه ١٩٦٤ الى الحكومة السعوديه من قبل ستيوارت ل . يودال ، وزير الداخلية وعنوانه ..

" تقرير عن التقييم المبدئي لمحطة مشتركة لتحلية مياه البحر والقوى الكهربائيه في جده — المملكة العربية السعوديه "

والمرفق طيه نسخة عنه (ملحق رقم ١) . وسيتم ابرام العقود من قبل الولايات المتحده بالنيابة عن الحكومة السعوديه بعد طلب عروض من الشركات التي تنتخبها وزارة الداخليه بشرط موافقة الحكومة السعودية على ذلك . وان وزارة الداخليــة الامريكيه — بواسطة مكتب المياه المالحه — ستكون مسئولة عن الاعمال الموكولــة للولايات المتحده الا اذا ذكر في هذه الاتفاقيه خلاف ذلك وان وزارة الداخليـــه سوف تستعمل اجراءاتها التعاقدية ونماذج عقودها مع ادخال ما تراه ملائما مـــن

Resolution No. 359, October 28, 1965, pp. 1–6
Source: Document from the National Center for Documents and Archives

سمو الأمير مشعل

يرعى الاحتفال ببدء العمل فى مشروع تحلية مياه البحر

فى تمام الساعة الرابعة والنصف من صباح الاحد الماضى جرى تحت رعاية سمو الأمير مشعل بن عبدالعزيز الاحتفال ببدء العمل فى مشروع انشاء محطة تحلية مياه البحر بجدة ، وقد حضر الحفل معالى وزير الداخليــة الامريكى المستر سيتوارت يودال ومعالى الشيخ حسن المشارى وزير الزراعة والمياه ورجال السلك الدبلوماسى وعدد من كبار رجالات الدولة وأعيان البــلاد ورجال الاذاعة والتلفزيون والصحافة ٠

وقد القى كلمة الافتتاح صاحب السمو الأمير محمد الفيصل مدير عام تحلية المياه بالمملكة حيث عدد سموه الأهداف التى ستعود على البلاد نتيجة لهــذا المشروع الحيوى الجبار الذى يؤكد حرص حكومة صاحب الجلالة الملك فيصل المعظم على السير قدما بعجلة التقدم فــى هــذا البلد ٠

ثم القى معالى وزير الزراعة والمياه كلمة رحب فيها بوزير الداخلية الامريكى وأشاد بعلاقات الصداقة بين المملكة والولايات المتحدة ٠

ثم ألقى بعد ذلك معالى وزير الداخلية الامريكى كلمة شكر فيها صاحب السمو الملكى الأمير مشعل ومعالى وزير الزراعة والمياه كما تحدث عن أهــداف المشروع والنتائج التى سوف تعود على البلاد من هذا المشروع الحيوى العملاق ٠

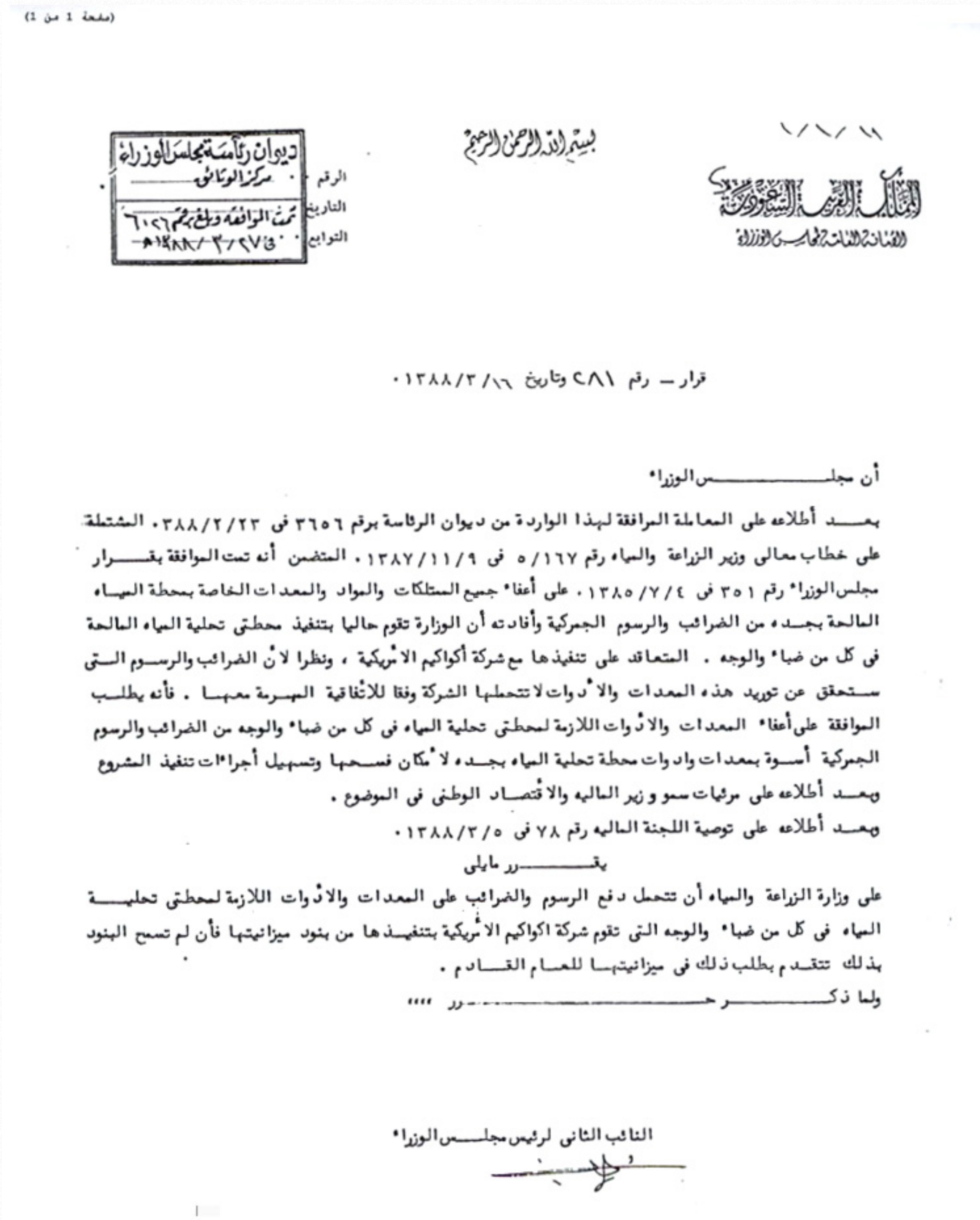
وبعد الانتهاء توجــه صاحب السمو الملكى الأمير مشعل وصاحب السمو الملكى الأمــير محمد الفيصل يرافقهما معالى وزير الداخليــة الامريكية ومعالى وزير الزراعة والمياه الى المنصة حيث ضغطوا على الزر ايذانا ببدء العمل فى المشروع ثم تحركت المعدات الثقيلة شارعة فى العمل ٠

هذا وقد أقام صاحب السمو الملكى الأمير مشعل بن عبد العزيز أمير منطقة مكة المكرمة ظهر الأحد حفل غداء فى فندق قصر الكندرة تكريما لمعالى وزير الداخليــة الأمريكية شهده كبار المسئولين وعــلى راسهم صاحب السمو الملكى الأمير متعب بن عبد العزيز والأمير محمد الفيصل ومعالى وزير الزراعة والمياه الأستاذ حسن المشارى وغيرهــم ٠

كما شهده رؤساء البعثات السياســية والوجهاء والأعيان فى كل من مكة وجدة ٠

كما أقام صاحب السمو الملكى الأمير محمد الفيصل مدير عام تحلية المياه بالمملكة بعد مغرب اليوم المذكور حفل استقبال فى فندق قصر الكندرة تكريما لمعالى وزير الداخلية الامريكية المستر ستيوارت يودال ٠ وقد حضر الحفل صاحب السمو الملكى الأمير مشعل بن عبد العزيز أمير منطقة مكة المكرمة ومعالى الشيخ حسن المشارى وزير الزراعة والمياه وعدد من كبــار المسئولين من مدنيين وعسكريين وأعضاء السلك الدبلوماســى والوجهــاء والأعيان ٠

Umm al-Qura newspaper, "His Highness Prince Mishal attends the celebration of the start of work on the seawater desalination project," issue 2158, February 10, 1967, p. 1



(صفحة 1 من 1)

المملكة العربية السعودية
الأمانة العامة لمجلس الوزراء

بسم الله الرحمن الرحيم

ديوان رئاسة مجلس الوزراء
مركز الوثائق
تمت الموافقة وبلغ برقم ٦٠٢٦
فى ٢٧/٣/١٣٨٨هـ

الرقم
التاريخ
التوابع

قرار – رقم ٢٨١ وتاريخ ١٦/٣/١٣٨٨٠

أن مجلــــــــس الوزراء

بعــد أطلاعه على المعاملة المرافقة لهذا الواردة من ديوان الرئاسة برقم ٣٦٥٦ فى ٢٣/٢/٣٨٨٠ المشتملة على خطاب معالى وزير الزراعة والمياه رقم ١٦٧/٥ فى ٩/١١/١٣٨٧٠ المتضمن أنه تمت الموافقة بقــرار مجلس الوزراء رقم ٣٥١ فى ٤/٧/١٣٨٥٠ على أعفاء جميع الممتلكات والمواد والمعدات الخاصة بمحطة المياه المالحة بجدة من الضرائب والرسوم الجمركية وأفادته أن الوزارة تقوم حاليا بتنفيذ محطتى تحلية المياه المالحة فى كل من ضباء والوجه . المتعاقد على تنفيذها مع شركة أكواكيم الأمريكية ، ونظرا لأن الضرائب والرسوم التى ستحقق عن توريد هذه المعدات والأدوات لا تتحملها الشركة وفقا للاتفاقية المبرمة معها . فأنه يطلب الموافقة على أعفاء المعدات والأدوات اللازمة لمحطتى تحلية المياه فى كل من ضباء والوجه من الضرائب والرسوم الجمركية أسوة بمعدات وادوات محطة تحلية المياه بجدة لإمكان فسحها وتسهيل أجراءات تنفيذ المشروع وبعــد أطلاعه على مرئيات سمو وزير الماليه والاقتصاد الوطنى فى الموضوع .

وبعــد أطلاعه على توصية اللجنة الماليه رقم ٧٨ فى ٥/٣/١٣٨٨٠

يقــــرر مايلى

على وزارة الزراعة والمياه أن تتحمل دفع الرسوم والضرائب على المعدات والأدوات اللازمة لمحطتى تحليــة المياه فى كل من ضباء والوجه التى تقوم شركة اكواكيم الأمريكية بتنفيذها من بنود ميزانيتها فأن لم تسمح البنود بذلك تتقدم بطلب ذلك فى ميزانيتها للعام القادم .

ولما ذكــــر حــــــرر ،،،،

النائب الثانى لرئيس مجلــس الوزراء

Resolution No. 281, March 16, 1968
Source: National Center for Documents and Archives


Seawater desalination plant in Jeddah, Phase I, 1970

The Corporation during the Reign of King Faisal

Plants on the eastern coast

The agreement was not limited to establishing plants on the western coast: the Saudi government also saw the need for analogous projects on the eastern coast, and tasked the Ministry of Agriculture and Water with undertaking all necessary steps for this project.[45]

al-Khobar

The first phase of the Eastern project began in 1968, when Prince Muhammad al-Faisal signed an agreement with the consulting company Italconsult to carry out the necessary research and designs for a water desalination plant in al-Khobar, at a cost of 369,000 US dollars using MSF technology. This plant provided water to five cities: al-Khobar, al-Dammam, Saihat, al-Qatif, and Safwa. [46]

In 1969, an agreement was signed with the American company Aquachem to import and install equipment at a value of 35,415,000 Saudi riyals. The Plant was inaugurated in1973, it was the first to be established on the coast of the Arabian Gulf, and its production volume reached 28,400 m^3/day, mixed with groundwater extracted from wells in the area, The plant was decommissioned in 1983.

al-Khafji

A plant with similar technology was also established in the city of Khafji to supply al-Khafji; the plant opened in 1974, with its production volume reaching 550 m^3, The plant was decommissioned in 1983.

In 1973, the Minister of Agriculture and Water signed an agreement with Konam Services to operate and maintain the two plants for a period of five years at a cost of 88,639,136 riyals.

Transmission projects

In 1973, the first water Transmission system was opened to supply the city of al-Khobar. The length of the pipes was 22 km, ranging from 19 to 23 inches in diameter. The project contained four storage tanks, with a capacity of 10,250 m^3.[48]

Al-Khobar water desalination plant, 1973

The SWCC during the Reign of King Khalid

1975–1982

The SWCC began making progress towards setting up water desalination plants in most regions of the Kingdom, which was no easy task. The creation and maintenance of these plants cost great effort and enormous sums of money; in order to organize the progress of work on water provision, they were attached to the Second Development Plan in 1975.[1]

During the reign of King Khalid, the SWCC underwent significant development in its services and the number of plants established, and it began to operate and maintain its projects independently.[2]

Plants on the western coast

Umluj

A plant was established to produce only fresh water using MSF desalination; it began operation in 1975, producing 473 m³/day. The units were manufactured by the German company Krupp, The plant was decommissioned in 1987.

In 1981, another plant using MED technology was set up on an urgent basis, to meet the people's need for drinking water at that time. It produced 825 m³/day. This plant was later transferred, in 1986, to the city of al-Wajh, The plant was decommissioned in 1987.[3]

Jeddah

The SWCC continued to meet Jeddah's water supply needs, setting up several plants, namely the following:

- The second plant was a dual-purpose facility for producing both fresh water and electricity. It functioned using MSF technology, and began operating in 1977, producing 43,200 m³/day and generating 85 megawatts in 1986, to the city of al-Wajh, The plant was decommissioned in 2008.
- A single-purpose reverse osmosis (RO) plant was established in 1978 to produce only fresh water. It was the first desalination plant in the Kingdom to use this technology, and one of the first such plants in the commercial world, producing 12,120 m³ in 1986, to the city of al-Wajh, The plant was decommissioned in 1987.[4]
- The third plant was set up in 1979 to produce both fresh water and electrical power. It operated using MSF technology, and its daily production rate was 88,320 m³ and 256 megawatts, The plant was decommissioned in 2013 .[5]
- The fourth plant was set up in 1981 to produce both fresh water and electrical power. It operated using MSF technology, and its production rate was 220,800 m³ and 590 megawatts, The plant was decommissioned in 2019.[6]

When work was completed on Jeddah's plants, its production capacity increased, and the connecting pipelines were extended to include all its suburbs and quarters, the water sources of Wadi Fatima and Wadi Khulays were dispensed with, and the Ministry of Agriculture and Water reallocated them for the development of agriculture in those valleys.[7]

Al-Wajh

Another plant for producing only fresh water using MSF technology was set up in 1979, and produced 550 m³/day, The plant was decommissioned in 2009.[8]

Duba

Another single-purpose plant using MSF technology was established in 1979, and produces 454 m³/day The plant was decommissioned in 1990.[9]

Farasan Island

A plant was built in Farasan, in the south of the western coastal region; it was inaugurated in 1979 and allocated to produce only fresh water. It operated using MSF technology, and produced 500 m³/day, The plant was decommissioned in 2009.[10]

Haql

A plant was built to produce only fresh water, using MSF technology. It began operating in 1979, and produced 774 m³/day. This plant was later transferred to Rabigh, in 1994, The plant was decommissioned in 1989.[11]

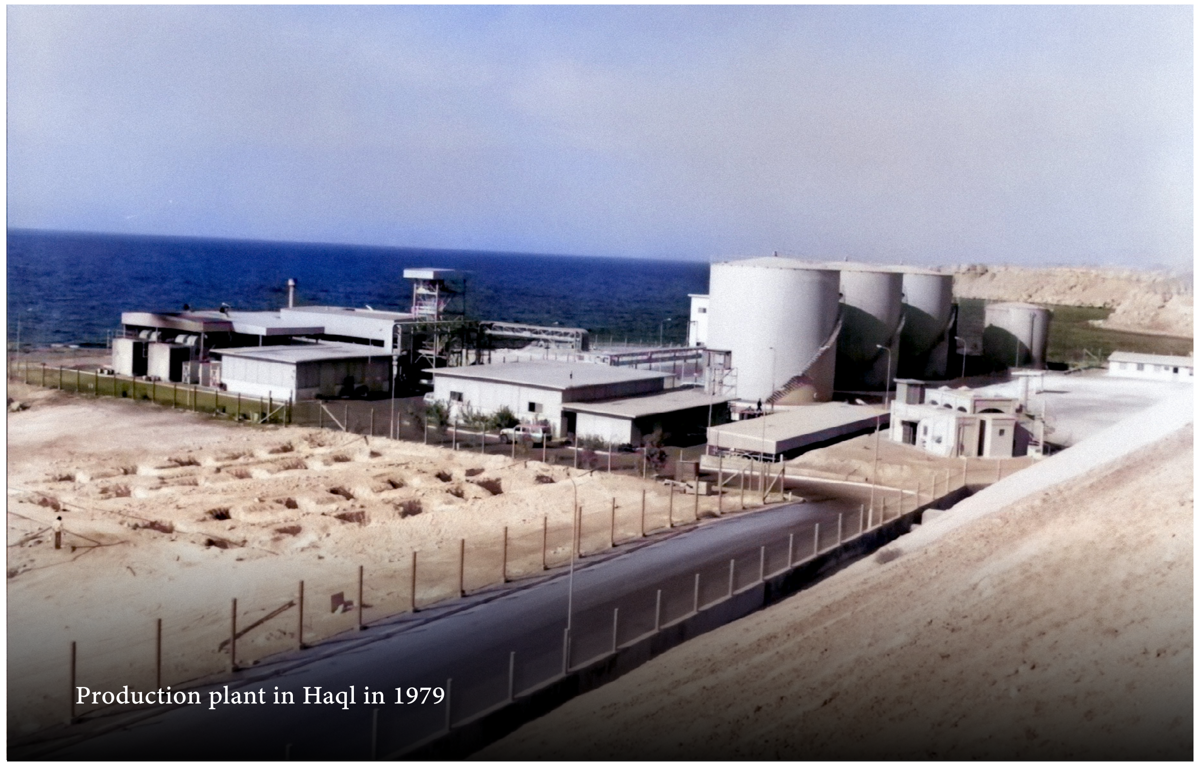
Yanbu

A dual-purpose plant for water production and electric power generation, using MSF technology, was established in 1981 to supply the water demands of both Madinah and Yanbuʿ al-Bahr. [12] It produced 100,800 m³/day and 357 megawatts, The plant was decommissioned in 2019.[13]

Plants on the eastern coast

Al-Khafji

An emergency plant consisting of five small units using MED technology to produce only water was established in 1978 to meet the people's need for water. It produced 1,075 m³/day; in 1990, it was transferred to Farasan The Plant was decommissioned in 1986.[14]



Production plant in Haql in 1979

The Corporation during the Reign of King Khalid

Transmission projects

The work of the SWCC was not limited to setting up desalination plants: it also created a network of pipelines from plants on the coasts to meet the need of coastal and inland cities and villages for fresh water.[15]

Creating these pipelines was no easy task: these projects were huge and expensive, and the SWCC spent vast sums on them. This was due to the distances between cities, and the rugged and difficult terrain they had to traverse.

