SWPC
7 YEARS STATEMENT
2020-2026

الشركة السعودية لشراكات المياه

Saudi Water Partnership Company

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Saudi Water Partnership Company

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I. SWPC SEVEN YEAR STATEMENT

This statement provides a 7-year outlook for KSA's Saudi Water Partnership Company (SWPC) planned projects along three water asset classes: (1) Desalination plants, (2) Sewage Treatment Plants, (3) Strategic Reservoirs and (4) Transmission Lines. This is the second published issue of the 7-year outlook and covers the planning period of 2020 to 2026, inclusive, with particular emphasis on 2020 and 2021. SWPC plans to provide annual updates of this statement.

The development of this statement builds on a number of water policies notably the National Water Strategy 2030 and MEWA's latest long-term supply demand forecast. As such, this statement is in line with the new vision or strategic direction for the water sector in KSA by translating existing policies and strategies into an actionable asset procurement plan. The overarching intent of this plan is to bridge any gaps in the water production, strategic storage, and treatment capacities by analyzing supply and demand over the next 7 years, and planning for projects accordingly.

As such, the 7-year statement provides a guidance to concerned private sector players on the projects that are expected to be tendered by SWPC. It also provides the public with a timeline for the realization of key service delivery milestones.

II. GLOSSARY

COD	Commercial Operations Date
DSM	Demand-Side Management
EOI	Expression of Interest
EPC	Engineering, Procurement and Construction
GDP	Gross Domestic Product
GW	Gigawatt
HE	His Excellency
ISTP	Independent Sewage Treatment Plant
ISWR	Independent Strategic Water Reservoir
IWP	Independent Water Plant
IWPP	Independent Water and Power Plant
IWTP	Independent Water Transmission Project
K	Thousands
K m^3/d	Thousand cubic meter(s) per day
Kingdom	Kingdom of Saudi Arabia
Km	Kilometer(s)
KSA	Kingdom of Saudi Arabia
LCD	Liters per Capita per Day
M	Million
m^3	Cubic meter(s)
m^3/d	Cubic meter(s) per day
M m^3/d	Million cubic meter(s) per day
MEWA	Ministry of Environment, Water and Agriculture
MW	Megawatt
NCP	National Center for Privatization
NTP	National Transformation Program
NWC	National Water Company
NWS	National Water Strategy
PPP	Public-Private Partnership
RfP	Request for Proposal
RfQ	Request for Qualification
RO	Reverse Osmosis (desalination technology)
SDG	Sustainable Development Goals
SR	Strategic Reservoir
STP	Sewage Treatment Plant
SWCC	Saline Water Conversion Corporation
SWPC	Saudi Water Partnership Company
TBD	To Be Determined
UC	Under Construction
UFW	Unaccounted for Water
UN	United Nations

III. EXECUTIVE SUMMARY

Desalination Plants

Within this context, the Ministry of Environment, Water, and Agriculture (MEWA) set a number of policies and plans with the objective of curbing the national urban water per capita requirement. These include reducing water network losses and engaging in demand-side management efforts such as promoting the use of water-efficient appliances and introducing tariff reforms. As a result, total urban demand is expected to increase to 14.5M m^3/d by 2026, and then to decrease to 14.2M m^3/d in 2030.

As for reducing reliance on non-renewable ground sources, MEWA has recently set the directive of providing 90% of national urban supply by desalinated water. By 2030, only four regions; namely, Najran, Hail, Al Jawf, and Northern Borders, will continue relying on groundwater, while the remaining nine regions will rely on desalinated and surface water. A gradual approach has been outlined to phase-out and reduce reliance on ground and surface water in the nine concerned regions. In total, existing, under construction and under tendering water sources are expected to supply 10.1M m^3/d in 2025 and 8.4M m^3/d in 2030.

As such, and given MEWA's supply/ demand policies, a gap of **4.5M** m^3/d is estimated in 2026 at the national level. Out of this national water gap, a 4.1M m^3/d gap exists in the nine regions that are expected to be served through newly constructed desalination plants. The current plan calls for SWPC to cover this gap through 11 new desalination plants as listed in Table 1 below. Some of these plants are targeted to provide water prior to COD, and is referred to as "Early Water". The % reference shown in the last column is in regards to plant capacity.

Table 1: SWPC desalination capacity plan

Supply Group	Plant	COD	Capacity (m^3/d)	Early Water
Eastern (*Riyadh , Qassim and Eastern Region*)	Jubail 3A	2022	600,000	-
	Jubail 3B	2023	600,000	-
	Jubail 6	2023	300,000	50%
	Ras Al Khair 2	2023	600,000	17%
	Ras Al Khair 3	2023	400,000	50%
	Jubail 4	2025	300,000	-
Western (*Makkah, Madinah, Baha and Tabuk*)	Ras Mohaisan	2022	300,000	-
	Rabigh 4	2022	600,000	-
	Tabuk 1	2023	400,000	50%
	Rabigh 5	2024	400,000	50%
	Rayis 2	2025	300,000	-
Southern (*Jazan and Asir*)	Shuqaiq 4	2023	400,000	50%
	Jazan 1	2023	300,000	-
Total capacity (m^3/d)			5,500,000	-

The above plants will be added to SWPC's operational, under construction, and under tendering desalination plants, listed in Table 2.

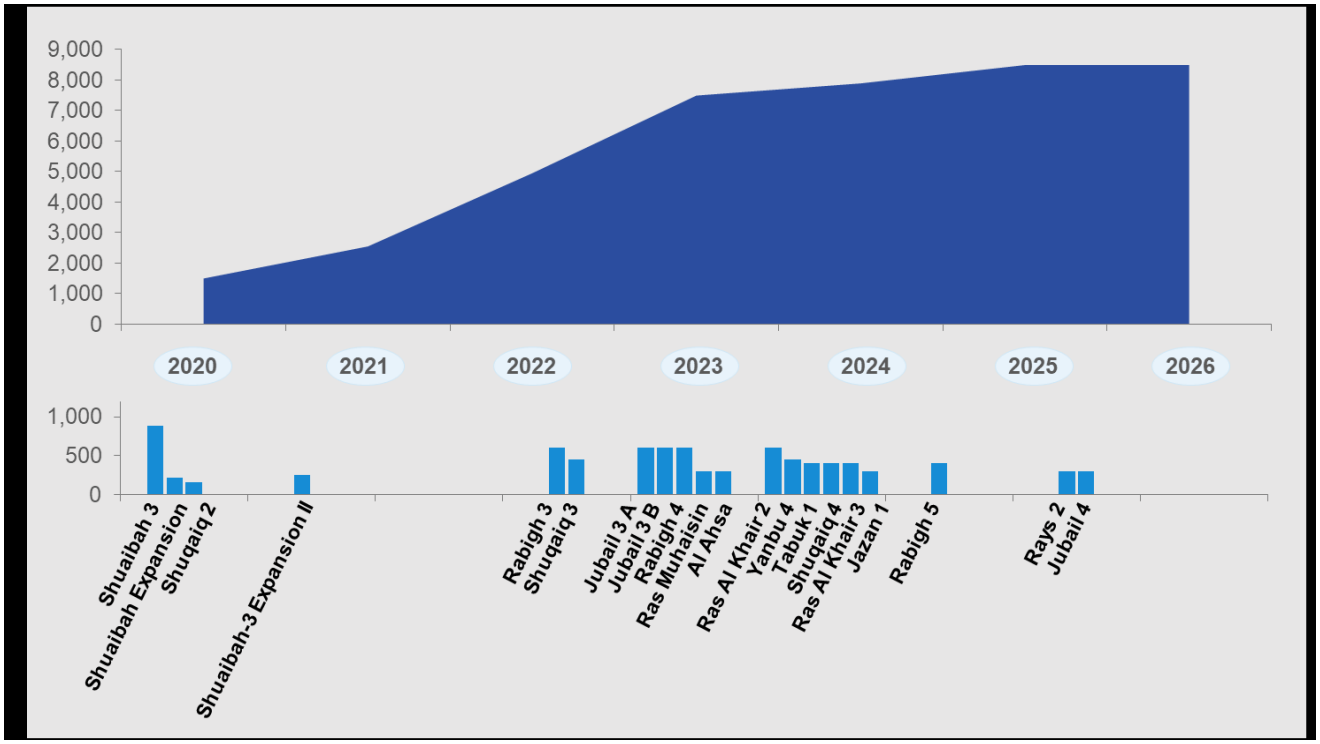
Table 2: SWPC operational, under construction and under tendering desalination plants

Supply Group	Plant	COD	Capacity (m^3/d)	Early Water
Western (*Makkah, Madinah, Baha and Tabuk*)	Shuaibah 3	2010	880,000	-
	Shuaibah 3 Exp. 1	2009	150,000	-
	Shuaibah 3 Exp. 2	2019	250,000	-
	Rabigh 3	2021	600,000	-
	Yanbu 4 (Rayis 1)	2023	450,000	-
Southern (*Jazan and Asir*)	Shuqaiq 2	2011	212,000	-
	Shuqaiq 3	2021	450,000	-
Total capacity (m^3/d)			2,992,000	-

SWPC desalination plants portfolio will witness a growth from the current 1.5M m^3/d to 8.5M m^3/d in 2025 as shown in Figure 1 below.

Figure 1: SWPC desalination plants portfolio growth

('000 m^3/d)



Sewage Treatment Plants

KSA is committed to meet a number of wastewater treatment and reuse objectives and targets as part of its vision 2030 plan. The main goals are to: increase network coverage in the Kingdom; boost the collected wastewater, which reduces environmental impact of sewage water; and increase the availability of sewage treatment plants (STPs) throughout the Kingdom. Currently, KSA has 60% of wastewater network coverage and is aiming to reach 95%-100% by 2030. With this increase of network coverage, the collected wastewater is estimated to grow to 10.8M m^3/d in 2030, resulting in a required capacity of 11.1M m^3/d (the additional capacity is kept as a buffer to counter for any unexpected increase in sewage inflow). As for STP supply, ~8.4M m^3/d of total capacity will be online by 2023. Hence, a shortage of 2.7M m^3/d is estimated by 2030, spread out across the Kingdom's 13 regions.

SWPC plans to address this gap by proposing new plants, with a primary focus on large plants that would not only benefit from economies of scale but also be attractive to the private sector due to their large transaction size, which makes them feasible for project financing. SWPC has identified a list of proposed STP plants as detailed in Table 3.

SWPC has also commissioned a study to prepare a pre-feasibility study of privatizing small-scale STPs throughout the Kingdom. These are STPs that range in size from 1,000 m3 per day to 25,000 m3 per day. This study was conducted in 2019 to identify the optimal option to tender these plants (e.g., bundle plants under one tender, centralize plants, other tendering options), and determine the extent to which the private sector can be involved in their construction, finance and operation. This study concluded that a number of 147 small plants should be implemented among the kingdom.

Table 3: SWPC STP capacity plan

Plant	Initial COD	Initial Capacity (m^3/d)	Expansion COD	Capacity After Expansion (m^3/d)
Buraydah 2	2022	150,000	-	150,000
Madinah 3	2023	200,000	2027	375,000
Al Haer 2	2023	200,000	-	200,000
Tabuk 2	2023	90,000	-	90,000
Khamis Mushait 2	2023	25,000	2027	50,000
Riyadh East	2023	50,000	2028	100,000
Abu Arish 3	2025	25,000	2028	50,000
South Najran	2024	25,000	2028	50,000
North Jeddah 1	2025	25,000	2029	50,000
Hafar Al Batin 2	2026	50,000	2030	75,000
Al Kharj 3	2026	25,000	2030	50,000
Total capacity (m^3/d)				1,240,000

The above plants will be added to the SWPC's under tendering STPs listed in Table 4 below.

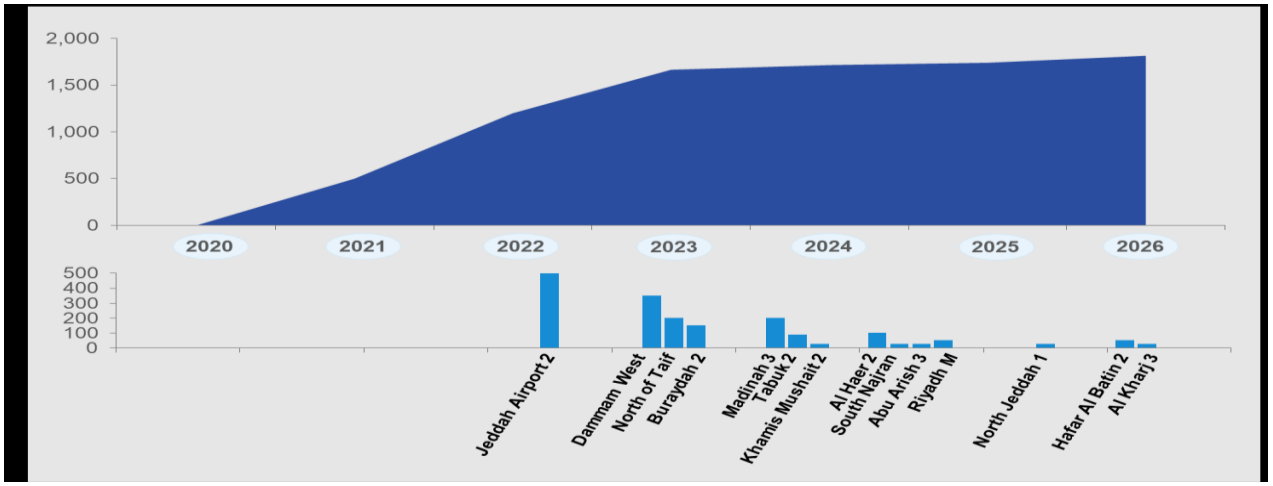
Table 4: SWPC under tendering STP plants

Plant	Initial COD	Initial Capacity (m^3/d)	Expansion COD*	Capacity After Expansion (m^3/d)
Jeddah Airport 2	2021	300,000	2028	500,000
Dammam West	2022	200,000	2029	350,000
North Taif	2022	100,000	2031	270,000
Total capacity (m^3/d)				1,120,000

*To be confirmed based on demand growth

As shown in Figure 2 below, SWPC sewage treatment plants portfolio is expected to reach 1.3M m^3/d in 2025. This portfolio is based on the assumption that the expansion capacity is required for all plants, though the initial COD is when the initial capacity is expected to be operational.