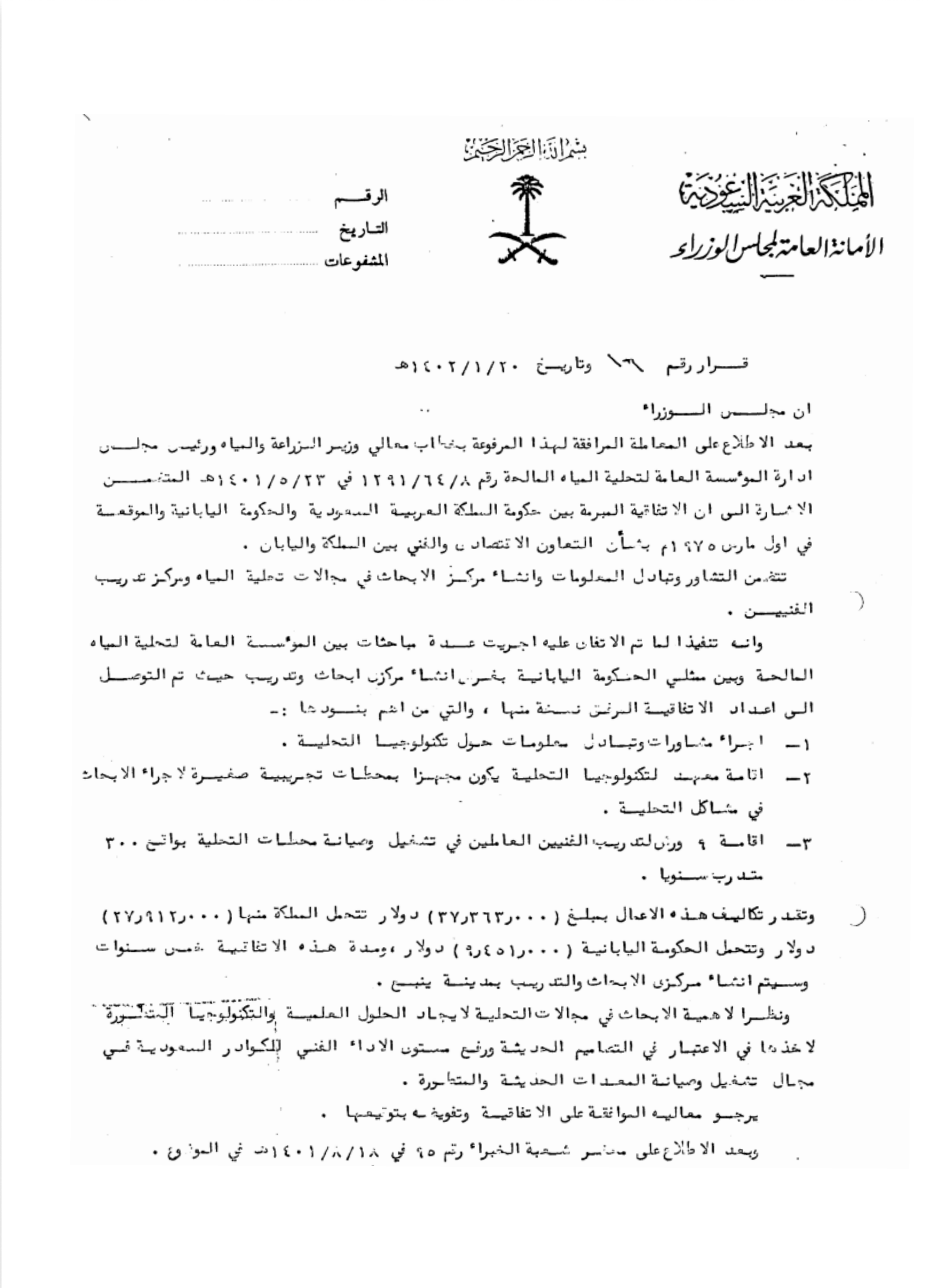
Among the inland cities served by the SWCC's work during the reign of King Khalid was Madinah. The creation of the pipeline from the Yanbuʿ plant began in May 1978. It ran to a length of 226 kilometers, and its diameter ranged between 23 and 32 inches. The pipes were covered on the outside with polyethylene and on the inside with epoxy paint to protect them from internal and external rust. The project contained two pumping stations and two storage tanks with a capacity of 40,000 m^3.[16]

In 1981, this Yanbuʿ–Madinah project began operating.

The training and research centers

From its earliest inception, the SWCC wanted to conduct technical research and studies in order to anticipate future developments, support its plants technically, reduce costs, and become a global leader in its field. It also desired to invest in its employees in order to keep pace with developing technology. Therefore, between 1982 and 1987, it signed agreements to establish two training and research centers in Yanbuʿ (later transferred to al-Jubayl). This will be discussed in detail in a subsequent chapter.

The first pipeline to transmit water from the Yanbuʿ plant to Madinah in 1981



بسم الله الرحمن الرحيم

المملكة العربية السعودية

الأمانة العامة لمجلس الوزراء

الرقم ....

التاريخ ....

المشفوعات ....

قرار رقم ١٦ وتاريخ ١٤٠٢/١/٢٠هـ

ان مجلس الوزراء

بعد الاطلاع على المعاملة المرافقة لهذا المرفوعة بخطاب معالي وزير الزراعة والمياه ورئيس مجلس ادارة المؤسسة العامة لتحلية المياه المالحة رقم ١٢٩١/٦٤/٨ في ١٤٠١/٥/٢٣هـ المتضمن الاشارة الى ان الاتفاقية المبرمة بين حكومة المملكة العربية السعودية والحكومة اليابانية والموقعة في اول مارس ١٩٧٥م بشأن التعاون الاقتصادي والفني بين المملكة واليابان .

تتضمن التشاور وتبادل المعلومات وانشاء مركز الابحاث في مجالات تحلية المياه ومركز تدريب الفنيين .

وانه تنفيذا لما تم الاتفاق عليه اجريت عدة مباحثات بين المؤسسة العامة لتحلية المياه المالحة وبين ممثلي الحكومة اليابانية بغرض انشاء مركز ابحاث وتدريب حيث تم التوصل الى اعداد الاتفاقية المرفق نسخة منها ، والتي من اهم بنودها :-

١- اجراء مشاورات وتبادل معلومات حول تكنولوجيا التحلية .

٢- اقامة معهد لتكنولوجيا التحلية يكون مجهزا بمحطات تجريبية صغيرة لاجراء الابحاث في مشاكل التحلية .

٣- اقامة ٩ ورش لتدريب الفنيين العاملين في تشغيل وصيانة محطات التحلية بواقع ٣٠٠ متدرب سنويا .

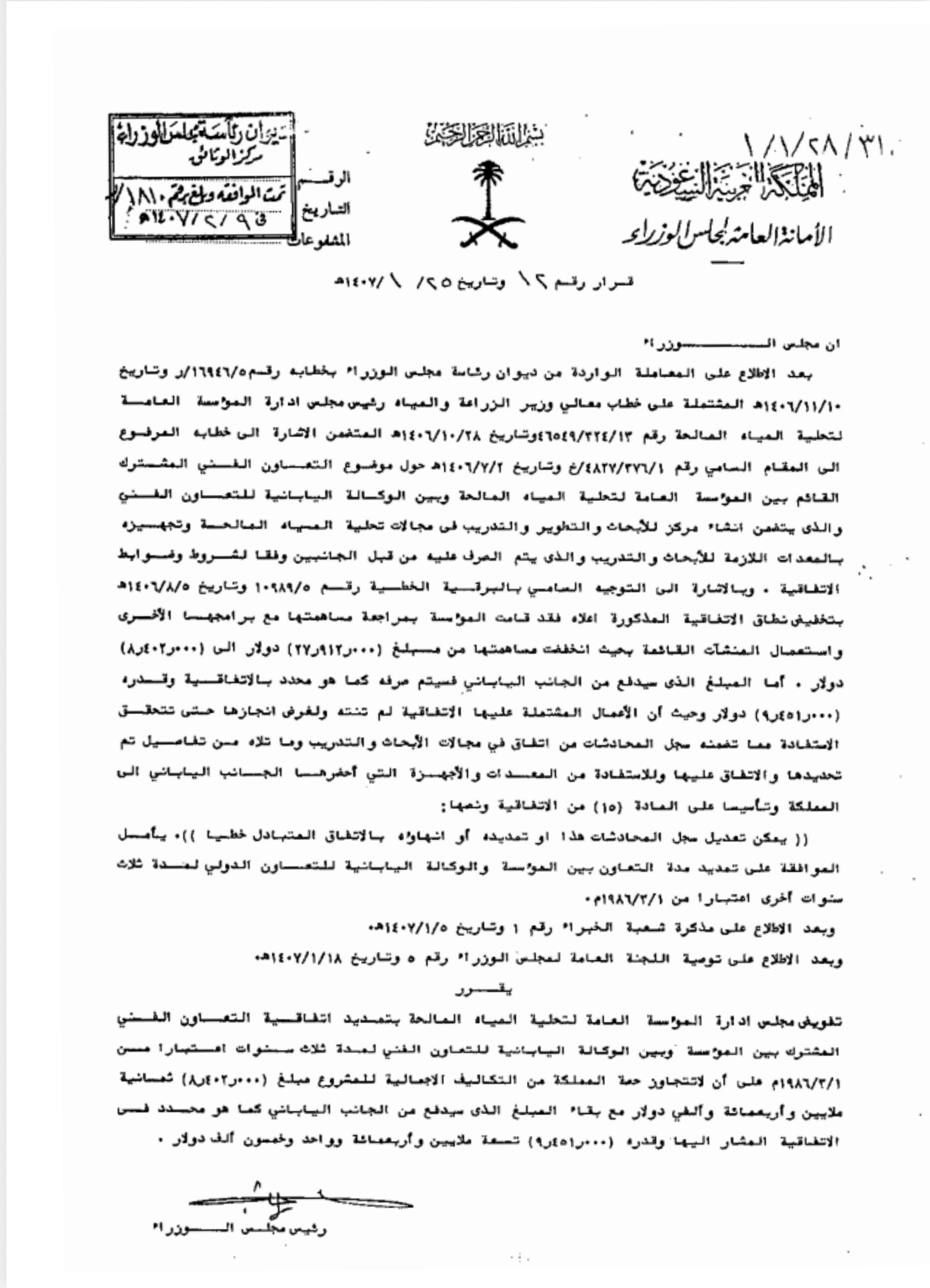
وتقدر تكاليف هذه الاعمال بمبلغ (٣٧٫٣٦٣٫٠٠٠) دولار تتحمل المملكة منها (٢٧٫٩١٢٫٠٠٠) دولار وتتحمل الحكومة اليابانية (٩٫٤٥١٫٠٠٠) دولار ، ومدة هذه الاتفاقية خمس سنوات وسيتم انشاء مركزي الابحاث والتدريب بمدينة ينبع .

ونظرا لاهمية الابحاث في مجالات التحلية لايجاد الحلول العلمية والتكنولوجيا المتطورة لاخذها في الاعتبار في التصاميم الحديثة ورفع مستوى الاداء الفني للكوادر السعودية في مجال تشغيل وصيانة المعدات الحديثة والمتطورة .

يرجو معاليه الموافقة على الاتفاقية وتفويضه بتوقيعها .

وبعد الاطلاع على محضر شعبة الخبراء رقم ٩٥ في ١٤٠١/٨/١٨هـ في الموضوع .

Resolution No. 16, November 16, 1981, pp. 1–2
Source: Document from the Institute of Public Administration,



١/١/٢٨/٣١

بسم الله الرحمن الرحيم

المملكة العربية السعودية

الأمانة العامة لمجلس الوزراء

ديوان رئاسة مجلس الوزراء
مركز الوثائق
تمت الموافقة وبلغ برقم ١٨١٠/ ق ١٤٠٧/٢/٩هـ

الرقم

التاريخ

المشفوعات

قرار رقم ١٢ وتاريخ ١٤٠٧/١/٢٥هـ

ان مجلس الوزراء

بعد الاطلاع على المعاملة الواردة من ديوان رئاسة مجلس الوزراء بخطابه رقم١٦٩٤٦/٥/ر وتاريخ ١٤٠٦/١١/١٠هـ المشتملة على خطاب معالي وزير الزراعة والمياه رئيس مجلس ادارة المؤسسة العامة لتحلية المياه المالحة رقم ٤٦٥٤٩/٢٢٤/١٣وتاريخ ١٤٠٦/١٠/٢٨هـ المتضمن الاشارة الى خطابه المرفوع الى المقام السامي رقم ٤٨٢٧/٣٧٦/١/غ وتاريخ ١٤٠٦/٧/٢هـ حول موضوع التعاون الفني المشترك القائم بين المؤسسة العامة لتحلية المياه المالحة وبين الوكالة اليابانية للتعاون الفني والذى يتضمن انشاء مركز للأبحاث والتطوير والتدريب فى مجالات تحلية المياه المالحة وتجهيزه بالمعدات اللازمة للأبحاث والتدريب والذى يتم الصرف عليه من قبل الجانبين وفقا لشروط وضوابط الاتفاقية . وبالاشارة الى التوجيه السامي بالبرقية الخطية رقم ١٠٩٨٩/٥ وتاريخ ١٤٠٦/٨/٥هـ بتخفيض نطاق الاتفاقية المذكورة اعلاه فقد قامت المؤسسة بمراجعة مساهمتها مع برامجها الأخرى واستعمال المنشآت القائمة بحيث انخفضت مساهمتها من مبلغ (٢٧٫٩١٢٫٠٠٠) دولار الى (٨٫٤٠٢٫٠٠٠) دولار . أما المبلغ الذى سيدفع من الجانب الياباني فسيتم صرفه كما هو محدد بالاتفاقية وقدره (٩٫٤٥١٫٠٠٠) دولار وحيث أن الأعمال المشتملة عليها الاتفاقية لم تنته ولغرض انجازها حتى تتحقق الاستفادة مما تضمنه سجل المحادثات من اتفاق في مجالات الأبحاث والتدريب وما تلاه من تفاصيل تم تحديدها والاتفاق عليها وللاستفادة من المعدات والأجهزة التي أحضرها الجانب الياباني الى المملكة وتأسيسا على المادة (١٥) من الاتفاقية ونصها:

((يمكن تعديل سجل المحادثات هذا او تمديده أو انهاؤه بالاتفاق المتبادل خطيا)). يأمل الموافقة على تمديد مدة التعاون بين المؤسسة والوكالة اليابانية للتعاون الدولي لمدة ثلاث سنوات أخرى اعتبارا من ١٩٨٦/٣/١م.

وبعد الاطلاع على مذكرة شعبة الخبراء رقم ١ وتاريخ ١٤٠٧/١/٥هـ.

وبعد الاطلاع على توصية اللجنة العامة لمجلس الوزراء رقم ٥ وتاريخ ١٤٠٧/١/١٨هـ.

يقرر

تفويض مجلس ادارة المؤسسة العامة لتحلية المياه المالحة بتمديد اتفاقية التعاون الفني المشترك بين المؤسسة وبين الوكالة اليابانية للتعاون الفني لمدة ثلاث سنوات اعتبارا من ١٩٨٦/٣/١م على أن لاتتجاوز حصة المملكة من التكاليف الاجمالية للمشروع مبلغ (٨٫٤٠٢٫٠٠٠) ثمانية ملايين وأربعمائة وألفي دولار مع بقاء المبلغ الذى سيدفع من الجانب الياباني كما هو محدد فى الاتفاقية المشار اليها وقدره (٩٫٤٥١٫٠٠٠) تسعة ملايين وأربعمائة وواحد وخمسون ألف دولار .

رئيس مجلس الوزراء

Resolution No. 12, dated September 29, 1986, p. 1
Source: National Center for Documents and Archives

The SWCC during the Reign of King Fahd

1982–2005

King Fahd bin Abdulaziz gave great attention to the desalination industry, providing it with every means of support in order to keep pace with the increasing demand for fresh water in the cities and villages of Saudi Arabia.

During his reign, the number of plants reached 19, and work on them became more professional, as the SWCC acquired experience in dealing with the difficulties in design, construction and operation that it had faced in the past.[1]

Plants on the western coast

Rabigh

In 1982, a single-purpose plant operating with MSF technology was established, producing 1,400 m^3/day, The plant was decommissioned in 2009. In 1994, a new plant, also using MSF technology, was added, its production volume reaching 774 m^3/day, The plant was decommissioned in 2009.[2]

Al-Bark

The SWCC established a single-purpose, producing only fresh water using RO technology, in 1983. This plant supplied the city of Al-Bark and its surrounding villages with water, with a daily production rate of 2,270 m^3, The plant was decommissioned in 2012. [3]

Umluj

After its plant was transferred to al-Wajh in 1986, a second plant was established in Umluj that used RO technology to produce only fresh water, at a rate of 4,400 m^3/day, The plant was decommissioned in 2020.[4]

Al-Wajh

In the city of Al-Wajh, a plant utilizing MED technology was added in 1986, producing 960 m^3/day. Another plant was added in 1989, with a production capacity of 1,200 m^3/day. The third expansion took place in 1993, utilizing MSF technology, with a production capacity of 550 m^3/day, The plants was decommissioned in 2009.[5]

Al-ʿAziziyya

In 1987, a single-purpose plant, producing only fresh water using MED technology, began operation in al-ʿAziziyya, north of Jeddah, to supply the Royal Palace; it produced 4,500 m^3/day, The plant is scheduled to be decommissioned in 2026.[6]

Al-Shuʿayba

Two dual-purpose plants were put into operation to supply Makkah, Jeddah, Ta'if, and al-Baha, the first in 1989 and the second in 2001; they operated using MSF technology. The first plant produced 223,000 m^3/day and generated 263 megawatts, The plant was decommissioned in 2023, while the other produced 455,000 m^3/day and generated 520 megawatts, The plant is scheduled to be decommissioned in 2036.[7]

Jeddah

The SWCC also set up two plants in Jeddah that were similar in design and capacity; they operated using RO technology, and were single-purpose plants that produced only fresh water. The first was established in 1989, and the second in 1994; their production rate reached 56,800 m^3/day for each plant, Both Plants were decommissioned in 2021.[8]

Duba

The demand for fresh water in Duba had by now risen due to the increase in its population, and the operational lifespan of the second plant there had ended. In 1989, therefore, a third plant was built that used RO technology to produce only fresh water, supplying the city of Duba and its surrounding areas, with a production capacity of 4,400 m^3/day, The plant was decommissioned in 2020.[9]

Al-Shuqayq

In 1989, a dual-purpose plant was set up in al-Shuqayq, in the southwest of the Kingdom, to produce fresh water and generate electrical power using MSF technology to supply the ʿAsir and Jazan regions. It produced 97,014 m^3/day and generated 108 megawatts of power, The plant was decommissioned in 2022.[10]

Farasan Island

In 1989, another plant utilizing single-purpose MSF technology was added, with a production capacity of 1,250 cubic meters per day. The plant was decommissioned in 2009.[11]

Haql

A plant was set up in 1990 comprising two small desalination units using RO technology to produce fresh water; their production rate reached 5,000 m^3/day, The plant was decommissioned in 2020.[12]

Yanbuʿ

In 1998, two desalination plants were put into operation to supply Madinah and Yanbuʿ. The first used RO technology and produced 127,800 m^3/day , The plant is scheduled to be decommissioned in 2033, while the second was a dual-purpose MSF plant that produced both fresh water and electrical power; the latter's production rate reached 143,808 m^3/day, and it generated 162.8 megawatts of energy, The plant is scheduled to be decommissioned in 2025.[13]

Plants on the eastern coast

Al-Jubayl

In 1982, a dual-purpose plant using MSF technology was putinto operation, producing 137,729 m3 of water and generating 360 megawatts, The plant was decommissioned in 2023, of electrical power. In the following year, the al-Jubail II plant was put into operation; it was the largest production plant in the world at that time, a designation it retained for many years. It used the same technology as the previous plant to supply Riyadh, al-Jubayl, and al-Qasim, producing 947,890 m3/day and generating 1,225 megawatts, The plant is scheduled to be decommissioned in 2025. In 2000, a plant using RO technology was set up to produce only fresh water; it produced 90,909 m3/day, supplying al-Jubayl, Riyadh, and al-Qasim, The plant was decommissioned in 2023.[14]

Al-Khobar

The second plant, using dual-purpose MSF technology to produce both fresh water and electricity, began operating in 1983 to supply the Eastern Region. It produced 223,000 m^3 of water per day and generated 710 megawatts, The plant was decommissioned in 2023. In 2000, a dual-purpose plant was established using the same technology, producing 280,000 m^3 and generating 478.8 megawatts, The plant is scheduled to be decommissioned in 2035.[15]

Al-Khafji

In 1983, a single-purpose plant was set up, consisting of four small units and producing only fresh water using MED technology, to meet the needs of the local population. It produced 1,032 m^3/day. This plant was transferred to al-Wajh in 1989, The plant was decommissioned in 2023 and another dual-purpose plant using MSF technology was established in al-Khafji in 1986, producing 22,886 m^3/day; however, its power generation rate was limited within the scope of the plant itself, generating 11 megawatts, The plant was decommissioned in 2019.[16]

Transmission projects

The SWCC undertook a number of large-scale projects to extend pipelines to inland cities and supply them with fresh water and for further development.[17.]