Figure 2: SWPC STP portfolio growth



Strategic Reservoirs

KSA water policies, in particular the National Water Strategy, recognizes strategic storage as a means for strengthening sector resilience and mitigating key water production and distribution risks and to deal with emergencies. To that end, sector policies set a strategic storage target for 2022 equivalent to 3 days of municipal water demand. With municipal water demand expected to reach 14.3 M m^3/d in 2022 at the Kingdom level, the strategic storage capacity required in 2022 amounts to 40.1M m^3.

In addition to their emergency role, strategic water storages will also be used for peak load management of Hajj water demand, which takes places in a span of approximately 20 days in Makkah and 40 days in Madinah, resulting in a considerable short-term peak demand water. Serving Hajj water demand entirely through desalination plants results in significant idle capacity during the off-Hajj season. Instead, sector policy opts for serving 80% of Hajj peak demand through strategic reservoirs, and an equivalent of 30% through desalination plants, 10% of which is kept as a buffer. With Hajj water demand expected to reach 1.1M m^3/d in 2022, a corresponding strategic storage capacity of 21.5M m^3 is required.

In total, the storage capacity required for strategic and peak Hajj demand amounts to 61.6M m^3 in 2022. Of that, 12.0M m^3 of strategic storage capacity exists today, with 7.1M m^3 in construction and expected to be available by 2022. As such, a gap of 42.5M m^3 in water storage capacity exists and is needed be filled by 2022. To meet this requirement, strategic reservoirs need to be designed for each major city in order to ensure proximity to users and reduce transmission risks and costs.

Of this required capacity, large-scale strategic reservoirs in selected areas are prioritized for tendering by SWPC as shown in Table 5 below:

Table 5: SWPC strategic reservoirs capacity plan

Region	Capacity required by 2022 (M m^3/d)
Makkah Cities	17.00
Madinah	6.44
Eastern Province Cities	4.90
Riyadh	2.87
Qassim Cities	1.01
Tabuk	0.74
Jazan Cities	0.61
Total Capacity (m^3)	33.57

Taking into consideration the above required capacities and timelines, SWPC plans to issue the following tenders:

		Appoint Advisors	EOI	RfQ	RfP
IWP	Jubail 3B	√	√	√	Q1 2020
	Rabigh 4	Q1 2020	Q2 2020	Q2 2020	Q2 2020
	Jubail 6 (Al Hassa)	Q1 2020	Q4 2020	Q4 2020	Q1 2021
	Jazan 1	Q1 2020	Q4 2021	Q4 2021	Q1 2022
	Ras Mohaisan	Q1 2020	Q2 2020	Q3 2020	Q3 2020
	Shuqaiq 4	Q4 2021	Q1 2023	Q1 2023	Q2 2023
	Ras Al Khair 2	Q4 2021	Q2 2022	Q2 2022	Q2 2022
	Ras Al Khair 3	Q4 2021	Q3 2022	Q3 2022	Q4 2022
	Tabuk 1	Q1 2020	Q1 2021	Q1 2021	Q1 2021
	Rabigh 5	Q1 2023	Q2 2023	Q2 2023	Q3 2023
	Jubail 4	Q1 2023	Q4 2023	Q4 2023	Q1 2024
	Rayis 2	Q1 2023	Q2 2024	Q3 2024	Q3 2024
ISTP	Buraidah 2	√	Q1 2020	Q1 2020	Q1 2020
	Tabuk 2	√	Q1 2020	Q1 2020	Q1 2020
	Madinah 3	√	Q2 2020	Q2 2020	Q2 2020
	Al Haer	Q1 2020	Q1 2021	Q1 2021	Q2 2021
	Riyadh East	Q1 2020	Q1 2021	Q1 2021	Q2 2021
	Khamis Mushait	Q1 2020	Q1 2022	Q1 2022	Q1 2022
	South Najran	Q1 2020	Q1 2022	Q1 2022	Q1 2022
	Abu Arish 3	Q1 2020	Q1 2022	Q1 2022	Q1 2022
	North Jeddah 1	Q1 2020	Q1 2022	Q1 2022	Q1 2022
	Hafar Al Batin 2	Q3 2023	Q1 2024	Q1 2024	Q1 2024
	Kharj 3	Q3 2023	Q1 2024	Q1 2024	Q1 2024
Small STP	Jazan Cluster	Q1 2020	Q2 2020	Q3 2020	Q3 2020
	Western Cluster	Q1 2020	Q2 2021	Q2 2021	Q2 2021
	Central Cluster	Q1 2020	Q1 2022	Q1 2022	Q2 2022
	Northern Cluster	Q1 2020	Q4 2022	Q1 2023	Q1 2023
	Northwestern Cluster	Q1 2020	Q2 2023	Q2 2023	Q2 2023
	Southern Cluster	Q1 2020	Q4 2024	Q1 2025	Q1 2025
	Eastern Cluster	Q1 2020	Q1 2025	Q1 2025	Q2 2025
ISWR	Makkah 1 (Moghammas)	√	Q3 2020	Q3 2020	Q3 2020
	Makkah 2 (N & S Jeddah)	√	Q3 2021	Q3 2021	Q3 2021
	Makkah 3 (Jmoom, Taif)	√	Q3 2022	Q3 2022	Q3 2022
	Eastern Province	Q4 2022	Q2 2023	Q2 2023	Q2 2023
	Madinah	Q4 2022	Q2 2024	Q2 2024	Q2 2024
	Qassim Cities	Q4 2024	Q2 2025	Q2 2025	Q2 2025
	Riyadh	Q4 2024	Q2 2025	Q2 2025	Q2 2025
	Tabuk	Q4 2024	Q2 2026	Q2 2026	Q2 2026
	Jazan Cities	Q4 2024	Q2 2026	Q2 2026	Q2 2026
IWTP	Yanbu – Rayis - Rabigh	√	Q2 2020	Q2 2020	Q3 2020
	Riyadh - Qassim	√	Q4 2020	Q4 2020	Q2 2021
	Ras Mohaisen-Baha-Makkah	√	Q4 2021	Q1 2022	Q1 2022
	Jubail - Nuayriah - Buraydah	√	Q4 2022	Q4 2022	Q1 2023
	Rabigh - Jeddah	Q3 2022	Q1 2023	Q2 2023	Q2 2023
	Tabuk - Ula	Q3 2022	Q2 2023	Q3 2023	Q3 2023
	Jazan	Q3 2022	Q1 2024	Q1 2024	Q2 2024
	Ras Alkhair - Khafji - Hafr AlBatin	Q3 2022	Q4 2024	Q4 2024	Q1 2025
					√ = *Completed*

The procurement options for strategic reservoirs are under consideration by SWPC and may involve isolated tanks or tank farms, or strategic reservoirs bundled with IWPs or a combination of both.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Saudi Water Partnership Company

IV. SWPC OVERVIEW

Established in 2003, Saudi Water Partnership Company (SWPC) is today the principal off-taker of water production, sewage treatment and strategic water storage in KSA, and is responsible for tendering all related PPP projects.