In 1977, a project to construct a closed Transmission system from Al-Jubayl plant to Riyadh was launched, the first of its kind in the world in terms of its design. It was implemented by the Austrian company ILF. The SWCC stipulated in the project design contract that the water transmission to Riyadh should cover the city's needs for a period of no less than 30 years, until 2012.

This project was an unusual challenge for the SWCC and its partners, given the very large contract size (almost 2 billion US dollars); it was inaugurated in 1983[18.]

The water transmission system was a closed one in which water was transported via two parallel lines, A and B, with a length of 932 km and a diameter of 60 inches. These pipes were made of steel, coated on the outside with polyethylene and on the inside with cement mortar.

The project contained eight storage tanks with a capacity of 3,300,000 m^3. The water went through six pumping stations, starting from the main control site in al-Jubayl, followed by other plants in Dhahran, Shedgum, al-Hofuf, Khurays, and al-Wasi', through to the storage tanks at the upper terminus in eastern Riyadh, without any storage during transmission. It was thus the largest high-pressure water transmission system in the world.[19]

When the water reached the upper terminus, the water was mixed with groundwater from wells and transmitted to Riyadh through a 132.5-kilometer pipeline, the diameter of which ranged between 62 and 78 inches.

In 1982, a water transmission system was extended to supply al-Jubayl Industrial City, the naval base, and the city of al-Jubayl itself. The length of the pipeline was 81.4 km, while its diameter ranged between 14 and 60 inches. The project contained nine storage tanks with a capacity of 360,542 m^3, and one pumping station.[20]

In 1983, pipelines were extended to supply the cities of the Eastern Region from the al-Khobar plant. The length of these pipes totaled 236 km, and their diameter ranged between 19 and 43 inches. The project included 60 storage tanks with a total capacity of 594,000 m^3, and one pumping station.[21]

In 2000, the third line from the al-Jubayl plant was installed to supply Riyadh and al-Qasim; it ran to a length of 374.8 km and had a diameter of 60 inches. The project contained six storage tanks with a capacity of 300,000 m^3, and four pumping stations.

In 2003, this project was also linked to another pipeline project to supply Burayda, al-Ghat, al-Majma'a, al-Zulfi, al-Nu'man, and Shaqra'. The length of this line was 994.15 km, and its diameter ranged between 16 and 80 inches. The project contained 26 storage tanks with a capacity of 552,000 m^3, and three pumping stations.[22]

In 1986, the al-Khafji water transmission system was established to supply that city. Its was 10 km long, and its diameter was 23 inches. The project contained two storage tanks with a capacity of 113,650 m^3, and one pumping station.[23]

In 1989, the SWCC continued to implement difficult projects, achieving remarkable successes that raised its global profile. These included a project to deliver water from the desalination palnt in al-Shuqayq to Abha, Bin Nu'man, 'Akkad, al-Darb, Ahad Rufayda, Khamis Mushayt, and the military city, which is located 2,300 meters above sea level. The SWCC faced major obstacles due to the rugged roads and mountainous terrain in the 'Asir region. The difficulty of this project also derived from the fact that the pipelines had to pass through the mountains via a series of tunnels dug for this purpose; nevertheless, the SWCC was able to complete this project with amazing success.

The length of the project's pipeline was 195 km, and its diameter ranged between 20 and 46 inches. The project contained eight storage tanks with a capacity of 256,000 m^3, and four pumping stations.[24]


The implementation of the pipeline project for transmission water from the Jubail system to Riyadh took place in 1983.

In 1998, the second phase of the water transmission system from the desalination plant in Yanbu' was put into operation to supply Madinah, Yanbu', al-Hamra', Badr, al-Rayis, and al-Mulaylih. The length of the pipeline was 364 km, and its diameter ranged between 12 and 60 inches. The project included 22 storage tanks with a capacity of 1,255,000 m^3, and three pumping stations.[25]

In 2000, the water transmission system from Shu'ayba to Jeddah (Burayman A) was put into operation, with a length of 122 km, a diameter of 60 inches, and one pumping station.[26]

In 2001, the SWCC proved its exceptional capabilities and strong position and determination by undertaking highly challenging projects. It was considered impossible to supply water to the city of Ta'if due to the presence of Jabal al-Hada, which posed a significant obstacle to this project. However, the institution managed to overcome this hurdle and successfully worked on delivering water through a tunnel measuring 11.5 kilometers in length and 5.64 meters in diameter, an achievement that deserves admiration.

the SWCC embarked on this project because the city of Ta'if was threatened with water scarcity, as it still relied on rainwater, which was sparse during those years. There was also a need to provide a stable water source for the residents of Mecca and the pilgrims to the Holy House of God.

In 2002, the fifth line was extended to supply the Eastern Region, with a length of 17.8 km and a diameter ranging between 43.3 and 60 inches. The project contained 10 storage tanks with a capacity of 196,000 m^3, and two pumping stations. The sixth line was also extended in the same year to supply al-Dammam, Dhahran, Sayhat, al-Qatif and Safwa, with a length of 134.6 km and a diameter ranging between 35.4 and 60 inches. The project contained 25 storage tanks with a capacity of 188,000 m^3, and three pumping stations.

In 2004, the seventh pipeline was also extended from the desalination palnt in al-Khobar to both al-Hofuf and Abqaiq, with a length of 150.68 km and a diameter of between 16 and 55 inches. The project contained eight storage tanks with a capacity of 180,000 m^3.[27]

Water was transmitted via a double A-B pipeline: the first was 196 km long, and the diameter of one pipe was 56 inches. It contained four storage tanks with a capacity of 200,000 m^3, and two pumping stations. The second line transmitted water from Shu'ayba to Mina; it was 112 km long and had a diameter of 80 inches, containing four storage tanks with a capacity of 560,000 m^3, and one pumping station. In 2001 a transmission pipeline was also extended from the pumping station's storage tanks in Makkah to supply both Ta'if and al-Baha; it had a length of 42 km and a diameter of 42 inches, containing four storage tanks with a capacity of 100,000 m^3, and three pumping stations[28].

The SWCC during the Reign of King Abdullah

2005–2015

During the reign of King Abdullah bin Abdulaziz, the SWCC continued to successfully implement many major projects, attracting attention to the massive expansion of its work and the speed of its implementation. The SWCC also underwent administrative and technical developments during this era that contributed to its increasing prestige.

King Abdullah's reign witnessed the involvement of the private sector in the creation, operation, and ownership of water desalination projects, as approved by Supreme Economic Council Resolution No. 5/23, issued on June 3, 2002, which determined the fundamental rules enabling the private sector to invest in this field.[1]

During his reign, the King Abdullah Initiative for Solar Water Desalination was launched, which aimed to produce fresh water at low cost, the Kingdom being one of the regions most exposed to solar energy: due to its natural and geographical characteristics, it receives the second highest quantity of sunlight in the world.[2]

One of the SWCC's most notable achievements during this era was the creation, in 2008, of the first floating plants operating with RO technology, which produced 50,000 m^3 of water per day; they were known as barges [*bawārij*].[3]

Desalination plant in Farasan, Phase II

Plants on the western coast

Al-Qunfudha

In 2008, the area's first palnt was established to produce only fresh water using MED technology; its production rate reached 9,000 m³/day, supplying al-Qunfudha, al-Quz, and Hali, The plant was decommissioned in 2021.

Umluj

A third plant, similar to the al-Qunfudha plant in terms of productivity and technology, was established in 2009 to supply Umluj, The plant was decommissioned in 2020.

Al-Wajh

A third plant, similar to the al-Qunfudha plant in terms of productivity and technology, was established in 2009 to supply Al-Wajh, The plant was decommissioned in 2020.

Farasan Island

A second plant, similar to the al-Qunfudha plant in terms of productivity and technology, was established in 2009 to supply Farsan, The plant is scheduled to be decommissioned in 2039.

Al-Layth

A second plant, similar to the al-Qunfudha plant in terms of productivity and technology, was established in 2009 to supply al-Layth, al-Wasqa, Ghamiqa, and al-Ghala, The plant was decommissioned in 2021.

Rabigh

A second plant was established in 2009. It used single-purpose MED technology to produce only fresh water, supplying Rabigh, Mastura and Thuwal. Its production rate reached 18,000 m³, The plant was decommissioned in 2022.[4]

Yanbuʿ

In 2013, A plant was added in Yanbuʿ. It was a single-purpose plant using MED technology to produce only fresh water to supply Madinah; its production rate reached 68,190 m³/day, The plant is scheduled to be decommissioned in 2025.[6]

Jeddah

In 2013, a single-purpose RO plant was established to produce only fresh water; its production rate reached 240,000 m³/day, The plant is scheduled to be decommissioned in 2038.[7]

Transmission projects

Increasing the pace and scope of its activities, the SWCC began Transmission fresh water to the inland cities and nearby villages.

- **In 2005**, a small water transmission system was established to supply al-Wajh, Mastura, Thuwal, Rabigh, al-Layth, al-Quz, al-Qunfudha, Hali and Farasan; the length of the pipes reached 199 km and their diameter ranged from 10 to 18 inches. The project contained 16 storage tanks with a capacity of 44,500 m^3.[8]
- **In 2009,** the Shuʿayba–Jeddah (Burayman B) water transmission system was established; the pipes were 122 km long and 60 inches in diameter. The project contained one pumping station. In the following year, the Shuʿayba–Jeddah (Quwayza) water transmission system was established, with pipes 109 km long and 76 inches in diameter; it had one pumping station to supply the city of Jeddah.[9]
- **In 2009,** it was decided to establish a Makkah-Ta'if D water transmission system to supply Ta'if and al-Baha. It was 44 km long and 44 inches in diameter, and it contained two pumping stations.[10]
- **In 2009,** the Eastern Region water transmission Line 8 was established to supply al-Dammam, Saihat, al-Qatif, Safwa, and Ras Tanura. The length of the pipeline was 151 km, and its diameter ranged between 35 and 70 inches. The project contained 30 storage tanks with a capacity of 775,000 m^3, and four pumping stations.[11]
- **In 2010,** the Ramah water transmission system was established to supply Ramah, Rawdat Khurraym, Ghaylana and al-Ramhiyya. The pipeline was 126 km long, and its diameter ranged between 12 and 24 inches. The project contained eight storage tanks with a capacity of 9,300 m^3, and two pumping stations.[12]
- **In 2012,** it was decided to establish an al-Shuqayq II water transmission system to cover the governorates and villages of ʿAsir and Jazan. The pipeline was 981 km long, and its diameter ranged between 10 and 64 inches. The project contained 53 storage tanks with a capacity of 904,000 m^3, and eight pumping stations.[13]
- **In 2014,** the Ras al-Khayr-Riyadh (D and E) water transmission system was established. The length of the pipelines reached 916,64 km, and they were 72 inches in diameter. The project contained 13 storage tanks with a capacity of 2,000,000 m^3, and three pumping stations, to supply Riyadh. In the same year, the Ras al-Khayr to Hafr al-Batin water transmission system was created to supply al-Nayriyya, Bin Hathlin, Qaryat al-ʿUlayya, al-Saʿira, al-Sadawi, al-Qaysuma, and Hafr al-Batin. The length of the pipeline was 384.26 km and its diameter was 44 inches. The project contained 10 storage tanks with a capacity of 126,600 m^3, and one pumping station.[14]
- **In 2014,** the Ta'if-al-Baha water plant was created to supply al-Baha, al-Sudayra, Shaqsan, the military base, Ghazayil, Qiya, and al-Mandaq. The pipeline was 210 km long, and its diameter was 40 inches. The project contained nine storage tanks with a capacity of 278,000 m^3, and one pumping station.[15]

Floating plants (Al Bwarej)

The first floating plant was established in 2008, producing 50,000 m^3. It is known as "Al Bwarej" and was decommissioned in 2018.

Digital transformation

One of the SWCC's most notable achievements was the establishment in 2007 of the Electronic Transformation Programme (TP) in 2007, which will be discussed in a later chapter.

Privatization

Privatization was a major decision that altered the structure and plants of the Saline Water Conversion Corporation. The Council of Ministers' resolution of November 11, 2002, specified the target parties for the privatization program, including the Saline Water Conversion Corporation. The Supreme Economic Council assumed responsibility for supervising the privatization program, monitoring the implementation processes, and developing a plan and timeframe.[16]

Lobby of the main center in Riyadh

The SWCC during the Reign of King Salman bin Abdulaziz

2015

During the reign of King Salman, the SWCC has made major leaps in all fields related to the water desalination industry. The year 2017 was a turning point in the SWCC's history, as it raised the level of its internal and external organization and increased the efficiency of its operation and maintenance. This contributed to an increase in its daily production from 3.5 million m^3 to over 5 million m^3/day, without a rise in costs. The SWCC continues to set up new plants according to each region's need for water; as of 2023, there were 30 water desalination plants, and their daily production rate totaled 7.5 million m^3.[1]

Plants on the Western Coast

Yanbuʿ

The third plant supplying Madinah was established in 2017. It operated using MSF technology and was dual-purpose, producing both fresh water and electrical energy. Its production rate reached 566,160 m^3 and 3,135 megawatts, The plant is scheduled to be decommissioned in 2052. In 2018, a mobile production plant using RO technology was put into operation; its production rate reached 30,000 m^3/day, supplying Madinah, The plant is scheduled to be decommissioned in 2053.[3]

Al-Shuʿayba

In 2018, A single-purpose plant utilizing MED technology was added in Al-Al-Shuʿayba, its production rate reached 91,200 m^3, The plant is scheduled to be decommissioned in 2036. In 2020, a fourth single-purpose plant operating with RO technology was established; its production rate reached 400,000 m^3/day , The plant is scheduled to be decommissioned in 2055. In 2023, the fifth single-purpose plant operating with RO technology was established; its production rate reached 600,000 m^3/day, replacing the technology and assets of the Shuʿayba I production plant that had reached the end of their lifespan, The plant is scheduled to be decommissioned in 2058. With this project, and through its investment in modern technologies and its approach to developing engineering designs, the SWCC was able to reduce consumption levels. The electrical energy required to produce water reached 2.68 kilowatts/m^3, and, using solar energy, consumption from the network was reduced to 2.42 kilowatts/m^3. This is undoubtedly an exceptional achievement for a large commercial production project.[4]

Haql

In 2018, a small, single-purpose desalination plant was established, operating with RO technology; its production rate reached 5,000 cm^3/day, The plant was decommissioned in 2021. In 2020, the third single-purpose plant was established, operating with RO technology; its production rate reached 17,000 m^3/day, The plant is scheduled to be decommissioned in 2055.

Duba

In 2018, small single-purpose desalination plants, operating using RO technology, were established to meet the increasing demand for water in Duba Governorate; their production rate reached 5,000 m^3/day, The plant was decommissioned in 2021.

In 2020, a single-purpose plant was established in NEOM to produce only fresh water using RO technology; its production rate reached 125,000 m^3/day, The plant is scheduled to be decommissioned in 2045. In the same year, a fourth single-purpose plant was established in Duba to produce only fresh water using RO technology; its production rate reached 17,000 m^3/day, The plant is scheduled to be decommissioned in 2055, A new plant, "MegaTon," was established in 2023, utilizing RO technology with a production capacity of 10,000 m^3/day. The plant is scheduled to be decommissioned in 2048. [5]

Al-Wajh

In 2018, small, portable, single-purpose desalination plants were established, operating with RO technology; their production rate reached 5,000 m^3/day, The plant was decommissioned in 2021. In 2020, a fourth single-purpose plant was established, operating with RO technology; its production rate reached 25,500 m^3/day, The plant is scheduled to be decommissioned in 2055.

Desalination plant in Al-Shuʿayba, 2020

Umluj

In 2020, the fourth single-purpose plant using RO technology was established; its production rate reached 25,500 m³/day, The plant is scheduled to be decommissioned in 2055.

Farasan Island

In 2020, the third single-purpose plant using RO technology was established; its production rate reached 8,500 m³/day, The plant is scheduled to be decommissioned in 2055.

Al-Shuqayq

In 2020, a single-purpose plant was established, operating using RO technology, to supply the regions of ‘Asir and Jazan; its production rate reached 42,500 m³, The plant is scheduled to be decommissioned in 2055. In 2023, a plant was established to replace the technology and assets that had reached the end of their lifespan at the al-Shuqayq I single-purpose production plant, operating using RO technology; its production rate reached 400,000 m³/day, The plant is scheduled to be decommissioned in 2058.

Al-Qunfudha

In 2021, a second RO plant was established to supply al-Qunfudha, al-Quz and Hali. It was a single-purpose plant, producing only fresh water, with a production rate of 51,000 m³/day, The plant is scheduled to be decommissioned in 2056.

Al-Layth

In 2021, a second plant was set up to supply al-Layth, al-Wasqa, Ghamiqa and al-Ghala, using single-purpose RO technology to produce only fresh water; its production rate reached 42,500 m³/day, The plant is scheduled to be decommissioned in 2056.[6]

Plants on the Eastern Coast

Ras al-Khayr

In 2015, the entire Ras al-Khayr production plant began operating on the Kingdom's northeastern coast, using RO and MSF technologies to supply the Eastern Region, Riyadh, the Ma'aden company, and Ras al-Khayr Industrial City. Its production rate reached 1,051,312 m³/day, with an electrical generation capacity of 2,650 megawatts, The plant is scheduled to be decommissioned in 2050.[7]

Al-Khafji

In 2018, the third plant, using RO technology and solar energy, was put into operation in partnership with the King Abdulaziz City for Science and Technology; its production rate reached 60,000 m³. This is due to its location, which receives the largest amount of global horizontal irradiance and a low level of direct irradiance. It serves as the first step in implementing the King Abdullah Initiative for Solar Water Desalination, The plant is scheduled to be decommissioned in 2053.[8]

Al-Khobar

In 2020, a single-purpose plant was established to produce only fresh water using RO technology, supplying the cities of the Eastern Region; its production rate reached 210,000 m³ , The plant is scheduled to be decommissioned in 2055. In 2022, a single-purpose plant using RO technology was established, with a production rate of 630,000 m³/day , The plant is scheduled to be decommissioned in 2057.[9]

Al-Jubayl

Later in 2022, the first plant was replaced by another station that operates using reverse osmosis, with a capacity of 400,000 m³/day, The plant is scheduled to be decommissioned in 2057.