Vision: Delivering secure, affordable and sustainable water resources and services to KSA residents in partnership with the private sector

Mission: To ensure adequate water production capacity, strategic water storage and adequate sewage treatment capacity in a competitive and transparent manner and drive local content development and private sector participation

Objectives:

Tendering of plants and projects of desalination, water purification, and sewage water treatment for the private sector (i.e., IWP, ISTP)

- Tendering of water storage tanks projects
- Tendering of projects for the construction of dams for the purpose of providing drinking water
- Purchase and sale of water (desalinated, purification, treated and untreated) and electricity and the conclusion of the necessary agreements
- Purchase the fuel needed to achieve its purposes

SWPC is fully owned by the Ministry of Finance. Its Board of Directors is chaired by H.E. the Minister of Environment, Water and Agriculture, and includes representatives of each of the Ministry of Finance, the National Center for Privatization, the Ministry of Environment Water and Agriculture, as well as a representative from the private sector.

SWPC's value proposition to private sector investors comprises six elements:

- Guarantee sale of water through off-take agreements
- Provide a clear set of rights and obligations
- Offer **logistics and infrastructure support** in securing land, fuel, electricity, feedstock, interconnection and other support infrastructure
- Ensure a transparent and competitive bidding process
- Facilitate **dialogues with related regulatory authorities** to secure government approvals, licenses and permits required to undertake its procurement activities
- Provide **sovereign guarantees** through the Ministry of Finance, where appropriate

Within the limits of its mandate, SWPC is committed to support the Kingdom in achieving its international and national commitments in relation to the water sector. Saudi Arabia is one out of UN's 193-member states to commit to achieve the 17 set Sustainable Development Goals (SDG) and their corresponding 169 targets. In particular, Saudi Arabia committed to SDG #6 "clean water and sanitation" which sets a list of targets to ensure availability and sustainable management of water and sanitation for all of its citizens.

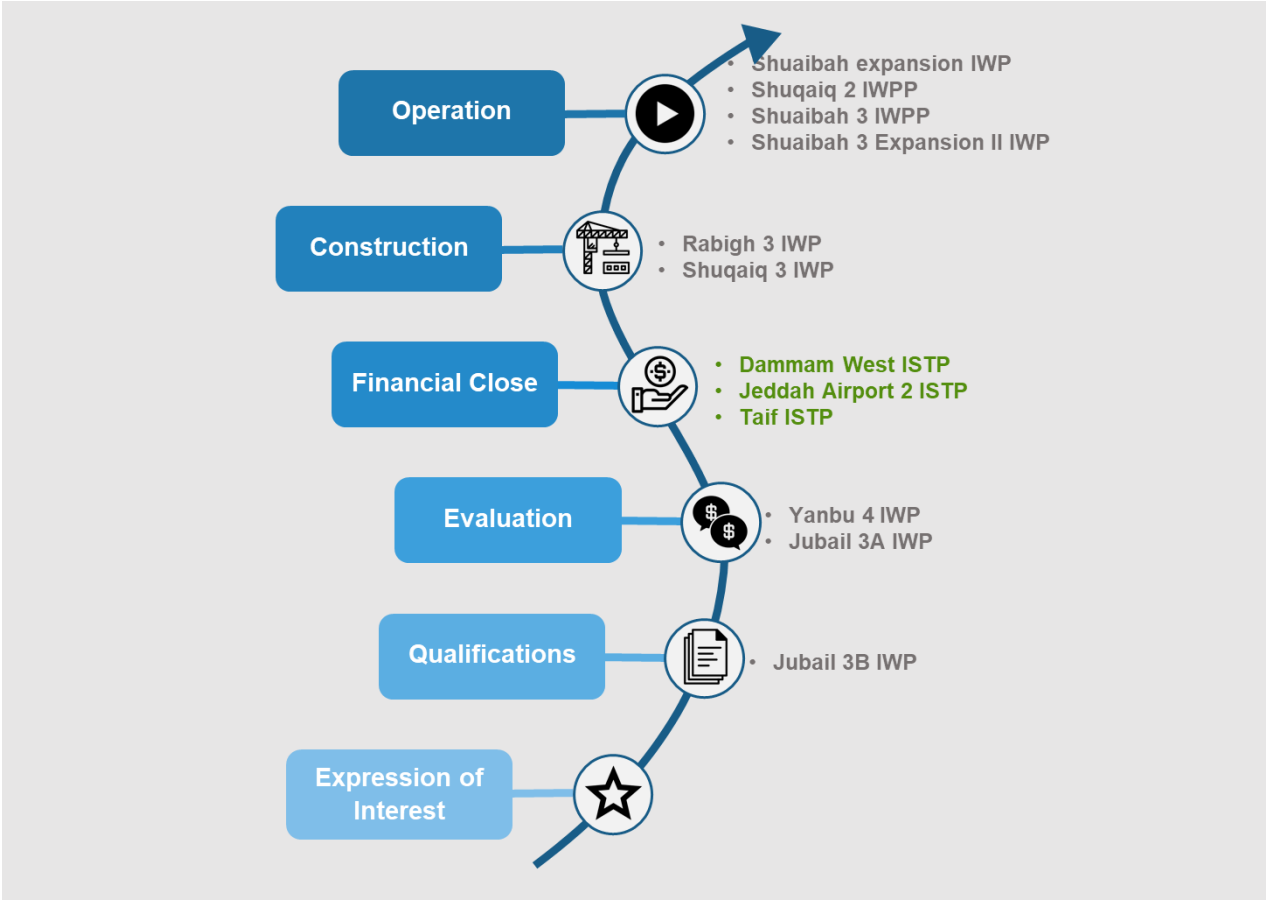
These targets include:

- Achieve universal and equitable **access to safe and affordable drinking water for all**
- Achieve **access to adequate and equitable sanitation** and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
- Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
- Substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
- Implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
- Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
- Expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities & programs, including water harvesting, desalination, water efficiency, wastewater treatment, recycling & reuse technologies
- Support and strengthen the participation of local communities in improving water and sanitation management

Today SWPC has four operational desalination projects located in Makkah and Jazan regions, providing 1.49M m^3/d of water and 1.75 GW of electricity. The construction of Rabigh 3 IWP and Shuqaiq 3 IWP is well under way in Makkah and Jazan, which will provide 1,050,000 m^3/d starting from 2021. SWPC has also progressed in the tendering and development of other projects, with project agreements signed for Dammam West ISTP, Jeddah Airport 2 ISTP and Taif ISTP, and the desalination projects Yanbu 4 IWP and Jubail 3A & 3B IWP are under bids evaluation.