Mobile plants

The SWCC, through its national staff, has created and invested in mobile reverse-osmosis plants that are highly energy-efficient, are flexible in their operation and transmission, and have a production capacity of between 2,000 and 10,000 m³. This innovation is intended to develop supply chains, reduce operating costs, and achieve profitable financial returns.

Floating plants (Al Bwarej)

In 2022, three floating desalination plants were established near the port of al-Shuqayq, as a first step in ensuring supply security and enhancing water security in all regions of the Kingdom. These are the largest floating desalination plants in the world, relying on advanced technologies, and are distinguished by the fact that they generate their own electricity and are self-cleaning, with high efficiency: their total production capacity is 150,000 m³ of water per day, with each system producing 50,000 m³. They can be used in any region of the Kingdom, It is planned for the plant to be decommissioned in 2043.[10]

A floating desalination plant, or “Al Bwarej”

Desalination plant in Ras Al-Khair

Transmission projects

In 2018, the Yanbuʿ-Madinah III water transmission system was established to supply Madinah, Wasit, Badr, al-Hamra', Yanbuʿ al-Nakhl, Yanbuʿ al-Bahr, Mahd al-Dhahab, Wadi al-Farʿ, al-ʿUshayra, al-Yatma, al-Akhal, al-Suwayriqiyya, al-ʿAqila, al-Suwaydra, al-Hannakiyya, al-ʿUwayna, and al-Radhaya. The length of the pipeline totals 604.92 km, and its diameter ranges between 24 and 76 inches; the project contains 16 storage tanks with a capacity of 1,148,000 m^3, and five pumping stations.[11]

In 2019, a number of transmission projects came into operation, namely the following:

- The Duba III–Sharma (NEOM) water transmission, to supply the royal palaces and NEOM. The length of the pipeline is 100 km, and its diameter is 48 inches. The project contains five storage tanks with a capacity of 850,000 m^3, and one pumping station.[12]
- A feeder plant for the city of Riyadh, consisting of three iron pipelines lined with cement mortar to supply the north, center and south of Riyadh, and three pumping stations. The total length of the pipeline is 137.8 km, and its diameter ranges between 80 and 100 inches. The project was completed in 2019.[13]
- The Shuʿayba-Mina B water transmission, to supply Makkah. The length of the pipeline is 95.66 km, its diameter is 80 inches, and it contains one pumping station.

In 2021, the Saline Water Conversion Corporation—through its national staff—managed to increase the pumping rate to Ta'if from the Arafat storage tanks across Jabal al-Hada using two pumping stations and pipelines with a length of 46.3 km, a diameter of 60 inches, and a design capacity of 176,400 m^3. The pipeline penetrated the mountains through a second tunnel with a length of 12.5 km, the longest tunnel in the world for water transmission. The SWCC also succeeded in putting the project into operation ahead of schedule, four months before its specified date. In the same year, the SWCC also completed a water transmission pipeline from Ta'if to the governorates of Turaba, Raniya and al-Khurma, measuring 109 km in length and 8 to 40 inches in diameter. The project includes 4 storage tanks with a capacity of 53,000 m^3, and one pumping station. In addition, a strategic storage project was implemented in Ta'if, with nine storage tanks with a capacity of 1,530,000 m^3.[14]

In the same year, the Rabigh water transmission system (AB) was established to supply Makkah, Jeddah, ʿAsfan, Thuwal, Kuliyya, Saʿbar, Gharan, al-Talʿa, Khulays, Rabigh, Nuwaybiʿ, Mastura, al-Abwa', al-Jumum, and al-Barza, with a pipeline length of 684 km and a diameter ranging from 10 to 80 inches. The project contains 51 storage tanks with a capacity of 2,214,500 m^3, and four pumping stations.[15]

In 2022, the western coast saw a number of transmission projects come into operation, namely the following:

- A water transmission system for new production units to supply Haql, Duba, al-Wajh, al-Layth, Umluj and Farasan. The length of the pipeline is 150 km, and its diameter ranges between 20 and 28 inches. The project contains 11 storage tanks with a capacity of 309,000 m^3, and five pumping stations.
- The al-Layth water transmission system, to supply al-Wasqa, al-Ghamiqa, and al-Ghala with a line 95 km long and from 5 to 11 inches in diameter. The project contains six storage tanks with a capacity of 8,000 m^3, and one pumping station.
- The third water transmission system in al-Shuqayq, to supply a number of cities, governorates, and centers in ʿAsir and Jazan. The pipeline is 523 km long, and its diameter ranges from 12 to 80 inches. The project contains 24 storage tanks with a capacity of 1,058,000 m^3, and ten pumping stations.

In 2022, the Eastern Region saw a number of transmission projects come into operation, namely the following:

- A water transmission system from al-Jubayl to Riyadh, 832 km long and with a diameter ranging from 60 to 88 inches. The project contains 14 storage tanks with a capacity of 2,380,000 m^3 and three pumping stations.
- A water transmission system from al-Jubayl to the cities of the Eastern Region, with a length of 133 km and a diameter ranging from 22 to 100 inches. The project contains six storage tanks with a capacity of 730,000 m^3 and three pumping stations.
- A water transmission system from al-Khobar to al-Dammam, 27 km long and with a diameter ranging from 52 to 80 inches. The project contains five storage tanks with a capacity of 710,000 m^3 and one pumping station.
- The Tufayh water transmission system, to supply the storage tanks of the al-Jubayl plant. The pipeline is 38 km long and 44 inches in diameter, and the plant contains one storage tank with a capacity of 60,000 m^3 and one pumping station.
- A new feeder water transmission system in al-Khafji Governorate. The length of the pipeline is 11 km, and its diameter is 36 inches; it has one pumping station.
- A water transmission system to supply King Salman Energy City (SPARK), with a length of 58 km and a diameter of 28 inches. The project contains two storage tanks with a capacity of 30,000 m^3 and one pumping station.

Finally, the SWCC has expended enormous effort on many transmission projects to strengthen the water supply around the Kingdom, and to respond to the increasing demand for water in all its regions. As of 2023, there were seven transmission systems, with a daily capacity of 14.8 million m^3. The length of these systems was estimated at 11,800 km.[16]

Dispatch Center

The Corporation during the Reign of King Salman bin Abdulaziz

Dispatch Center

The SWCC has worked hard to develop its production and transmissions, including by implementing monitoring plants. For this purpose, in 2018 it established a support center in Riyadh, built on an electronic plant that operates according to global standards, linking water plants' data to a unified database to achieve smart water management during the production, transmission and storage stages.

The Center monitors all desalination plants on the eastern and western coasts, and contains a number of advanced plants and large screens through which data on the desalination and transmissions are monitored, as well as the operational and reserve storage tanks and their capacity. It operates 24 hours a day, and communicates in emergency cases via a hotline with various relevant parties.

The Center also applies operational standards of excellence by raising production efficiency and reducing costs by monitoring the consumption of fuel and chemicals to achieve the best possible operational model in the production units.[17]

Groundwater purification plants

As part of the efforts by Saudi Arabia's water sector to redistribute tasks and competencies throughout the water supply chain, in March 2022 the Council of Ministers tasked the SWCC with establishing, operating, and maintaining water purification plants for dams and groundwater supplies affiliated with the Ministry of Environment, Water, Agriculture and Reconstruction. Whose production exceeds 5,000 m^3 with a total production capacity of 4 million m^3, these constitute about 25% of the water supply for urban use in the Kingdom.

This decision was based on the SWCC's long experience in the field of water desalination. From this standpoint, it will work to improve operational efficiency and extend the lifespan of the target assets, whose production rate exceeds 5,000 m^3/day. Even before this decision, the SWCC was supervising the following plants:

- Water purification plants for Hali Dam in the Makkah region, with a daily production capacity of 100,000 m^3.
- The Maraba water purification plants at the Wadi ʿAtud Dam in the ʿAsir region, with a daily production capacity of 75,000 m^3.
- Water purification plants for Wadi Bish Dam, northeast of the Jazan region, with a daily production capacity of up to 150,000 m^3.

The SWCC also installed and operated the Khaybar water purification plant and increased its production capacity to 9,000 m^3/day.[18]

The SWCC has also set up 15 innovative plants to supply cities and governorates in the Eastern Region with approximately 76,000 m^3 of desalinated water per day.[19]

Projects under implementation

Production

- A project to replace the Yanbuʿ II production plant, with a design capacity of up to 500,000 m^3/day.
- A project to replace the al-Jubayl II production plant, with a design capacity of up to 1 million m^3/day.[21]
- A project to replace and improve the environmental impact of desalinated water production units in the al-Shuʿayba II production plant, with a design capacity of up to 545,000 m^3/day.

Transmission

- Establishing Al-Mughmas storage tank transmissions, with a design capacity of up to 2,400,000 m^3/day.
- Al-Jubayl-Riyadh (A–B) line reconstruction project, with a design capacity of up to 850,000 m^3/day.
- Al-Shuʿayba–Quwayza water transmission system (Phase II), with a design capacity of up to 620,000 m^3/day.
- Importation and implementation of a pipeline to transmit water to reservoirs north of Jeddah, with a design capacity of 560,000 m^3/day.
- Yanbuʿ–Madinah water transmission system (Phase IV), with a design capacity of up to 550,000 m^3/day.
- al-Khobar-al-Hofuf water transmission system (Phase II), with a capacity of up to 500,000 m^3/day.
- Abha urban feeder line water transmission, with a design capacity of up to 375,000 m^3/day.
- Abha urban feeder line plant (Phase IIA) with a design capacity of 151,800 m^3/day.
- A new supply line for al-Qunfudha Governorate, with a design capacity of up to 75,000 m^3/day.
- A supply line for King Khalid Military City, with a design capacity of 45,789 m^3/day.
- Importation and implementation of a sub-pipeline to the Wadi Qudayd plant and storage tanks, with a design capacity of up to 7,500 m^3/day.[20]

Memoranda of understanding

In order to develop its water desalination projects, the SWCC has signed a number of memoranda of understanding with various countries. In 2017, it signed a memorandum of understanding (MOU) with the Ministry of Economy, Trade and Industry of Japan concerning cooperation in the field of water desalination, enhancing efforts to expand the capacity of desalination plants, and increasing usage of reclaimed water sources, with the participation of the Japanese private sector. All of this is in order to improve the quality of Saudi Arabia's water infrastructure.[21]

Accordingly, in 2017, the SWCC contracted with the New Energy and Industrial Technology Development Organization (NEDO) in Japan and the companies implementing the Megaton project to create a reverse-osmosis facility in the Kingdom. This project enhances optimal energy use and protects the environment. It also contributes to effective performance and work in factories, and saves both money and energy.[22]

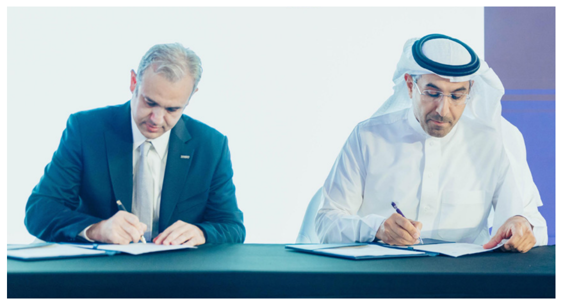
In 2020, the SWCC signed an MOU with the Department of Energy of the United States, aiming to strengthen and enhance cooperation in the development of the water desalination industry, to build and develop capabilities, and to exchange scientific, practical and technical expertise in water desalination and its technologies.[23]

Also in 2020, the SWCC signed an MOU with the Institute of Seawater Desalination & Multi-purpose Utilization of the People's Republic of China, aiming to enhance cooperation between the two nations in the field of seawater desalination and to develop relevant technologies.[24]

In the same context, in 2021, the SWCC signed an MOU with Ufa State Petroleum Technological University in the Russian Federation concerning cooperation in the field of water desalination technologies and pipeline operation and maintenance.[25]

In 2022, the Council of Ministers approved the signing of two MOUs: one with the National Institute of Ocean Technology of the Republic of India, to enhance cooperation in the field of water desalination;[28] and the other with Górnica-Hutnicza University in the Republic of Poland, to enhance cooperation in the field of water and brackish water desalination technology powered by renewable energy sources.[26]

In July 2023, the Foundation signed a joint MOU with Japan's Shinshu University to develop reverse-osmosis technologies for seawater, improve pollution resistance and energy consumption, and remove salts from washing operations using osmosis technologies, as well as developing innovative technologies in several areas, such as zero salt return, fine membranes, and seawater mining technologies. The two parties will also cooperate in the use of advanced, environmentally friendly renewable energy for water-related applications and other fields.[27]



The Development of the SWCC

The achievements of SWCC have not been limited to water desalination and the construction of plants for this purpose. It has also accrued successes in development, innovation, research, and training, and it has expanded its activities to ensure the sustainability of its work and achievements.

Saudi Water Academy

Ever since its inception, the SWCC has been concerned with technical and specialized training, and has sought to develop its employees' skills in order to keep up with technology and help them acquire expertise in their work. In 1982, it concluded a five-year agreement with representatives of the Japanese government to establish two research and training centers in Yanbuʿ (which the SWCC's leadership later decided to transfer to al-Jubayl, near the plant there). The most important items in the agreement were the consultation and exchange of information regarding desalination technologies, and the creation of a desalination technology institute for this purpose, which would be equipped with a miniature experimental plant for desalination research. Nine workshops would also be established to train 300 technicians annually in operating and maintaining desalination plants. The cost of the agreement amounted to 37,363,000 US dollars, of which the Kingdom would bear 27,912,000 dollars, and the Japanese government 9,451,000 dollars. The duration of the agreement was five years;[1] as it proved fruitful for both parties, in 1986 it was decided to extend it for another three years.[2]

To implement this agreement, a high-level Research and Training center was established in al-Jubayl in 1982, which hosted many specialized seminars and workshops to train and qualify national staff in desalination-related work; it also enrolled them in various universities and other specialized bodies, as well as sending them abroad to receive further training at universities and institutes in various engineering and other professional specializations (e.g. engineering, desalination technology, power electronics and construction, mechanical engineering, and electrical engineering and facilities). The SWCC has worked hard to support and assist high-achieving trainees by allowing them to supervise the implementation of projects and plants, and entrusting them with their operation, management and maintenance.[3]

As a culmination of these efforts, in 2010, the SWCC's Board of Directors approved an investment operation for the training center within the framework of the commercial transformation project for the center's work; this was an incentive to develop its facilities and programs and enhance its capabilities so that it could provide its services to the government and private sectors.

Due to the training center's importance and the services it provides to operational staff, as well as its qualification of engineers, operators and technicians, its training programs have been developed and diversified, its facilities have been improved, and its capabilities have been strengthened to launch programs that serve the public and private sectors. Its name was changed to the Saudi Water Academy, reflecting the integrated educational and training experience it provides according to modern learning methodologies and techniques, compatible with the objectives, requirements and training needs of the current labor market. All this is to promote and develop human resources and prepare them for the labor market, one of the most important goals of the Saudi Vision 2030, by providing a set of qualification programs for newly graduated engineers, operators and technicians to work on operating and maintaining desalination and electrical power plants, and providing programs to raise the efficiency of workers on these plants by providing them with theoretical information and practical skills in operating and maintaining desalination and transmissions, renewable energy, artificial intelligence, water management, environmental sustainability, security and safety, firefighting, and administration.

In terms of global leadership, the Saudi Water Academy strives to be a leader in academic content in the field of desalination technologies, and to support water sector leaders locally and internationally, by offering a number of global programs in operational excellence, water management, the environment and sustainability.

In an effort to develop basic skills and skills of the future, and knowledge that will help students to participate in local economic development as well as compete on the global labor market, the Saudi Water Academy has obtained many accreditations, certificates, and licenses, including:

- IACET international accreditation, as the first entity in the Kingdom to obtain this accreditation.
- Certification as a permanent strategic business partner from the Chartered Institute of Water and Environmental Management (CIWEM).
- ISO 9001 International Quality Certification
- Certificate of recognition for institutional excellence from the European Organization for Quality.
- EDEXCEL British curriculum accreditation certificate.
- ABB certificate of accreditation for training in distributed control systems.
- Certificate of accreditation from the International Accreditors for Continuing Education and Training.
- Certificate of accreditation from the National Center for e-learning.
- A license to provide IELTS services, courses, and tests.
- Full institutional accreditation from the National Center for Educational Evaluation (MASAR).
- Professional license for reverse osmosis from the International Association for Training and Development.
- Accreditation from the International Artificial Intelligence Driving License.
- Certificate of accreditation in environmental training and capacity building from the National Center for Environmental Compliance.
- Accreditation from King Abdullah City for Atomic and Renewable Energy in training programs for the design and installation of solar energy plants.

The Academy's distinction has also enabled it to obtain the Prince Muhammad bin Fahd Award for the best educational institution in the Eastern Region and the Khalifa Award for Excellence.

The Saudi Water Academy strives to provide an attractive training, educational and interactive offer of facilities and resources to its trainees, which it continuously develops to keep pace with modern technologies, using the latest equipment and training devices to achieve a leading position and coverage. The Academy has more than 28 training halls, 32 laboratories simulators and training workshops, and 41 engineering qualification programs, from which 1,593 trainees have benefited, as well as 48 qualifying programs for technicians, from which 5,917 trainees have benefited. There are also 5,680 short programs, from which 70,000 trainees have benefited, as well as well-equipped and integrated housing at the most modern standard with a capacity of up to 350 trainees.

The Saudi Water Academy continues to invest, qualify and develop national personnel within and outside the institution to ensure the sustainability of its achievements and to obtain accreditation for its curricula from international bodies. It aims to expand into a number of cities in Saudi Arabia and across the region, in order to become the world's premier center for water industry professionals.[4]

Research and development

The SWCC not only implements projects—it also maintains and operates its plants with maximum efficiency and at the lowest possible cost.

For this reason, the SWCC has kept abreast of all water technology-related research and studies around the world, and has allocated a special department to this task since its founding.

To achieve its ambitious goals, the SWCC understood that it needed to engage further

with research and studies related to its activities, in order to achieve its objective of continuously developing its desalination activities, plants, and methods. Therefore, in 1987, the SWCC opened a research and development center in al-Jubayl under the Saudi-American Joint Agreement for Economic Cooperation. The center was named the Research and Development Center; in 2023 its name was changed to the Institute for Water Technology Innovation and Advanced Research, and it was given responsibility for scientific research and studies, and development and innovation.[5]

This is based on the goals stipulated in the Saudi Vision 2030; its commitment to enhancing the Kingdom's research capabilities; its pursuit of leadership in research, development and innovation; and the search for solutions to major environmental and water challenges.