The progress of the above projects is illustrated in Figure 3

Figure 3: Progress on SWPC's procurement activities



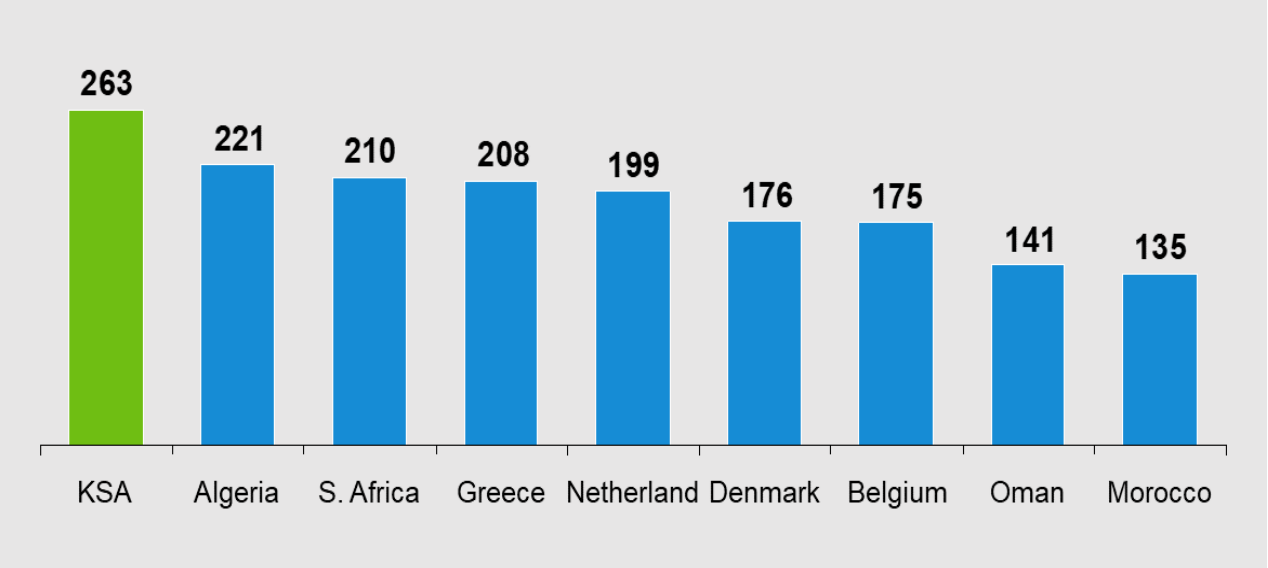
V. DESALINATION CAPACITY PLAN

1. National Water Demand Context and Policies

KSA water demand context is characterized by its high per capita water requirement. As seen in Figure 4, KSA urban water demand per capita currently stands at 263 liters per day, which is significantly higher than most other countries.

Figure 4: Urban water demand per capita

(Liters/ capita/ day)



Source: KSA's National Water Strategy

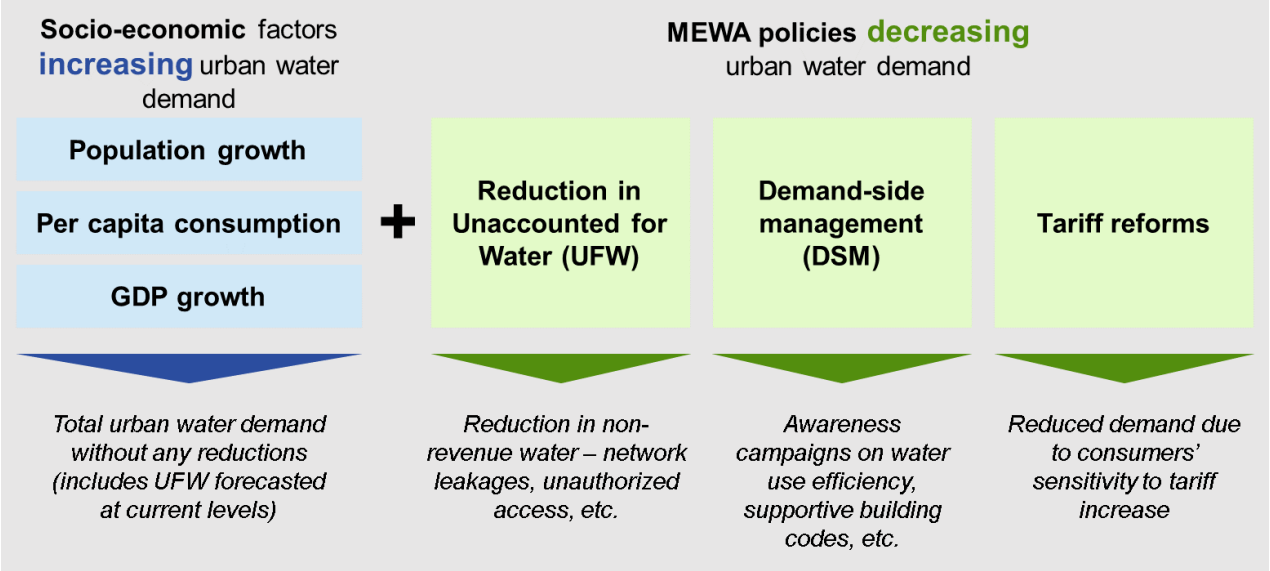
This comparatively high- water per capita requirement in KSA is driven by five key factors:

1. Social customs and climatic considerations
2. High losses and inefficiencies within housing units (after the meter)
3. Limited awareness on water use efficiency, including incentives for end-users to conserve water
4. Limited price signaling, including issues in metering and billing
5. High transmission and distribution losses.

As shown in Figure 5 below, MEWA plans to work across a number of levers with the objective of curbing national urban water per capita requirement and improving network efficiencies. These include:

1. Reducing Unaccounted for Water (UFW) through addressing network leakages and unauthorized access
2. Engaging in Demand-Side Management (DSM) through the launch of awareness campaigns on water use efficiency, promotion of supportive building codes, retrofitting, and other measures intended to reduce water demand
3. Introducing tariff reforms and reducing consumption by capitalizing on consumers' price sensitivity

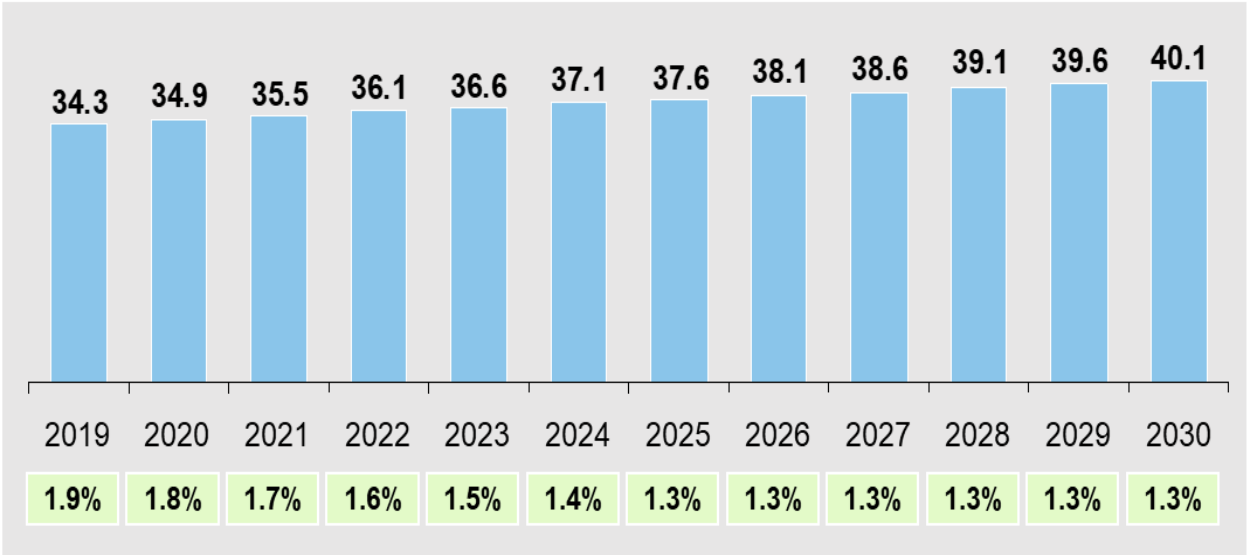
Figure 5: Water Demand Reduction Levers



Population and GDP growth are key drivers for overall water demand. KSA's population is expected to grow at a yearly average growth rate of 1.5% between 2019 and 2025 as shown in Figure 6, while GDP is set to grow at an average of ~2.6% per year over the same period. Prior to any improvement in leakages, urban water requirement at source is estimated to be 362.5 liters per capita per day, which consists of:

- 250 Liters Capita per Day (LCD) consumption
- 62.5 LCD for network losses (25% of 250 LCD)
- 50 LCD for peak consumptions (includes network losses) (20% of 250 LCD)

Figure 6: KSA population and population growth

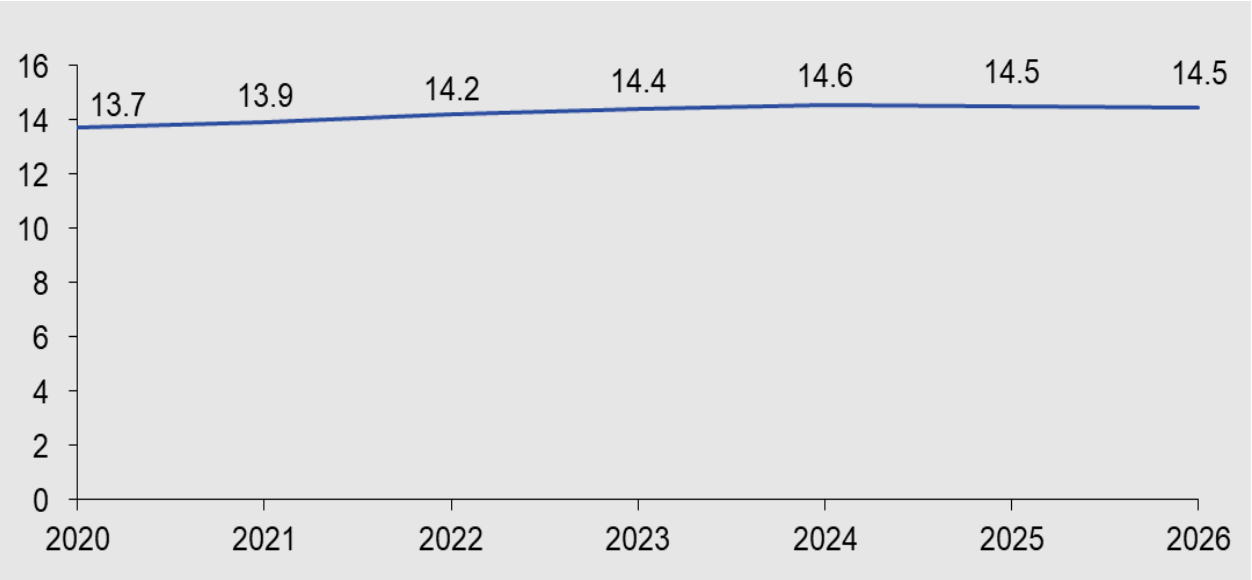


Source: MEWA

Reduction in water losses will start in 2021 and will take losses from the current level of 40% to 15% in 2030. As such, water demand will reach its highest level in 2024 with 14.56 M m^3/d and will decrease to 14.48 M m^3 in 2026 thereafter, as illustrated in Figure 7 below.

Figure 7: National urban water requirements

(Million m^3/d)



Source: MEWA

2. National Water Supply Context and Policies

High reliance on non-renewable groundwater sources is another key characteristic of KSA's urban water context, with non-renewable ground sources constituting around 35% of KSA's water supply in 2018, as shown in Figure 8. Desalinated water accounts for about 59%. Extensive use of groundwater sources has contributed to the Kingdom's high "water stress" level shown in Figure 9 below, calculated as the ratio of freshwater withdrawal as a proportion of available renewable freshwater resources. This reflects a high pressure on renewable water resources and a challenge for water sustainability in the Kingdom.

Figure 8: Baseline urban water supply mix (in 2018)

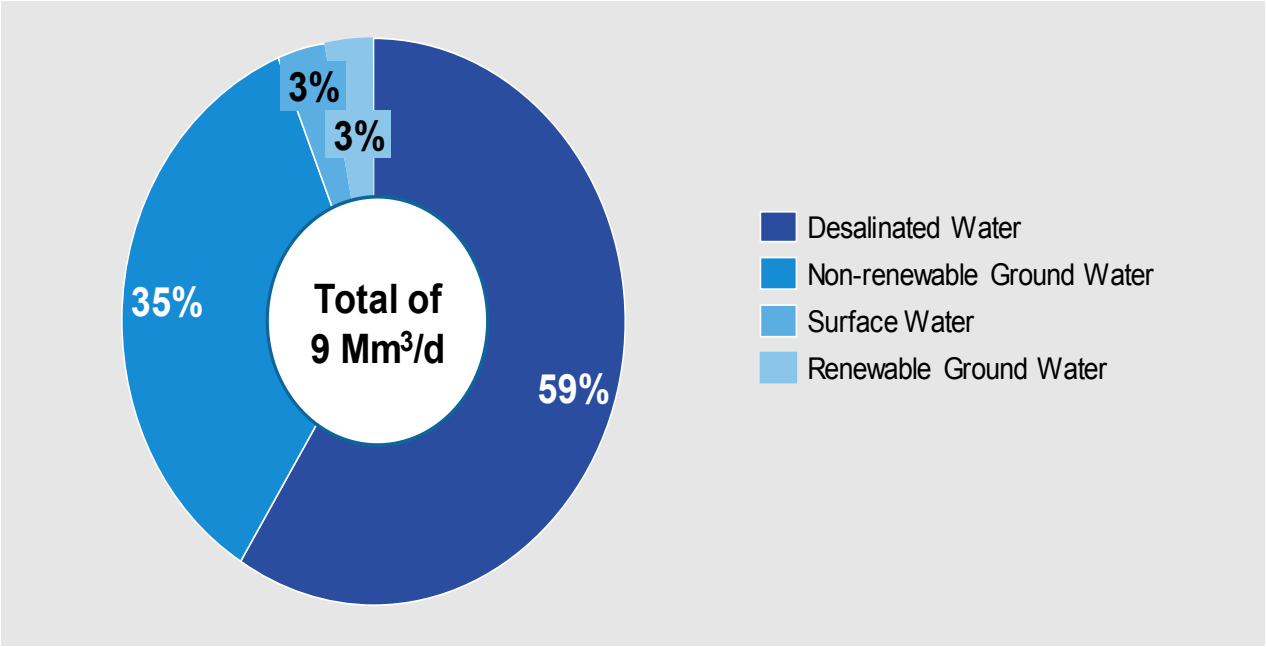
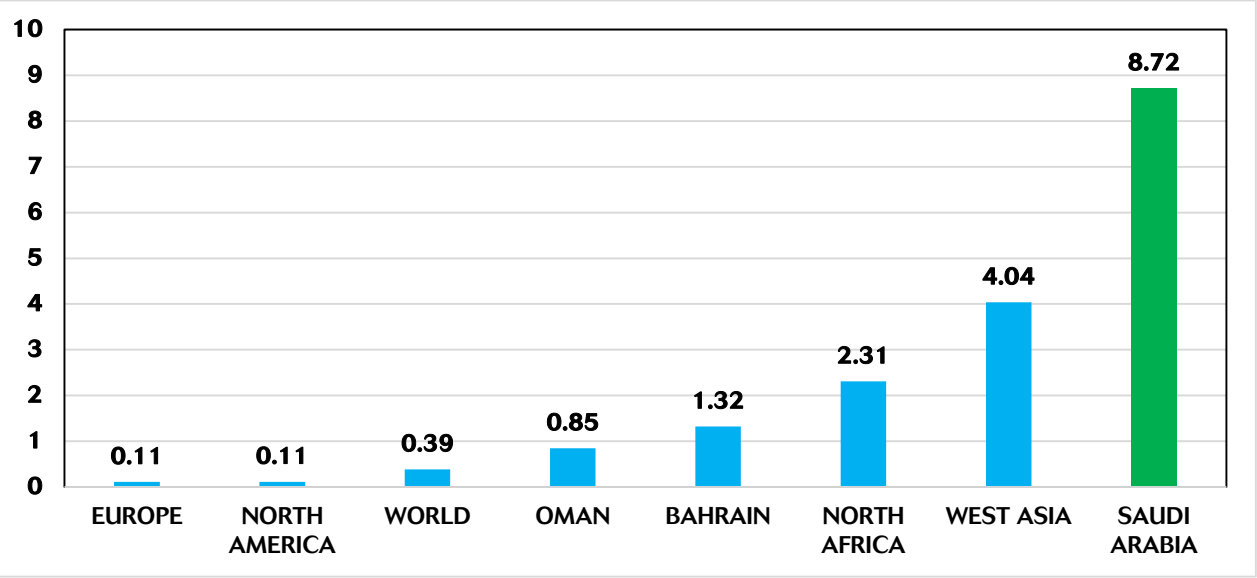