The Institute aims to:

- improve the efficiency of the plants and increase their drinking-water production capabilities;
- work to operate and maintain the plants at the lowest cost;
- apply the capabilities of scientific and technical research in the field of water desalination;
- conduct research and studies into the best methods, in order to apply them to the SWCC's projects.[6]

The research institute has six laboratories equipped with modern facilities, workshops equipped with the necessary equipment, and a scientific library containing the latest books and specialist periodicals, as well as a large hall for lectures and seminars.[7]

The Institute also includes various departments:

- Corrosion Department: This department specializes in studying the corrosion of plant components due to the highly salty marine environment, as well as the corrosion of water transmission pipes. It seeks, through experiments and studies, to reduce the effect of corrosion on these components in order to extend their lifespan and reduce the need for maintenance.
- Chemistry Department: This department conducts research into chemicals to assist the plants' maintenance and operation departments. Researchers study the effect of metal corrosion on plants, the chemical monitoring of boiler steam, organic and inorganic pollution in seawater and desalinated water, and other topics aimed at preserving the environment and maintaining the excellent quality of the water produced.
- Reverse-Osmosis Department: This department specializes in studying the performance and types of reverse-osmosis plants, as well as the malfunctions they are prone to, in order to mitigate these.
- thermal Department: This section is concerned with describing and simulating the thermodynamics of all plants to determine the ideal volume of energy used, heat recovery processes, etc., in order to reduce costs. It also simulates the hydraulics of water and steam flow systems, and evaluates hydrodynamic and hydrostatic performance, in order to remove deposits and keep them out of pipelines.
- Environmental and Marine Biology Department: This department studies biological pollution and water sterilization, and determines the extent of pollution resulting from seawater desalination operations and studies and monitors the environment surrounding the plant.[8]

The Institute has also worked to conclude several research agreements with suppliers and manufacturers of materials for desalination plants; to conduct tests, experiments and studies to ensure the suitability of their products for use in the industry; and to evaluate new products from a technical and economic perspective, before installing them and starting any desalination project.

These agreements have created an atmosphere of competition that has reduced prices and broken monopolies. The Institute has also concluded cooperation agreements with international research organizations and bodies. It signed an agreement with the Japanese agency JICA in 1990–1995 to improve the efficiency of heat exchangers, remove scaling, and test new anti-scale and anti-pollution materials in seawater. In 1993–2000, an agreement was signed with the US

Bureau of Reclamation to carry out research and studies into reverse-osmosis desalination.[9]

The Institute has continued to advance and focus its goals on developing desalination technologies, increasing their efficiency, and reducing the cost of production. This has given it a pioneering reputation and drawn attention from external bodies, who have sought opportunities for joint research cooperation that could benefit both parties. In 2006, the Institute signed an agreement with the Japanese Water Reuse Promotion Center and the Sasakura Company to carry out tests to develop the plants' operations, while in 2007, a research cooperation agreement was signed with the Singapore International Facilities Company and the Hyflux Company.[10]

In 2011, the Institute signed a research agreement with the Japanese company Hitachi Zosen to develop the use of solar energy in desalination technologies.

In 2012, an agreement was signed with the Korean company Doosan to develop thermal units to raise their efficiency and reduce the cost of producing desalinated water.[11]

In 2016, a cooperative agreement was signed with the Japanese Megaton team to study the operation of the plant and develop its facilities to reduce energy consumption.[12]

The Institute has addressed the problem of the corrosion of plant components by concluding several agreements aimed at studying this issue with the French Institute of Corrosion in 2012 and with the American company Cortec in 2014.[13]

In 2020–2021, the Institute signed a number of MOUs concerning the exchange of expertise and the development of water desalination technologies. MOUs have been signed with the Russian company Uraltek Prom, the Chinese Institute of Seawater Desalination and Multipurpose Utilization, the American company FluidTech, the international organization of corrosion engineers NACE International, and the National Renewable Energy Center in Spain (CENER).[14]

Likewise, local entities and universities have sought to conclude research agreements or MOUs with the Institute. In 2007, the Institute established a joint research project with the Saudi Arabian Oil Company (Aramco) aimed at reducing the operational cost of membranes by washing dirty membranes using environmentally friendly methods.

In 2008, a joint cooperation agreement was concluded with King Abdulaziz City for Science and Technology concerning the formation a strategic partnership in the field of water desalination technology. The Institute also signed a research agreement in 2010 with King Saud University, as an umbrella agreement for any future cooperation between the Institute and any of the university's departments.

The Institute also signed research cooperation agreements with King Fahd University of Petroleum and Minerals, King Abdulaziz University, King Abdullah University of Science and Technology, and Imam Abdulrahman bin Faisal University for the creation of desalination research centers in these regions.[15]

The research agreements concluded by the Institute have continued for several consecutive years. Their objective was to conduct further studies, research, and experiments that led to successful results for both parties in terms of increasing production efficiency, reducing costs, and further developing desalination techniques.[16]

The Institute's efforts have borne fruit through its innovation of numerous solutions that have advanced the work of the organization's plants in particular and the desalination industry in general. It has achieved a number of innovations, most notably the discovery of a new way to desalinate water using ultra-fine (nano) filtration membranes along with traditional desalination methods before pumping it to other types of traditional desalination units. Experimentation on this technology continued for three years in test plants in al-Jubayl, with the following results:

- reduced feed water salinity, from 30% to 60%;
- removal of up to 98% of hardness, such as sulfates;
- removal of suspended matter and bacteria;
- extraction of fresh water at a rate ranging from 50% to 70% recovery, compared to only 35% using traditional methods.

In 1999, this method was applied to the Umluj reverse-osmosis plant, which led to a 21% increase in its productivity. In 2004, the nano method was also applied to an experimental thermal plant, operating using the multi-stage flash evaporation method, located at the Institute; it proved effective, without the formation of any salt crusts, and with an extraction rate of up to 70%, rather than the 35% extracted using the traditional method. As a result of this innovation, in 2003, the Institute obtained a patent registered in the United States, and it also received the International Award for Innovation.[17]

The Institute has invented units called "Units of the Future," mobile water desalination units that have achieved a record low electricity consumption of 2.27 kilowatt-hours/m^3. It has also discovered a new generation of reverse-osmosis membranes with an increased efficiency of between 15% and 20%, competing with membranes manufactured globally. In addition, it has invented the "zero liquid dischage" technique. The process of desalinating seawater produces a brine solution called liquid dischag; the researchers converted the concentrated salt value into zero liquid dischage by breaking down this compound and extracting the precious metals to benefit from them economically and leave a positive environmental impact.

The minerals extracted from liquid dischage are used in the military, chemical, medical, food and other industries.[18]

This innovation is based on developing a system and method for extracting minerals based on divalent cations from discharge water.

The Institute has obtained a patent for extracting several salts, namely sodium chloride, bromine, magnesium metal, and potassium, from brine solution with high purity, after concentrating the brine in innovative ways. This invention is based on the idea of extracting valuable minerals from the return solution through nanofiltration membranes (NF); the Institute submitted an innovative design to separate commercially valuable minerals from the return solution, specifically targeting magnesium chloride and calcium sulphate dihydrate.

With this innovation, it is possible to produce many salts and minerals in their solid state, with specifications appropriate for industrial use, and to make commercial investments in liquid dischage.[19]

The SWCC has also implemented a project, considered the first of its kind, in which magnesium ions were produced from nano units in the al-Shu'ayba plant and added to drinking water to improve its quality; in addition, plankton from the seawater intake system were used to improve the quality of soil for agricultural purposes.

The Institute has also implemented several initiatives aimed at achieving the SWCC's vision of global leadership in the desalination industry, obtaining the necessary approvals to attract international experts and scientists in the field of water desalination. Among the most prominent of these initiatives are the following:

Initiative to improve the performance of current production plants

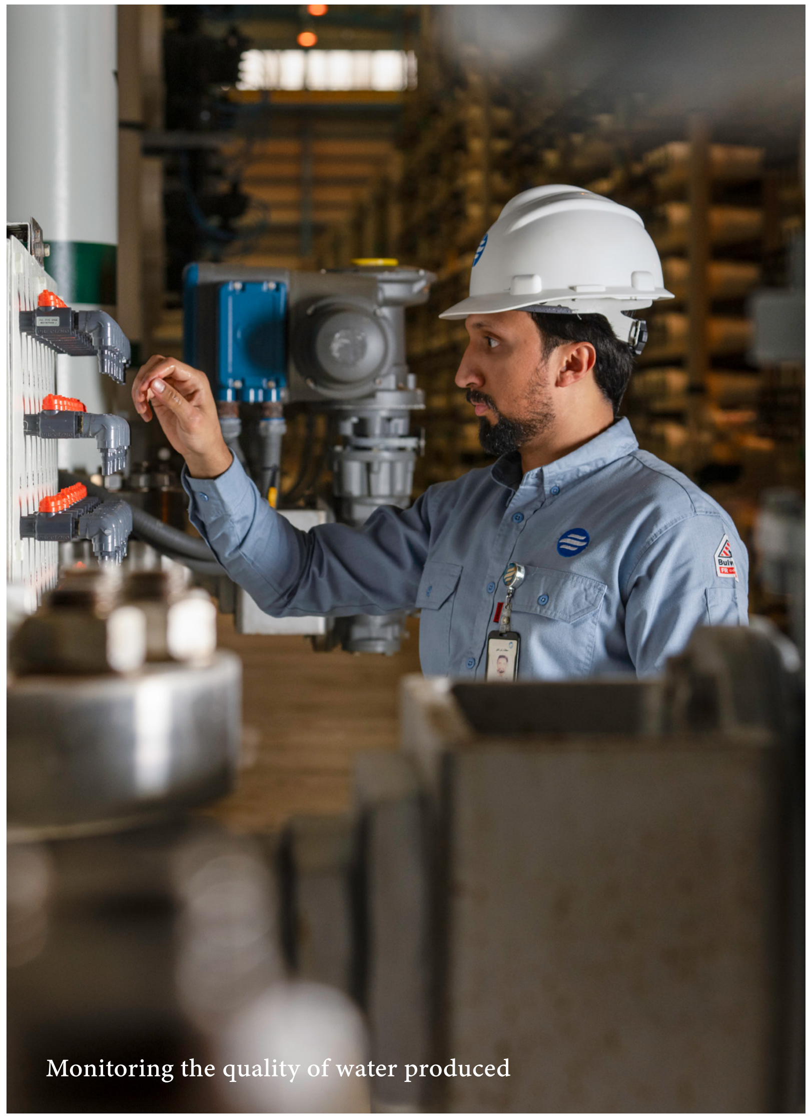
The Institute has achieved a number of successes in increasing production and improving the performance of the SWCC's production plants. In 2018, the Institute contributed to increasing the total production of the SWCC's plants to 5 million m^3/day, with a production increase of up to 300,000 m^3/day at its existing plants. In 2019, the Institute achieved other successes, increasing the total production of the plants to 5.6 million m^3/day, through a production increase of 260,000 m^3/day as well as 340,000 m^3/day from new sources in the SWCC. Furthermore, in 2020-2022, the production capacity of the SWCC's plants increased by about 66,294 m^3/day, and reducing carbon emissions by 291,660 tons annually. The Institute's work has not been limited to increasing production: it has also worked to lower operating costs by reducing the replacement rate of cartridge membranes and the consumption of chemicals such as coagulants and anti-scaling agents.

Initiative to monitor the quality of water produced and transmission lines

The Institute has worked to develop a program to monitor the quality of water produced and transported at the SWCC through an integrated system of research and development projects that address the SWCC's current and future needs in raising the quality level of water produced and transported from desalination plants. This is part of the implementation of the Kingdom's National Water Strategy 2030. This program involves measuring all variables at more than 74 points and ensuring their conformity with locally and internationally approved specifications and standards (by the Ministry of Environment, Water and Agriculture, dated 3/21/2021, and the World Health Organization) for non-bottled drinking water. It covers all stages from the production to transmission and delivery to distribution plants. The aim is to track all these variables and monitor them periodically to ensure their safety, in addition to tracking any changes that may occur in the properties of the water, which may trigger intervention by taking the necessary measures to improve and develop production and transmission processes.

Renewable and Clean Energy Initiative

In line with the Saudi Green Initiative, the Institute is working on several innovative projects to link renewable energy sources, whether wind or solar energy, with reverse osmosis production units, with the aim of reducing carbon emissions from desalination operations and enhancing their sustainability.


Monitoring the quality of water produced

One current project involves connecting a field production unit to a hybrid wind/solar renewable energy source, in addition to green hydrogen production units, so that the production unit depends solely on sustainable energy sources.

Another current project is an evaluation several solar installations to assess their performance and efficiency when integrating them with reverse osmosis technology. Another project involves studying the installation of solar panels to cover part of the energy needed to operate transmission line pumps.

Carbon Capture and Environmental Sustainability Initiative

The Institute for Water Technology Innovation and Advanced Research is working on many initiatives and research projects as part of the Kingdom's efforts to reduce carbon emissions and achieve its goal of reaching carbon neutrality by 2060. Among the Institute's most important initiatives in achieving carbon neutrality in the desalination industry are the following:

Extraction of carbon dioxide using a highly efficient absorber

Through this initiative, the Institute aims to extract 200 tons per day of carbon dioxide, equivalent to 73,000 tons annually, from the Ras al-Khayr production plant, which operates partly through thermal technologies. The carbon dioxide will be reused in the final treatment of the water produced, with an operating cost approximately 50% less than currently; it will begin operation in mid-2025.

Microalgae cultivation and growth initiative in the desalination industry

This initiative will contribute to reducing carbon emissions and producing biofuels by cultivating and growing microalgae, making use of carbon dioxide capture and sequestration. The Institute has studied the installation of a carbon dioxide sensor, which has allowed it to determine the rate of carbon dioxide capture through the cultivation of a specific type of microalgae suited to the environmental conditions surrounding the SWCC's production plants.


Solar panels used in the Khafji plant

Planting mangrove trees on coastal beaches for production plants

The Institute is planting mangrove trees along coastal beaches near its production plants to enhance environmental sustainability, reduce carbon emissions, and improve the quality of marine life, as the roots of mangrove trees help to remove environmental pollutants from seawater.

Based on these innovations and initiatives undertaken by the Institute, and the success and distinction they have achieved, it has

The Development of the Corporation

obtained numerous patents from international and global organizations, with some still in the process of acquisition. The Institute has also participated in 277 local and international conferences. All these achievements have won the Institute a high degree of recognition for its research, studies, and innovations in the development and advancement of seawater desalination technologies. Notably, these studies and innovations have been carried out by national cadres.[20]

Patents

- Seawater desalination via a dual method using nanofiltration membranes to enhance productivity and quality compared to traditional seawater desalination methods.
- An integrated dual desalination plant combining pre-treatment with nanofiltration membranes and reverse osmosis desalination, offering high recovery rates and energy efficiency.
- Seawater desalination via a dual or triple integrated method, comprising nanofiltration membranes with traditional thermal desalination methods, with or without reverse osmosis membranes.
- A control system for freshwater evaporation devices, including methods for controlling the operation and generation of freshwater evaporation devices.
- A desalination plant and method for producing freshwater.
- A desalination plant and method for producing freshwater, featuring a plant with high-efficiency multiple-design groups.
- Removal of boron from saline water using alkalized NF membrane pretreatment.
- A plant and method for concentrating desalination brine.
- A plant and method for remineralization.
- Carbon dioxide sequestration.
- Development of green corrosion inhibitors for acid cleaning.
- A plant and method for desalination and high-yield mineral production.
- A method and plant for extraction of minerals from brine based on divalent cations.
- A method and plant for extraction of minerals from brine based on monovalent cations.
- A plant and method for monovalent ion purification using multi-pass nanofiltration with recirculation.
- Corrosion inhibitor composition and inhibition methods.
- A plant and method for concentrating brine solution for desalination.
- A subsea desalination plant.
- A plant for water sample extraction.
- Control of disinfection byproduct formation in water produced and transported from production plants.
- Extraction of brine using low-pressure system in nanofiltration membranes.
- A plant and method for concentrating brine for desalination.
- Clean-in-place plant for cartridge filters.
- Brine extraction system using a multi-stage reverse osmosis pressure system and method.
- Plants and methods for simulating desalination processes and brine concentration.
- A method for removing air from sponge balls before loading them into a heat exchanger cleaning system.
- Multivalent ion concentration using multi-stage nanofiltration.
- Reverse osmosis desalination plant powered by direct hydrogen drive plant and method.
- A plant and method for sea creature detection and monitoring, and response decision-making.
- An autonomous water surface vehicle.
- An electrochlorination system.
- The invention of an effective formulation extracted from palm fronds as an alternative to chemical substances to prevent pipe corrosion, reducing environmental harm by replacing chemicals with eco-friendly materials and lowering costs by recycling alternative natural materials.[21]

Major studies and academic papers

- “Double concentration of brine for optimal use of two concentrated streams from desalination plants – concept proposal and demonstration of a pilot plant.”
- “The possibility of desalinating water to produce lithium in the Kingdom of Saudi Arabia.”
- “Plant and method for high-extraction water desalination and mineral production.”
- “Beneficial effects of adding magnesium to desalinated drinking water.”
- “Concentrated seawater desalination – a new frontier for sustainable mining of valuable minerals.”[22]

Digital transformation

One of the SWCC's most notable achievements was the creation, in 2007, of the Electronic Transformation Programme–TP to undertake all tasks related to technical initiatives. The SWCC faces a number of challenges, such as the increased demand for water due to population growth, as well as the geographical distance between the Kingdom's cities: the SWCC's activity is focused on plants distributed along the eastern and western coasts, so the challenges include the transmission of water from coastal cities to inland cities. Moreover, the SWCC is obliged to keep pace with the continual change and development in operational techniques and plant maintenance.

The creation of the Electronic Transformation Programme represents a qualitative shift in the development of procedures and processes, building the capabilities of the SWCC's employees, and advancing the technologies used, by applying international best practices in information technology and keeping pace with modern global trends in transforming the information technology sector from a service apparatus into a strategic partner.

The Electronic Transformation Programme has worked to develop the SWCC's technical infrastructure, connect disparate plants, and unify various databases. It has also facilitated electronic communication with local and international suppliers, and paved the way for digital connectivity with all governmental and commercial agencies within the Kingdom.[23]

The year 2021 was one of remarkable development for the Electronic Transformation Programme, as it saw the launch of internal and external applications that strengthen the SWCC's identity, vision, goals and values, in which services are provided in a professional manner, and raise the speed and efficiency of processes, procedures, and services.[24]

The SWCC achieved major progress in the field of information technology through the Electronic Transformation Programme, which won a number of awards, namely:

- the Excellence Award for the largest application of the iSupplier system in the Kingdom;
- the award for Best Application in the Middle East in the field of energy and utilities, from the magazine *Arabian Computer News*, 2008;
- the award for Best Application in the Middle East in the field of energy and utilities, from the magazine *Arabian Computer News*, 2010;
- an award from the company Infor for the largest implementation of the Infor facility asset management system in the Middle East;
- membership for the SWCC in the Infor Ambassador Program, making it an accredited reference within the joint Infor Ambassador Reference Program; this award is the first of its kind in Europe, Africa and Asia, and the SWCC was the first body outside the United States to receive it.[25]
- the PMO Global Award for Pioneering Leadership in Applying Best Practices in Project Management, 2011.[26]
- The SAP Global Award for Project Quality in the Business Transformation category (Middle East and North Africa), 2021.[27]

Artificial intelligence

Continuing its application of new technology, the SWCC has harnessed artificial intelligence to support and develop its water desalination work. This will help it to accelerate and advance water production, reduce operational costs, and provide essential solutions for services in the sectors of sales and procurement, human and financial resources, warehouse management, stakeholder relations, and management of the SWCC's systems, in response to the national strategy for data and artificial intelligence launched by the Kingdom in 2020.