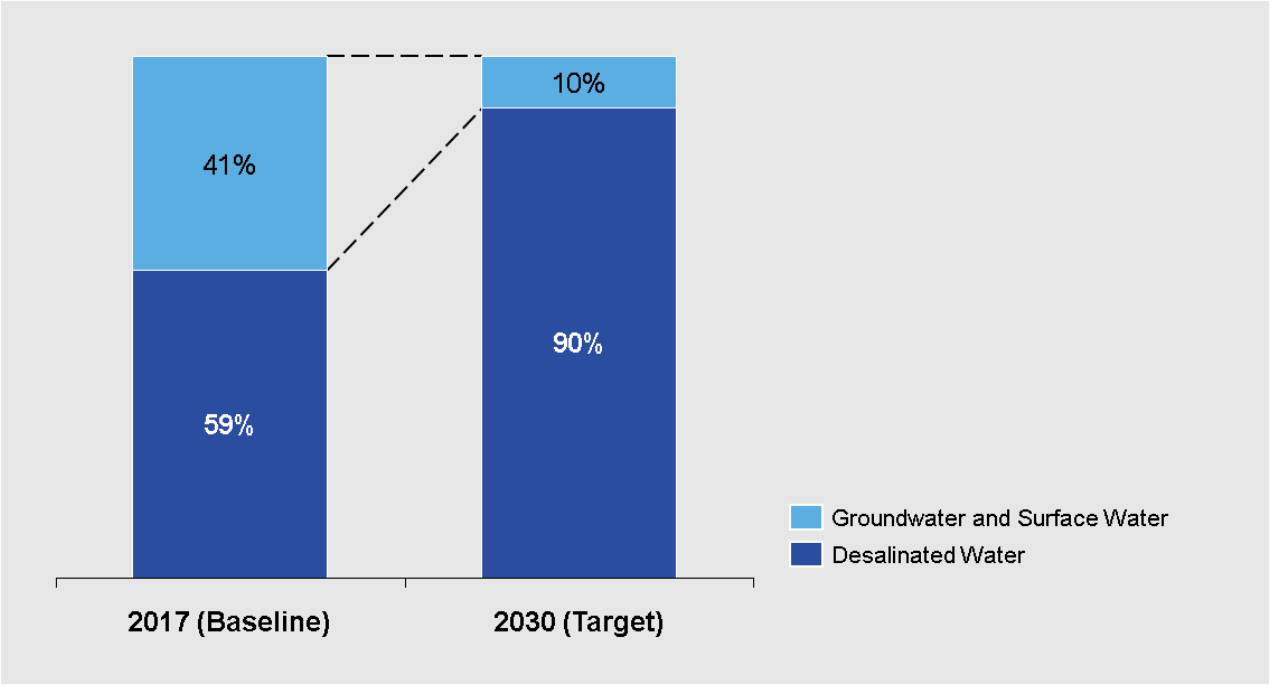
Figure 9: Water stress levels in selected countries (2017)



Within this context, MEWA has recently set a directive of reaching an urban water supply mix of 90% desalinated water and 10% ground and surface water by 2030, as shown in Figure 10. This directive will support the preservation of groundwater and will improve water quality in some parts of KSA, and increase reliability of supply.

Figure 10: Urban water supply mix

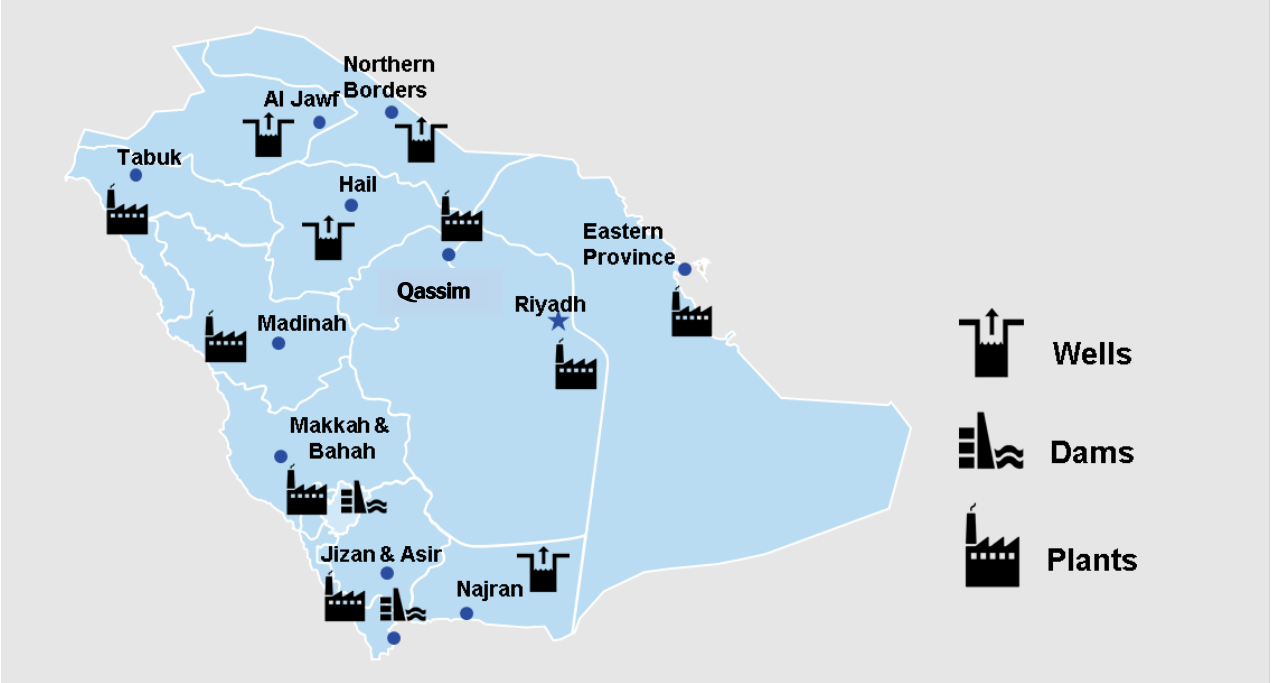
(Million m^3/d)