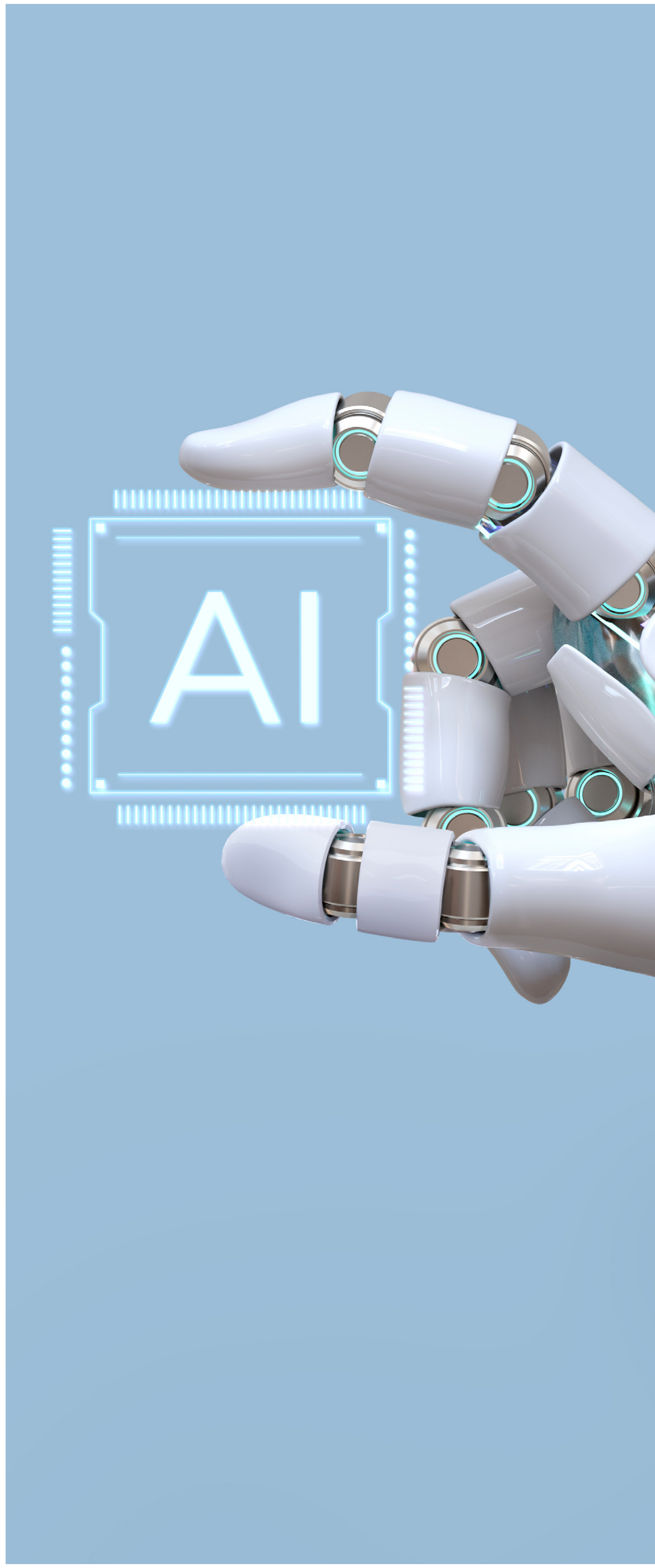
In 2021, the SWCC developed a strategic plan for data and artificial intelligence covering more than 50 projects scheduled over four years. It harnesses big data and the Internet of Things to build a recommendation system that will help to raise production efficiency and reduce costs. It has also harnessed this advanced technology in carrying out various repetitive daily operations required by some of its divisions.

Artificial intelligence technologies have also been harnessed to monitor the operation of plants through the use of unmanned aircraft (drones) to perform intelligent monitoring and take high-quality images of the plants and their transmission lines, in order to improve security and safety and detect any faults.

The SWCC has employed artificial intelligence and Internet of Things technologies to raise levels of security and safety, monitoring predicted risks and take the necessary measures to maintain the safety of its workers.[28]

The SWCC's artificial intelligence projects have also included a smart chatbot. This system allows employees to enquire about and request services easily and conveniently, and to obtain immediate responses around the clock through the Tahlia application and the internal portal.[29]

In 2022, thanks to the SWCC's excellence in the field of artificial intelligence, it obtained accreditation from the International Artificial Intelligence Driving License.[30]



Saudi Water Innovation

The Saudi Innovation Center for Water Technologies was established in partnership between the General Authority for Small and Medium Enterprises and the SWCC to align with the goals of Saudi Vision 2030, which stipulates the localization of the industry, increasing local content, and providing quality job opportunities.

The center aims to improve the labor market in the field of water technologies by creating new companies and jobs, developing the industrial capabilities of small and medium enterprises, and increasing the local content of industries in the water sector. This is done through three main axes:

- Managing and operating a business incubator in the field of water technologies.
- Managing and operating the Saudi Water Technologies Network.
- Managing and operating reverse engineering laboratories.

The business incubator aims to provide an environment conducive to entrepreneurship through suitable training workshops, which include incubating entrepreneurial projects, hosting training camps and idea hackathons in the water sector, and publishing relevant scientific reports and research. The Center, through its reverse-engineering laboratories, seeks to help provide spare parts by creating final designs; this is achieved by scanning and recording the dimensions of mechanical parts, then manufacturing them through local factories and small enterprises. The Water Network aims to be a platform for knowledge exchange, best practices, and attracting partnerships in the water sector. The market value of the projects totaled approximately 585 million Saudi riyals by the end of 2023.[31]

Important Events in the History of the Saline Water Conversion Corporation

Since its inception, The SWCC has sought to excel at the local and global levels and to achieve the Kingdom's vision of excellence and leadership. It has accordingly been granted numerous certificates, awards and patents.

Its role is not limited only to water desalination: it also fulfills its academic and research duties by holding international and local exhibitions and seminars. The SWCC has organized a number of conferences within the Kingdom, and the Institute for Research, Innovation and Desalination Technologies has contributed many research papers to local, regional and international conferences.[1]

Prizes and awards received by the Saline Water Conversion Corporation

- The International Desalination Association Award in the USA, 1999.
- The Almarai Award, an annual national award for scientific creativity under the supervision of the King Abdulaziz City for Science and Technology, 2000.
- Almarai Award, 2001.
- Global Water Intelligence (GWI) Award, 2007.
- Creativity Award from the Water and Energy Forum in Jeddah, 2007.
- His Royal Highness Prince Sultan bin Abdulaziz International Water Award, 2008.

In 2016, The SWCC obtained an award for the largest water desalination plant in the world for the Ras Al-Khayr plant. It was recognized as such by Guinness World Records and in 2023 obtained their award for the largest drinking water storage tank in the world.

- The SWCC obtained the silver King Abdulaziz Quality Award in 2018.
- Quality Management Systems Certificate.
- Occupational Health & Safety Certificate.
- Environmental Management Systems Certificate.
- Laboratory Quality Management System Certificate.[2]

The SWCC also set a Guinness World Record in 2021 for the desalination plant with the lowest energy consumption in the world, amounting to 2.27 kilowatt-hours/m^3.

- First place among government agencies in institutional excellence for the Pillars of Spending Efficiency Sustainability program, 2021.
- "Best water desalination company in the world" award in the international competition organized by the Global Water (GWI), 2021.
- Certificate of Recognition for Institutional Excellence from the European Quality Management Organization, receiving a high rating of four stars as a result of its commitment to the highest standards of institutional excellence, 2021.
- ISO 9001 certificate, 2021.
- The 2021 Award for Operational Excellence from the Expenditure Efficiency and Government Projects Authority, for creating innovative opportunities to enhance operational efficiency by reducing the production cost of one cubic meter.
- The SWCC received the Award for Excellence in Compliance with Local Content Requirements at the level of the highest spending government entities, in its first and second years in 2023-2024, from the Local Content and Government Procurement Authority.[3]
- The Minister of Environment, Water, and Agriculture and Chairman of the Corporation, Engineer 'Abd al-Rahman al-Fadli, along with its Governor, Engineer 'Abd Allah al-'Abd al-Karim, received the Global Innovation Award in Water Desalination at the "Innovation in the Desalination Industry" conference held in Jeddah in 2023.[4]
- In February 2024, the SWCC received nine Guinness World Record certificates for: the largest water pipeline network; the largest water desalination capacity in the world; the largest site in terms of production capacity; the largest multi-effect distillation (MED) desalination unit; the largest drinking water storage tank network; the largest drinking water storage facility; the largest drinking water storage tank; the largest mobile plant in partnership with Bahri (floating); and the lowest energy consumption for a desalination plant.

The leadership's interest in desalination

The SWCC has been the subject of particular royal attention, reflecting the leadership's interest in the SWCC and its vital role in social stability and state development at all levels.

The Saudi government's interest in the SWCC began with the appointment of His Royal Highness Prince Muḥammad al-Faisal to lead it following its creation, due to his experience in the field of seawater desalination. Royal concern and interest in the SWCC and its work have continued, as is evident in the number of royal field visits to the SWCC to inspect its activities, inaugurate its new projects, and monitor the progress of its work.

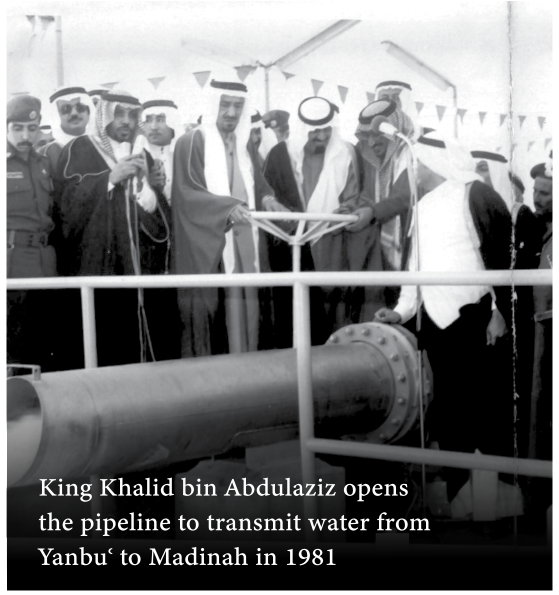
The reign of King Faisal

King Faisal bin Abdulaziz inaugurated the first salt water desalination plant in al-Khobar in 1973.[5]

The reign of King Khalid

In 1979, King Khalid bin Abdulaziz Al Saud inaugurated the third phase of the Jeddah plant.


King Faisal inaugurates the desalination plant in al-Khobar, 1973


King Khalid bin Abdulaziz opens the pipeline to transmit water from Yanbu' to Madinah in 1981


King Fahd ibn Abdulaziz Al Saud opens the al-Jubayl-Riyadh water transmission project, 1983

Demonstrating his confidence in the SWCC and its projects, he drank a cup of the first batch to flow from the newly-established plant. He was accompanied by His Royal Highness Prince Fahd bin Abdulaziz, then Crown Prince, and His Royal Highness Prince Abdullah bin Abdulaziz.[6]

In 1981, King Khalid inaugurated Phase IV of the Jeddah water desalination plant, accompanied by His Royal Highness Prince Majid bin Abdulaziz, then Governor of the Makkah Region.[7] In the same year, King Khalid bin Abdulaziz inaugurated the Yanbuʿ water desalination plant, and a royal ceremony was held in honor of his visit.[8]

The reign of King Fahd

In 1983, King Fahd bin Abdulaziz attended a large inauguration ceremony for the al-Jubayl-Riyadh water transmission project and the opening of the water valves.[9]

In 1988, King Fahd attended the opening ceremony of the Shuʿayba desalination plant.[10]

As Crown Prince, King Abdullah bin Abdulaziz honored the SWCC with his presence on several occasions, inaugurating the desalination plant in al-Shuqayq, as well as the ʿAsīr water supply line project in 1989.

He also attended the opening ceremony for the Yanbuʿ desalination plant in 1999. Accompanying the King of the Kingdom of Bahrain, King Hamad bin ʿIsa Al Khalifa, he attended the opening ceremony for the third phase of the al-Khobar desalination plant and the pipeline transmission desalinated water from al-Khobar to Abqaiq and al-Ahsaʾ in 2002.

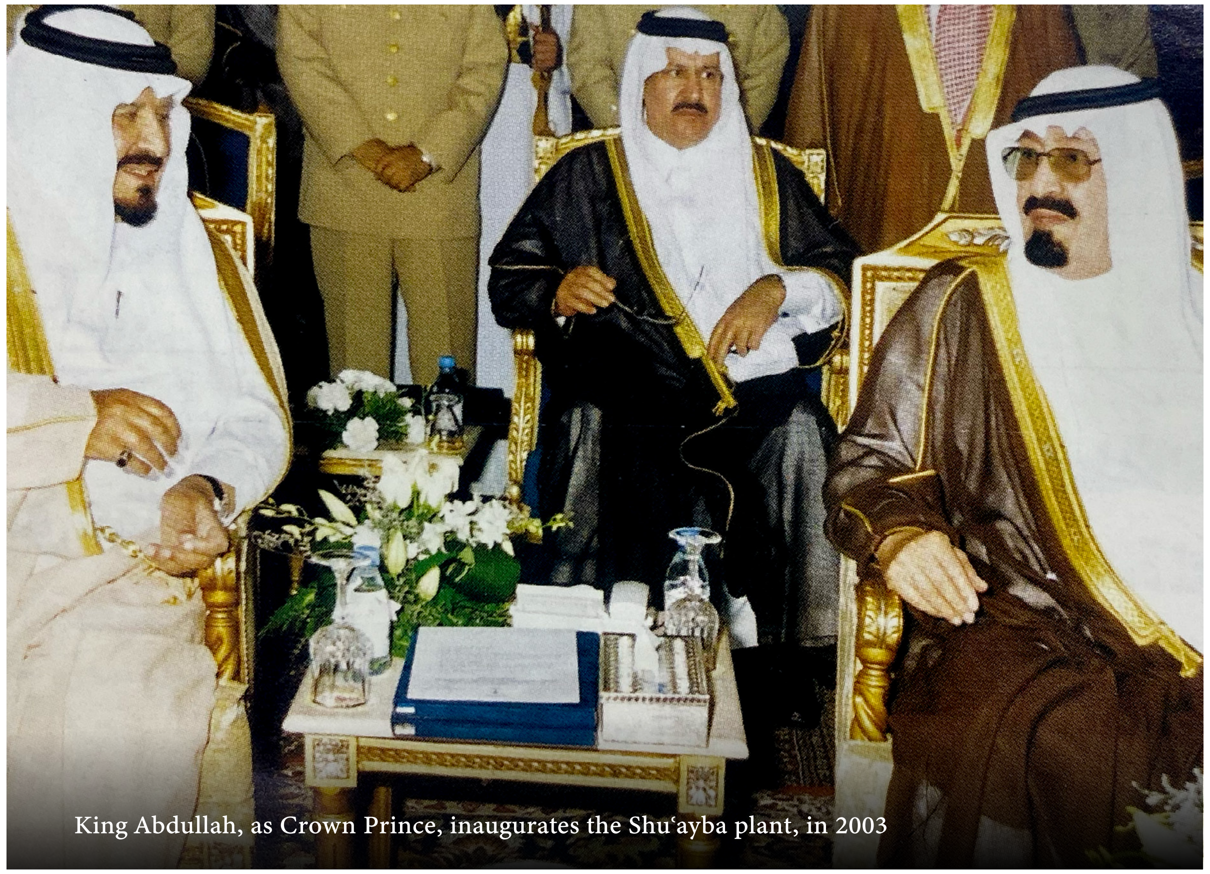
King Fahd bin Abdulaziz Al Saud inaugurates the Shuaiba plant, the second phase, in 1988

Important Events in the History of the Saline Water Conversion Corporation

A ceremony was also held in his honor at the inauguration of the pipeline from Shuʿayba to Jeddah, Makkah, and Ta'if in 2002.[11]

His Royal Highness Prince Abdullah bin Abdulaziz also inaugurated Phase II of the Shuʿayba dual-purpose plant and the water

King Abdullah, as Crown Prince, inaugurates the project to transmit desalinated water from al-Khobar to Abqaiq and al-Ahsaʾ, accompanied by the King of Bahrain, King Hamad al-Khalifa, in 2002.



King Abdullah, as Crown Prince, inaugurates the Shuʿayba plant, in 2003 transmission system from Shu‘ayba to Makkah, Jeddah, and Ta’if in 2003.[12]

The reign of King Abdullah

In 2006, members of the SWCC visited King Abdullah at the Royal Court in the al-Yamama Palace, following the SWCC’s receipt of the first prize from the International Desalination Association, in order to present the award to him.[13]

The reign of King Salman

In 2015, the SWCC visited the Custodian of the Two Holy Mosques, King Salman bin Abdulaziz, at the al-Yamama Palace to present him with two awards it had received from the World Water Summit in Greece: the first being the award for “Best Water Desalination Organization in the World”, and the second for the Ras al-Khayr desalination plant, for its pioneering modern technologies and globally

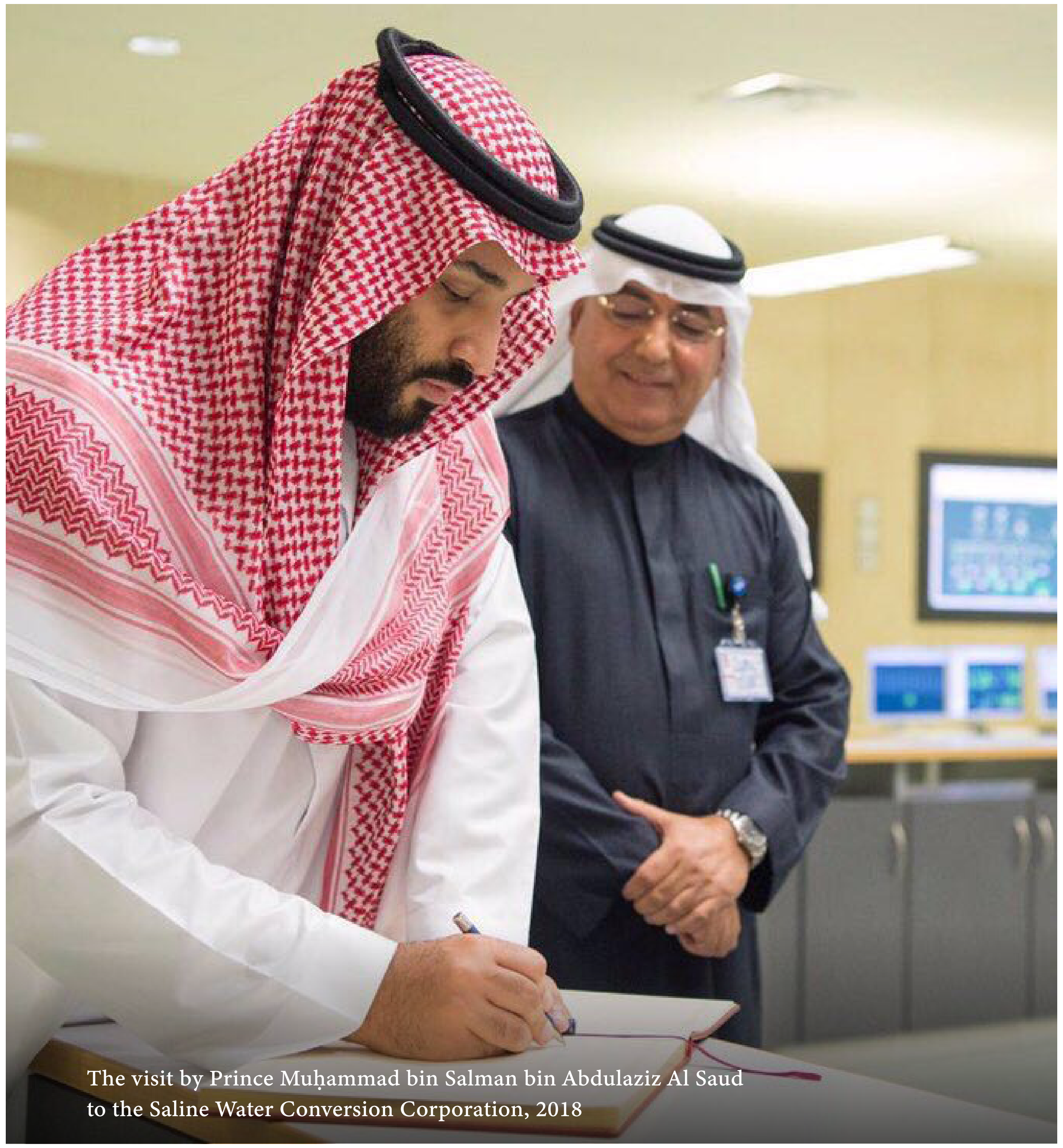
Members of the SWCC attend upon the Custodian of the Two Holy Mosques, King Salman bin Abdulaziz, at al-Yamamah Palace, 2015

Important Events in the History of the Saline Water Conversion Corporation

unprecedented operational levels of efficiency in the plant’s design. The Custodian of the Two Holy Mosques took this opportunity to express his pride in the SWCC’s work.[14]

The Crown Prince’s visit

In 2018, His Royal Highness Crown Prince Muḥammad bin Salman bin Abdulaziz visited the water desalination plant in Jeddah, during which he was briefed on the SWCC’s efforts to employ the research and studies carried out by its Research Institute in improving the efficiency of its plants and increasing their productivity in all areas. The plants in the Kingdom had increased their production rate from 3.5 million to 5 million m^3 without a concomitant increase in operational costs. During the visit, the SWCC also highlighted to His Highness its commitment to the Kingdom’s Vision 2030 programs.[15]



The visit by Prince Muḥammad bin Salman bin Abdulaziz Al Saud to the Saline Water Conversion Corporation, 2018

The SWCC's Role in the Development of Saudi Arabia

Since its founding, the Kingdom of Saudi Arabia has adopted a comprehensive development planning process in the state's various sectors. In order to achieve its social and economic goals, the program to supply water to all of the Kingdom's cities, villages, and governorates was given priority in this development plan.

The long-term development plan aimed to meet the country's increasing need for potable water, in order to develop society and the economy as well as all the state's facilities, with particular attention to supplying the industrial sector—which required increasing amounts of water—with the quantities it needed to carry out its tasks most efficiently.[1]

The Kingdom has made significant progress in numerous fields, and the SWCC has had a clear impact on this progress. It has brought an end to the problem of water provision, which the state had worked hard to solve for many years, and has ensured, through its large-scale projects, the existence of a sustainable source of water.

Undoubtedly, the supply of water to all the cities and villages in the Kingdom has accelerated their development; the government of Saudi Arabia has therefore invested significant effort in the work of the SWCC, and has provided it with everything necessary to help it accomplish its tasks.[2]

Desalination has contributed to the development of the Kingdom, the economic revival of all its cities, and the increase in its population. The population at the start of the desalination project in 1964 was estimated at between 3.5 and 4 million people; the goal during the first five years was to increase the population to more than 10 million. This idea was perhaps surprising, given that the population was being evacuated from the cities due to insufficient water sources, as happened in the Madinah evacuation when the wells dried up and they stopped supplying the city's palm trees with sufficient water. Nevertheless, since that time, the country's population has surpassed 35 million people.[3]

One of the SWCC's most important contributions has been to enhance the water supply and meet the demand of the Holy Sites and the cities of Makkah and Madinah during the hajj and umrah seasons. Despite the increase in the number of pilgrims, water provision has been facilitated by the huge projects that the SWCC has implemented in this field and its efforts to provide high-quality services to pilgrims.[4]

Notably, Saudi Arabia has been ranked first in the world in terms of its use of seawater desalination technology, and it has the world's largest desalination capacity.

The contribution of the SWCC to the Kingdom's development has embraced several areas:

- **Economy:** The SWCC has succeeded in supplying water to industrial facilities in order to promote industrial development, which requires large amounts of water; this in turn has contributed to increasing local production.

  The SWCC has therefore kept pace with industrial and urban development by finding scientific and practical solutions to increase its production rate to 7.5 million m³; of seawater desalination, and 4 million m³/day of desalinating and purifying well and dam water, with a total of 11.5 million m³/day.

  It has achieved an advanced position globally in developing salt water desalination technology, and has been entered in the Guinness Book of Records for the largest water desalination institution in the world, representing 22% of global production, and the world's largest desalination plant, namely the Ras al-Khayr plant.[5]

  The SWCC has continued to achieve impressive results in the economic field, meeting the need for desalinated water at the lowest cost and the highest economic return, with an operational efficiency exceeding 99%. The percentage of local content in its projects has also increased to more than 64%, and the SWCC is still working to reduce the capital and operational costs of its projects [6].

  The SWCC has also worked with the Non-Oil Revenues Development Center to offer investment opportunities for brine discharge water resulting from desalination operations. The first investment opportunity was at the Ras al-Khayr production plant site, where the SWCC signed its first contracts with the Ningxia TB and JSG Alliance companies of China. The project is expected to be completed during 2027. It will produce approximately 16,000 tons annually of sodium bromide, 180,000 tons annually of calcium sulphate, and 300,000 tons annually of potassium chloride in its first stage, in addition to 300,000 tons annually of a mixture of various chemical compounds. In 2027, additional desalinated water will be produced during mineral extraction operations. These agreements will support the supply chains of a number of different industries (i.e. the oil and gas, petrochemical, pharmaceutical, and construction industries). The second phase of the project has also been launched at the Yanbuʿ production plant site, and work is underway; the submitted bids are currently being evaluated.
- **Agriculture:** The SWCC has also contributed to the development of agriculture by supplying desalinated water to all coastal cities as well as transporting it to those inland. It has also supported the exploitation of groundwater resources, and thus agriculture development, by allocating groundwater for agricultural purposes. In addition, work by the SWCC's national personnel is underway to develop techniques to desalinate water for agricultural purposes at a low cost and with high efficiency.[7]
- **localization:** The SWCC has had an impact on the creation of job opportunities for citizens, thereby raising the standard of social and economic life. Cities and villages now enjoy most service facilities, which has led to a significant decline in population drain to the large cities.

  Furthermore, the SWCC has made efforts to onshore jobs by training citizens and involving Saudi women in its work. In 2022, the proportion of Saudis in the SWCC reached about 98% of workers in various engineering, technical, and administrative fields.[8]
- **Environmental conservation:** The SWCC's concern for the environment is a result of its profound awareness of the increased demand for water resulting from population growth, economic growth, and rapid urbanization. It has therefore paid great attention to the importance of the environment and its conservation, especially since this attitude is fully in line with Vision 2030, the Green Saudi Arabia Initiative, the National Program for Environmental Awareness and Sustainable Development, and the National Environment Strategy launched by the Ministry of Environment, Water and Agriculture.[9]

  The SWCC has invested significant effort in the issue of environmental preservation, establishing a special department for biology and the environment at its Research Institute to conduct studies into protecting the marine environment from pollution. The water discharged into the sea (brine) is monitored to ensure that it conforms to the applicable environmental standards and that marine life is not harmed.

  The Research Institute has invented a "zero liquid dischage" technology. The process of desalinating seawater produces a brine solution called salt return. The researchers converted the concentrated salt value into zero liquid dischage by breaking down this compound and extracting the precious metals to benefit from them economically. This will have a positive environmental impact.

  Every project implemented requires an environmental license in accordance with the standards and regulations of the Environmental Compliance Center, in order to prevent it from affecting the ecosphere; the SWCC has also obtained environmental licenses for all of its previous projects [10].

  To this end, the SWCC had reduced its carbon emissions by 19,900,000 metric tons at the end of 2023, compared to 7,790,000 metric tons in 2021. Additionally, in 2020, the SWCC launched an initiative to plant 5 million trees, with 500,000 trees planted by 2023, aiming to reduce approximately 120,000 tons of carbon emissions annually to address the challenges of climate change.[11]

  Finally, the SWCC has worked to expand the use of photovoltaic plants to generate renewable energy, which it uses to power its water production and transmissions, in order to reduce carbon emissions and costs.[12]

The SWCC and the Saudi Vision 2030

VISION رؤية
2030
المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

The Kingdom of Saudi Arabia's Vision 2030 was launched following its approval by the Council of Ministers, headed by the Custodian of the Two Holy Mosques, King Salman bin Abdulaziz. It is an integrated vision, capitalizing on the country's strengths to empower it and take it to the front rank of the world's countries.[1]

Vision 2030 is based on the unique advantages that distinguish the Kingdom from other countries. These are the presence of the Two Holy Mosques, which give the country an Arab and Islamic value and depth, as well as the huge investment capabilities it possesses and its strategic location as a pivot and link between three continents and the surrounding seas and bodies of water.

The Vision is based on three main axes. The first is "A Vibrant Society," which is foundational for achieving the vision and creating a solid base for economic prosperity. Its goal is to build a vibrant society whose members follow the principle of moderation, proud of their national identity and cultural heritage.

The second axis is "A Prosperous Economy," which focuses on providing opportunities for all, from entrepreneurs and small enterprises to large companies, by building an educational system linked to the labor market. It also aims to develop investment tools to diversify and unleash the potential of the national economy, generate job opportunities for citizens, and create competition to raise the level of services and economic development. Finally, it focuses on tailoring government services and improving the business environment to attract top global talent and investments.

The last axis, "An Ambitious Nation," focuses on the public sector. It lays out a plan for effective government by enhancing efficiency, transparency, and accountability; encouraging a culture of performance to empower human resources and capabilities; and creating the necessary environment for citizens, businesses, and non-profits to assume their responsibilities and seize the initiative in facing challenges and exploiting opportunities.[2]

Water desalination undoubtedly contributes to these three axes by supplying the water necessary to build a strong society with ambitious goals, based on a prosperous economy that helps citizens to participate in its construction and advancement in various ways, so that it can take its rightful place among the developed countries of the world.

Saudi Arabia faces great challenges due to its unsustainable use of water resources and its limited non-renewable groundwater reserves, as well as high demand for water: all urban, agricultural, industrial and environmental sectors will require significant quantities of water in the future. This is why the water sector features among the Vision's objectives: addressing the issue of water security is one of the Saudi government's highest priorities under Vision 2030. Accordingly, a national strategy has been developed, known as the "National Water Strategy 2030"; it was approved by the Council of Ministers in 2018 as an integrated water plan laying out the comprehensive foundations and structure of institutions to guarantee the protection and sustainability of water resources, and to address all other challenges in the water sector.

The vision of the National Water Strategy is: "A sustainable water sector that develops and preserves water resources, conserves the environment, and provides a safe water supply, high-quality services, and efficiency, contributing to economic and social development."[3]

Hence the SWCC's pioneering role in achieving water security for the Kingdom, through its continuing major efforts to desalinate water with high efficiency and to reinforce the supply of water to all of the Kingdom's cities and governorates.[4]

The SWCC's leadership objectives are linked to the objectives of Vision 2030 as follows:

- ensuring the sustainability of water resources;
- reducing all types of pollution;
- enhancing the effectiveness of financial planning and the efficiency of government spending;
- increasing the contribution of renewable energy sources to the energy mix;
- onshoring promising industries and increasing the percentage of local content;
- preventing health risks and adhering to occupational health and safety standards;
- providing high-quality services to pilgrims.[5]

Finally, the SWCC is striving, with all its knowledge, strength and experience, to bring its future plans into conformity with this grand vision for the security, stability and supremacy of the Kingdom of Saudi Arabia.

The SWCC and the Future

Since its inception nearly five decades ago, the SWCC has gone through many transformations, some of which have constituted radical turning points in its business strategies and operational foundations. Nevertheless, guaranteeing the security of supply and the chain of operations has remained the watchword of its leadership, as the SWCC represents a lifeline for many regions of the Kingdom, and any impact on its operations could pose a threat to the livelihoods that depend on this strategic industry. This has made the desalination industry a top concern for the Kingdom's leaders since its founding.[1]

An integrated strategic plan to privatize and restructure the SWCC was drawn up to address all the major challenges that the Kingdom's water sector may face. The plan was approved by the Supervisory Committee for the Privatization of the Environment, Water and Agriculture Sector, and it was then submitted to the Council of Ministers, which approved it in 2018.[2]

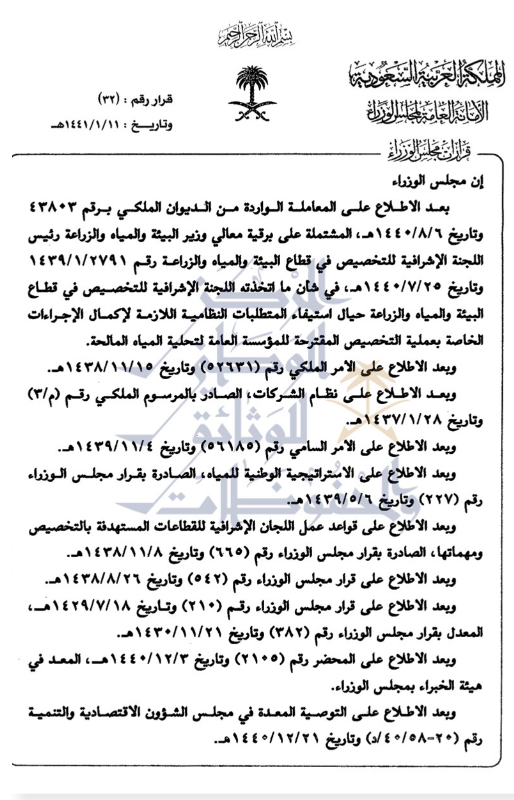
Accordingly, on October 19, 2020, a national state-owned company was established under the name of the Water Transmission and Technologies Company. It is responsible for managing, operating, and maintaining water transmission, storage, and supply systems in the Kingdom's various regions, as well as finding solutions in the field of water technologies and research, and qualifying personnel to enhance the Kingdom's leadership in the desalination industry.[3]

On June 24, 2022, the Council of Ministers approved the transfer of ownership of all water production, transmission and storage assets owned by the Saline Water Conversion SWCC, or allocated to it by the state, to the Water Solutions Company, wholly owned by the Public Investment Fund or any of its subsidiaries.

As a result, a steering committee was formed, headed by the Minister of Environment, Water and Agriculture and with the membership of the Minister of Finance, the Governor of the Public Investment Fund, and the Governor of the Saline Water Conversion SWCC, or their representatives. Its objective was to supervise and implement the transfer of ownership of the assets, and it was given powers to determine the mechanism for transferring the assets from the SWCC to the Solutions Company after appropriate deliberation. The transfer of the assets will be accompanied by the transfer of the strategic, research and engineering expertise on which the SWCC was founded and which have given it its prestigious global position, while maintaining the security and supply of potable water to the Kingdom's various regions. There will be a complete shift to a commercial basis of operations, to reduce dependence on government budgets and rely instead on the self-governance of this strategic industry. The allocation work and necessary procedures involving the SWCC and the other parties concerned is still ongoing.

The SWCC looks forward to an increase in development and innovation; it has ensured that its future plans are of the same standard as what it has created and accomplished over the past fifty years. It therefore aims to increase the quantities of water produced by its plants, and to set up additional plants for producing, transporting and storing desalinated water in accordance with the rise in demand caused by expected population increases and the Kingdom's future development projects under the Vision 2030 program, all while reducing costs, improving operational efficiency, and applying the highest international health, safety, and environmental standards, by developing its innovations and leveraging the efforts of all its employees.[4]

The Corporation and the Future


بسم الله الرحمن الرحيم

المملكة العربية السعودية
الأمانة العامة لمجلس الوزراء
قرارات مجلس الوزراء

قرار رقم : (٣٢)
وتاريـــخ : ١٤٤١/١/١١هـ

إن مجلس الوزراء

بعد الاطلاع على المعاملة الواردة من الديوان الملكي برقم ٤٣٨٠٣ وتاريخ ١٤٤٠/٨/٦هـ، المشتملة على برقية معالي وزير البيئة والمياه والزراعة رئيس اللجنة الإشرافية للتخصيص في قطاع البيئة والمياه والزراعة رقم ١٤٣٩/١/٢٧٩١ وتاريخ ١٤٤٠/٧/٢٥هـ، في شأن ما اتخذته اللجنة الإشرافية للتخصيص في قطاع البيئة والمياه والزراعة حيال استيفاء المتطلبات النظامية اللازمة لإكمال الإجراءات الخاصة بعملية التخصيص المقترحة للمؤسسة العامة لتحلية المياه المالحة.

وبعد الاطلاع على الأمر الملكي رقم (٥٢٦٣١) وتاريخ ١٤٣٨/١١/١٥هـ.

وبعد الاطلاع على نظام الشركات، الصادر بالمرسوم الملكي رقم (م/٣) وتاريخ ١٤٣٧/١/٢٨هـ.

وبعد الاطلاع على الأمر السامي رقم (٥٦١٨٥) وتاريخ ١٤٣٩/١١/٤هـ.

وبعد الاطلاع على الاستراتيجية الوطنية للمياه، الصادرة بقرار مجلس الوزراء رقم (٢٢٧) وتاريخ ١٤٣٩/٥/٦هـ.

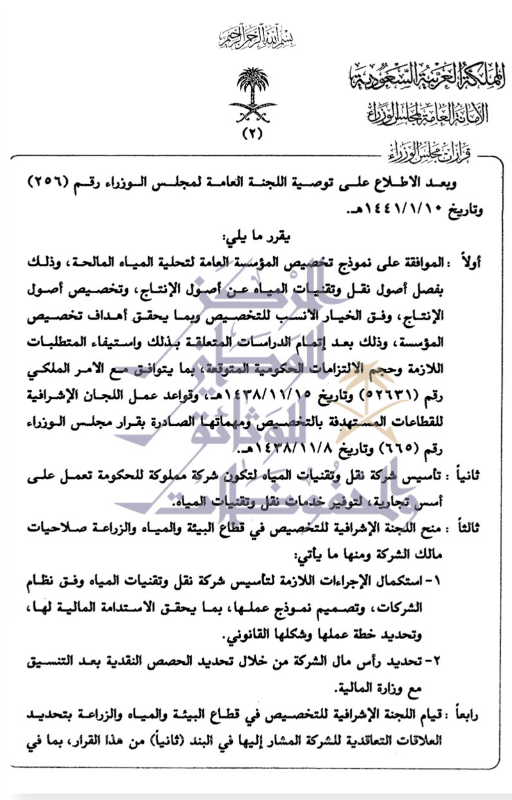
وبعد الاطلاع على قواعد عمل اللجان الإشرافية للقطاعات المستهدفة بالتخصيص ومهماتها، الصادرة بقرار مجلس الوزراء رقم (٦٦٥) وتاريخ ١٤٣٨/١١/٨هـ.

وبعد الاطلاع على قرار مجلس الوزراء رقم (٥٤٢) وتاريخ ١٤٣٨/٨/٢٦هـ.

وبعد الاطلاع على قرار مجلس الوزراء رقم (٢١٠) وتاريخ ١٤٢٩/٧/١٨هـ، المعدل بقرار مجلس الوزراء رقم (٣٨٢) وتاريخ ١٤٣٠/١١/٢١هـ.

وبعد الاطلاع على المحضر رقم (٢١٠٥) وتاريخ ١٤٤٠/١٢/٣هـ، المعد في هيئة الخبراء بمجلس الوزراء.

وبعد الاطلاع على التوصية المعدة في مجلس الشؤون الاقتصادية والتنمية رقم (٢٠-٥٨/٤٠/د) وتاريخ ١٤٤٠/١٢/٢١هـ.


بسم الله الرحمن الرحيم

المملكة العربية السعودية
الأمانة العامة لمجلس الوزراء
قرارات مجلس الوزراء

(٢)

وبعد الاطلاع على توصية اللجنة العامة لمجلس الوزراء رقم (٢٥٦) وتاريخ ١٤٤١/١/١٠هـ.

يقرر ما يلي:

أولاً : الموافقة على نموذج تخصيص المؤسسة العامة لتحلية المياه المالحة، وذلك بفصل أصول نقل وتقنيات المياه عن أصول الإنتاج، وتخصيص أصول الإنتاج، وفق الخيار الأنسب للتخصيص وبما يحقق أهداف تخصيص المؤسسة، وذلك بعد إتمام الدراسات المتعلقة بذلك واستيفاء المتطلبات اللازمة وحجم الالتزامات الحكومية المتوقعة، بما يتوافق مع الأمر الملكي رقم (٥٢٦٣١) وتاريخ ١٤٣٨/١١/١٥هـ، وقواعد عمل اللجان الإشرافية للقطاعات المستهدفة بالتخصيص ومهماتها الصادرة بقرار مجلس الوزراء رقم (٦٦٥) وتاريخ ١٤٣٨/١١/٨هـ.

ثانياً : تأسيس شركة نقل وتقنيات المياه لتكون شركة مملوكة للحكومة تعمل على أسس تجارية، لتوفير خدمات نقل وتقنيات المياه.

ثالثاً : منح اللجنة الإشرافية للتخصيص في قطاع البيئة والمياه والزراعة صلاحيات مالك الشركة ومنها ما يأتي:

١- استكمال الإجراءات اللازمة لتأسيس شركة نقل وتقنيات المياه وفق نظام الشركات، وتصميم نموذج عملها، بما يحقق الاستدامة المالية لها، وتحديد خطة عملها وشكلها القانوني.

٢- تحديد رأس مال الشركة من خلال تحديد الحصص النقدية بعد التنسيق مع وزارة المالية.

رابعاً : قيام اللجنة الإشرافية للتخصيص في قطاع البيئة والمياه والزراعة بتحديد العلاقات التعاقدية للشركة المشار إليها في البند (ثانياً) من هذا القرار، بما في

Resolution No. 32, September 10, 2019, pp. 1-5
Source: National Center for Documents and Archives,

Future activities and projects to increase the production of desalinated water include the following:

Projects relating to production

- Replacing the al-Khobar production plant (Phase III).
- Establishing a drinking water purification plant on the Hali Dam, with a production capacity of up to 30,000 m^3/day.
- Establishing Megaton plants for new research technologies, with a production capacity of up to 50,000 m^3/day.

Projects relating to transmission

- Increasing the capacity of the Hali Dam to Shuaiba water transmission line.
- Completing the Asir water transmission systems.
- Dawadmi–Afif water transmission system.
- Abha–Bishah water transmission system.
- Hejier–Nwaiba water transmission system.
- Aradah Phase 2 water transmission system.
- Jubail–Riyadh water transmission system (J&K).
- Northeren Riyadh ring feeder lines.
- Implementation of the Ras Al-Khair to Riyadh H&I water transmission system.
- Implementation of the southern ring water transmission system for the city of Riyadh.[5]

One of the SWCC's most significant ongoing projects to enhance the security of the water supply is to increase the emergency water storage capacity from 22 million m^3, equivalent to 2.2 days of demand in 2022, to a rate equivalent to 225%, or 7 days of strategic storage, by 2030.[6]

Seeking to develop its plants further, it aims to replace the old dual-purpose plants on the eastern and western coasts with reverse-osmosis plants, as this technology will help to keep pace with the global trend and reduce the costs of operation and construction. Significantly, this technology is environmentally friendly because it does not produce carbon dioxide.[7]

The use of reverse-osmosis technologies is part of the SWCC's commitment to the Kingdom's Vision regarding halting emissions that cause global warming by 2060 to protect the climate. Other technologies that the SWCC has relied on, such as flash evaporation, consume large quantities of fuel, while reverse-osmosis plants operate using electricity. Nevertheless, the SWCC has conducted extensive research and studies in order to reduce electricity consumption per m^3, and it has been so successful in this that it has entered the Guinness Book of Records for achieving an energy consumption of 2.27 kWh/m^3. The SWCC is working hard to reduce its electricity consumption by 2060.[8]

The SWCC has also worked on a future program to gradually reduce emissions, taking into account the increasing demand for water. To achieve this, it is also seeking the assistance of qualified and accredited bodies to examine emissions by production plants on an ongoing basis, to ensure that the measurements do not exceed the permissible limits. It is also working to use clean fuels, such as natural gas, and technologies that help to reduce emissions, with the goal of reducing carbon emissions by 26% by 2024 and reaching net zero by 2060.[9]

To this end, the SWCC has also built innovative plants to purify groundwater, as an extension of the engineering solutions it has created through its high-end research capabilities. These plants are designed, implemented, operated and maintained by national personnel.

These plants aim to provide permanent solutions for producing desalinated water in new facilities, using renewable energy and the most innovative technologies to provide a safe, healthy environment, with an energy use of 0.3 $kilowatts/m^3$, as well as reduce carbon emissions and costs. This will help to increase efficiency, improve the quality of drinking water, and raise production rates.[10]

Based on the National Industrial Development and Logistics Services Program launched by the Kingdom in 2019, which focuses on the mining, energy, industrial and logistics sectors to transform the Kingdom into an industrial power and a global logistics platform, in recent years the SWCC has actively participated in industry, in order to lead the world in the manufacture of water desalination technologies. It has therefore set future goals to improve the efficiency of fuel use, electricity generation, water desalination, the petrochemical industry, manufacturing, and mining.[11]

As part of its effort to bring the water desalination industry within the country, the SWCC has sought to raise the proportion of spare parts for desalination plants manufactured in the Kingdom from 40% to 70% by 2030. To this end, in partnership with the Local Content and Government Procurement Authority and the company Toray Middle East, it has signed an agreement to establish a factory for reverse-osmosis membranes in the Kingdom, which will begin production by 2025.

The factory will help to meet the growing demand for reverse-osmosis membranes within and outside the Kingdom, driving growth and economic diversification, and achieving revenues on the domestic product amounting to 1.14 billion riyals within five years, with an annual impact on the trade balance amounting to 135 million riyals.

It will also serve other sectors, such as oil, gas and industry, as its production capacity will reach 254,000 membranes, 5% of which will meet the SWCC's own needs; another 10% will go to the local water sector, 5% will supply the oil and gas sector, and 30% will be exported to meet external demand.[12]

Using renewable energy to produce desalinated water in new plants

The SWCC is also a global leader in the field of brine water processing, seawater mineral extraction, and improving drinking water quality. One of its main goals is to enhance the local economy by 2030, contributing up to 1.5 billion riyals annually through its investments in the production and extraction of valuable minerals, including bromine, sodium, potassium, magnesium, calcium, and lithium, which are used in the oil and gas, pharmaceutical, construction, food, and various chemical industries. These minerals are supplied to local factories and exported abroad.[13]

The SWCC continues its innovation, development, and research to increase its body of scientific and technological knowledge, ensuring the Kingdom's continued global leadership in seawater desalination.

The SWCC has undergone many changes and transformation programs that have altered its future directions and operations. The most recent change was the issuance of a resolution by the Council of Ministers, chaired by the Custodian of the Two Holy Mosques, No. 918 dated May 7, 2024, transforming the Saline Water Conversion Corporation into a body named the "Saudi Water Authority," which will regulate water services.[14]

الهيئة السعودية للمياه
Saudi Water Authority

Notable Leaders in the History of the SWCC

Since its founding, the Saline Water Conversion Corporation has been directed by a series of distinguished leaders who have played a prominent role in advancing and developing the SWCC. Their efforts have brought it to prominence both locally and internationally. A number of ministers, chairpersons, and governors have taken the helm of the SWCC, including the following:

Ministers

His Excellency Hasan bin Mishari al hussein

9/6/1974 – 10/13/1975

He holds a bachelor's degree in accounting from the Faculty of Commerce at Fouad University, and a master's degree in business administration from the University of Southern California. He worked at Aramco, then served as the director of Yamamah Cement. He also worked as a professor of economics at King Saud University, and was then appointed Deputy Minister of Finance and National Economy. He contributed to the establishment of the Institute of Public Administration in Riyadh. A royal decree was issued appointing him to establish and chair the board of directors of the Saudi French Bank and the Saudi Hotels and Tourism Company. He was the first chairman of the board of the Saline Water Conversion Corporation and Minister of Agriculture and Water.[1]

His Excellency Dr. ʿAbd al-Rahman bin ʿAbd al-ʿAziz Al al-Shaykh

10/13/1975 – 11/28/1994

He holds a bachelor's degree in agricultural economics from Texas Tech University in the United States, a master's degree in agricultural economics from Pennsylvania State University in the United States, and a doctorate in agricultural economics from the University of Edinburgh in the United Kingdom. He began his career as a faculty member at the College of Agriculture at King Saud University, later becoming dean of the College. Before his appointment as Minister of Agriculture, he was the first president of King Faisal University and worked to establish its colleges. He also served as Acting Minister of Health in addition to his role as Minister of Agriculture and Water, and chaired the Saudi Red Crescent Authority.[2]

His Excellency Dr. ʿAbd al-ʿAziz bin ʿAbd Allah bin ʿAli al-Khuwaytir

11/28/1994 – 8/2/1995

He holds a bachelor's degree in Arabic language and Islamic studies from Dar al-Ulum at Cairo University, and a doctorate in history from the School of Oriental and African Studies at the University of London. He served as the Secretary-General of King Saud University in 1960, and held several other positions until he was appointed Minister of Health in 1973, Minister of Education in 1975, Acting Minister of Agriculture and Water, and then Minister of State and Member of the Council of Ministers in 1995.[3]

His Excellency Dr. ʿAbd Allah bin ʿAbd al-ʿAziz bin Muʿammar

8/2/1995 – 9/16/2002

He holds a bachelor's degree in economics from the International American University in California, a master's degree in management and organizational development from the International American University in California, and a doctorate in social sciences from the University of California. He worked as a teaching assistant at the University of California, then served as a manpower consultant at the Kingdom's Secretariat of the Manpower Council, then as the Director of Research and Studies at the Secretariat. He subsequently became an advisor in the office of the Minister of Water and Agriculture, then Deputy Minister of Water and Agriculture, and finally Minister of Agriculture and Water.[4]

His Excellency Dr. Ghazi bin ʿAbd al-Rahman al-Qusaybi

9/16/2002 – 4/13/2004

He holds a bachelor's degree in law from Cairo University, a master's degree in international relations from the University of Southern California, and a doctorate in international relations from the University of London. He began his career as a lecturer at the College of Commerce at King Saud University from 1965 to 1970, then served as an assistant professor from 1970 to 1974. He served as dean of the College of Commerce from 1971 to 1973. He then worked as the director-general of the Railway Corporation in al-Dammam, held ministerial positions in the Ministries of Industry and Electricity and the Ministry of Health, and served in the diplomatic corps as the Kingdom's ambassador to Bahrain and the United Kingdom. He became the first Minister of Water in 2002 and the first Minister of Water and Electricity in 2003, and he then served as Minister of Labor.[5]

His Excellency Engineer ʿAbd Allah bin ʿAbd al-Rahman al-Husayn

4/13/2004 – 4/23/2016

He holds a bachelor's degree in electrical engineering and a bachelor's degree in mathematics from Oregon State University in the United States, and a master's degree in computer science from the Georgia Institute of Technology in Atlanta, United States. He worked as an engineer and then as an assistant and lecturer at King Saud University. He was the Director of the Computer Department and later the General Director of the Computer and Information Center at the Saline Water Conversion Corporation. He also served as the SWCC's General Director of Operations and Maintenance and its Deputy Governor for Operations and Maintenance, and was then the Governor of the SWCC from 2001 to 2004. He then became the Deputy Minister of Water and Electricity and the Acting Governor of the SWCC in 2004, and later in 2004 he became Minister of Water and Electricity.[6]

His Excellency Engineer ʿAbd al-Rahman bin ʿAbd al-Muhsin al-Fadli

7/5/2016

He holds a bachelor's degree in chemical engineering from King Saud University and worked for thirteen years in the petroleum industry. He then joined Almarai as CEO and was appointed in 2015 as the first Minister of the Ministry of Environment, Water, and Agriculture, and he remains in his position until the date of publication of this book.[7]

Notable Leaders in the History of the SWCC

Governors

His Royal Highness Prince Muḥammad Faisal ibn ʻAbdulaziz Al Saud

11/27/1974 – 7/8/1977

He holds a bachelor's degree in business administration from Menlo College in California, United States. He worked as an economic researcher at the Saudi Arabian Monetary Agency in 1963, as the head of the agent's office at the Ministry of Agriculture and Water, and as a technical advisor at the Ministry of Agriculture and Water. He was appointed as the first governor of the SWCC upon its establishment in 1974.[8] In 1976, he was named Man of the Year by the American General Assembly for solving water problems.[9]

His Excellency Dr. ʻAbd al-Rahman bin ʻAbd al-ʻAziz Al al-Shaykh

7/8/1977 – 12/31/1977

He served as governor of the SWCC twice, the first time for six months from June 1977 to December 1977, and the second time from May 1979 to March 1981.[10]

His Excellency ʻAbd al-ʻAziz bin Rashid al-Rashid

12/31/1977 – 5/28/1979

He holds a bachelor's degree in accounting and business administration from the College of Commerce, a master's degree in public administration/financial resource management, and a postgraduate diploma in accounting and auditing. He served as a teacher in the Royal Guard, director of the Retirement Pensions Department, director of the General Accounting Department at the Ministry of Finance, and departmental director at the Ministry of Finance. He was appointed as an undersecretary in 1974 and became the governor of the SWCC in 1978.[11]

His Excellency ʻAbd Allah bin Muḥammad al-Ghulayqa

3/7/1981 – 6/8/1991

He holds a bachelor's degree from King Saud University and began his career as a lecturer there. He then became head of the Corporation's office at the Ministry of Agriculture and Water, assistant director of the Minister's office for technical affairs at the Ministry of Agriculture, assistant director of the project management department at the Ministry of Agriculture and Water, director of administrative affairs at the Ministry of Agriculture and Water, and director of water affairs at the Ministry of Agriculture and Water. He served as undersecretary for water affairs at the Ministry of Agriculture and Water and was appointed as governor of the SWCC in 1981, until he retired at his own request.[12]

His Excellency Dr. Fahd bin ʿAbd al-Rahman Balghunaym

6/8/1991 – 5/26/2001

He holds a bachelor's degree in civil engineering from King Fahd University of Petroleum and Minerals in Dhahran, a master's degree in construction engineering and management from Stanford University in the United States, and a doctorate in transmission engineering from the University of Michigan, Ann Arbor, United States. He worked as an assistant lecturer at King Fahd University of Petroleum and Minerals in Dhahran, an assistant lecturer at King Saud University, and an assistant professor at the College of Engineering at King Saud University. He also served as a consultant to the Ministry of Agriculture and Water, and as fisheries undersecretary of the Ministry of Agriculture and Water. He was appointed governor of the SWCC in 1991.[13]

His Excellency Engineer ʿAbd Allah bin ʿAbd al-Rahman al-Husayn

He served as governor of the SWCC from May 2001 to March 2004.[14]

His Excellency Fuhaid bin Fahd Al-Sharif

3/3/2004 - 13/12/ 2011

He holds a bachelor's degree in economics and political science from King Saud University and a master's degree in economics from the United States of America. He has served as an economic researcher at the Center for Research and Industrial Development, General Manager of the Office of the Minister of Industry and Electricity, Assistant Undersecretary for Financial and Administrative Affairs at the Ministry of Industry and Electricity, Supervisor of the Office of the Minister of Industry and Electricity, General Manager of Financial and Administrative Affairs at the Ministry of Health, Deputy Governor of the General Electricity Corporation, Chairman of the Board of Directors of the General Electricity Corporation, Chairman of the Board of Directors of the Unified Saudi Electricity Company, Undersecretary of the Investment Services Authority at the General Investment Authority, and Economic Advisor to the Minister of Water and Electricity. He assumed the position of Governor of the SWCC in 2004.[15]

His Excellency Abdul Rahman bin Mohammed Al-Ibrahim

13/12 2011 - 31/10/2016

He holds a bachelor's degree in mechanical engineering from King Abdulaziz University in Jeddah, a master's degree in mechanical engineering from the University of Wisconsin in the United States, and a doctorate in mechanical engineering from the University of Wisconsin in the United States. After completing his bachelor's degree, he worked at King Abdulaziz City for Science and Technology as a scientific researcher. After obtaining his master's and doctoral degrees, he was appointed as an assistant research professor at the Energy Research Institute at the City, and was later promoted to associate research professor. He became the governor of the Saline Water Conversion Corporation in 2011 and has authored numerous studies on energy.[16]

His Excellency Engineer ʿAli bin ʿAbd al-Rahman al-Hazimi

10/31/2016 – 5/6/2020

He holds both a bachelor's and a master's degree in mechanical engineering from the University of Michigan in the United States. He held several positions at Saudi Aramco before becoming governor of the SWCC in 2016.[17]

His Excellency Engineer ʿAbd Allah bin Ibrahim al-ʿAbd al-Karim

5/6/2020

He holds a bachelor's degree in computer engineering from King Saud University in Riyadh. Rising through the ranks at the SWCC, he eventually became its deputy governor for planning and development. He played significant roles in leading transformation and setting strategic plans during the various phases of the SWCC's development and growth.

He was appointed as governor of the SWCC in May 2020. In addition, he chairs the board of directors of the Water Transmission Company and serves as the vice-chairman and managing director of the Water Solutions Company. On July 5, 2024, he became CEO of the Saudi Water Authority, following the decision to transform the SWCC into a new body under that name.[18]

المؤسسة العامة لتحلية المياه المالحة
Saline Water Conversion Corporation (SWCC)

We race the future
Where life is

Conclusion

In conclusion, desalination has played a prominent and tangible role in the history of the Kingdom of Saudi Arabia. Initial research in 1964 into solving the Kingdom's water problem expanded rapidly under the auspices of the Saline Water Conversion Corporation into major projects. For over 50 years, the Corporation has continued to push the boundaries of innovation and achievement to new heights, winning multiple awards and honors as testament to its success.

Today, Saudi Arabia leads the world as a producer of desalinated water, and the SWCC has become a distinctive Saudi icon, a beacon of achievement that the Saudi state can be justly proud of, and an institution that brings benefit to all who live and work in the Kingdom.

Driven by the passion and expertise of its people, the SWCC is not content to rest on its laurels; it will continue to develop its operations, innovations, and goals. This ongoing commitment will enable it to fulfil its honorable mission of providing water, the elixir of life, throughout the Kingdom, now and in the future.

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Water in the Kingdom of Saudi Arabia

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49	king Abdulaziz Foundation for Reserch and Archives
50	king Abdulaziz Foundation for Reserch and Archives
53	king Abdulaziz Foundation for Reserch and Archives
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72	he history of Ain Aziziyah in Jeddah and insights into water sources in the Kingdom of Saudi Arabia
82	The Saudi Water Authority
85	The Saudi Water Authority
90	The Saudi Water Authority
99	The Saudi Water Authority
102	The Saudi Water Authority
105	The Saudi Water Authority
109	The Saudi Water Authority
111	The Saudi Water Authority
112	The Saudi Water Authority
115	The Saudi Water Authority
117	The Saudi Water Authority
119	The Saudi Water Authority
120	The Saudi Water Authority
122	The Saudi Water Authority
126	The Saudi Water Authority
127	The Saudi Water Authority
129	The Saudi Water Authority
133	The Saudi Water Authority
134	The Saudi Water Authority
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