Source: MEWA

The supply mix will vary amongst Saudi regions depending on unique factors such as availability of water sources, proximity to sea, and network connectivity, as depicted in Figure 11 below:

Figure 11: 2030 target supply sources



Source: MEWA

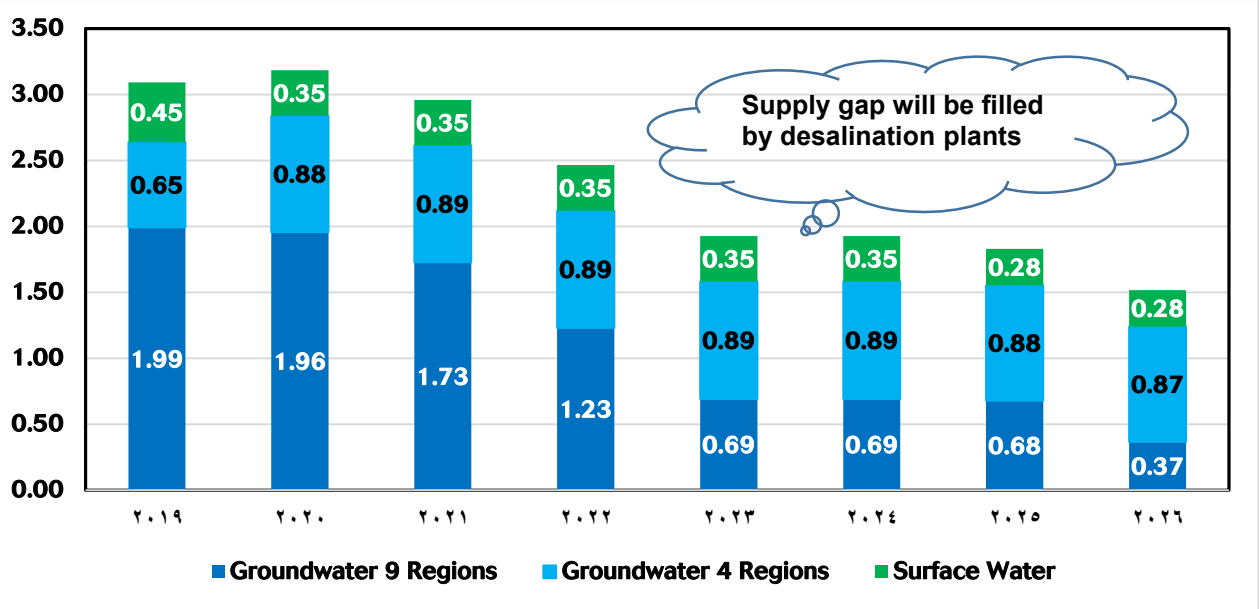
Ground and Surface Water

By 2030, the use of groundwater for urban supply is expected to be restricted to Najran, Hail, Al Jawf, and the Northern Borders. Furthermore, sources with below standard water quality requirements are planned to be discontinued. For the remaining regions, groundwater sources are expected to be phased-out gradually by 2025. As for surface water, dams are expected to continue to feed urban supply, but at 50% of their safe capacity, starting in 2020.

Accordingly, a gradual approach has been outlined in this plan to phase-out and reduce reliance on ground and surface water and transition to the 2030 target water supply mix shown in Figure 12.

Figure 12: KSA ground and surface water supply

(Million m^3/d)



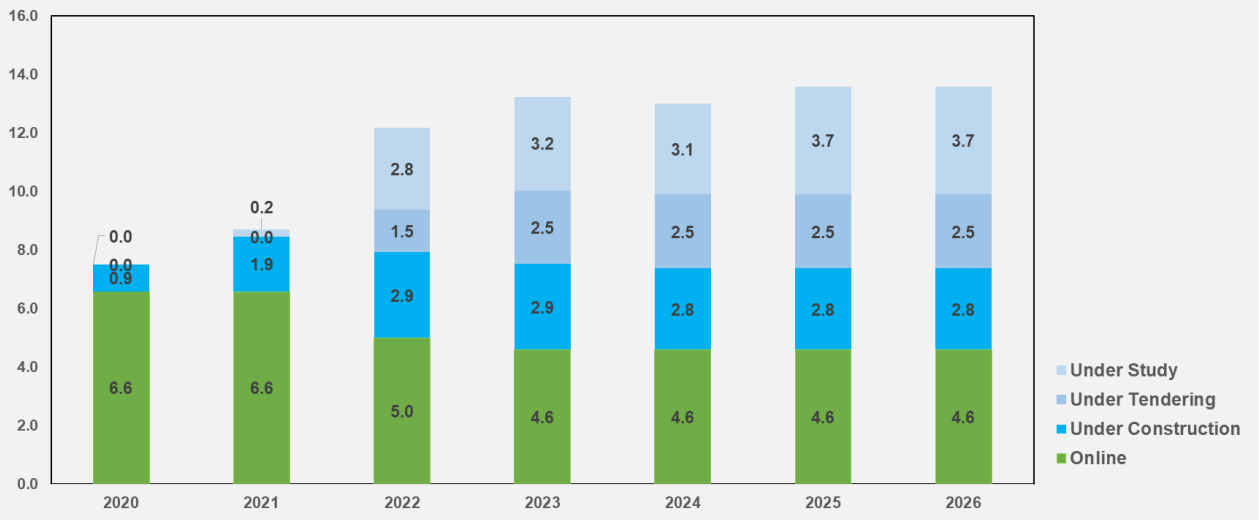
Source: MEWA

Desalinated water:

Desalination plants will continue to be developed to cater for growing urban water demand as well as shortages resulting from reduced reliance on ground and surface water. In 2026, existing and committed desalinated water supply are expected to provide 9.3M m^3/d, as illustrated in Figure 13.

Figure 13: KSA existing and committed desalinated water supply

(Million m^3/d)

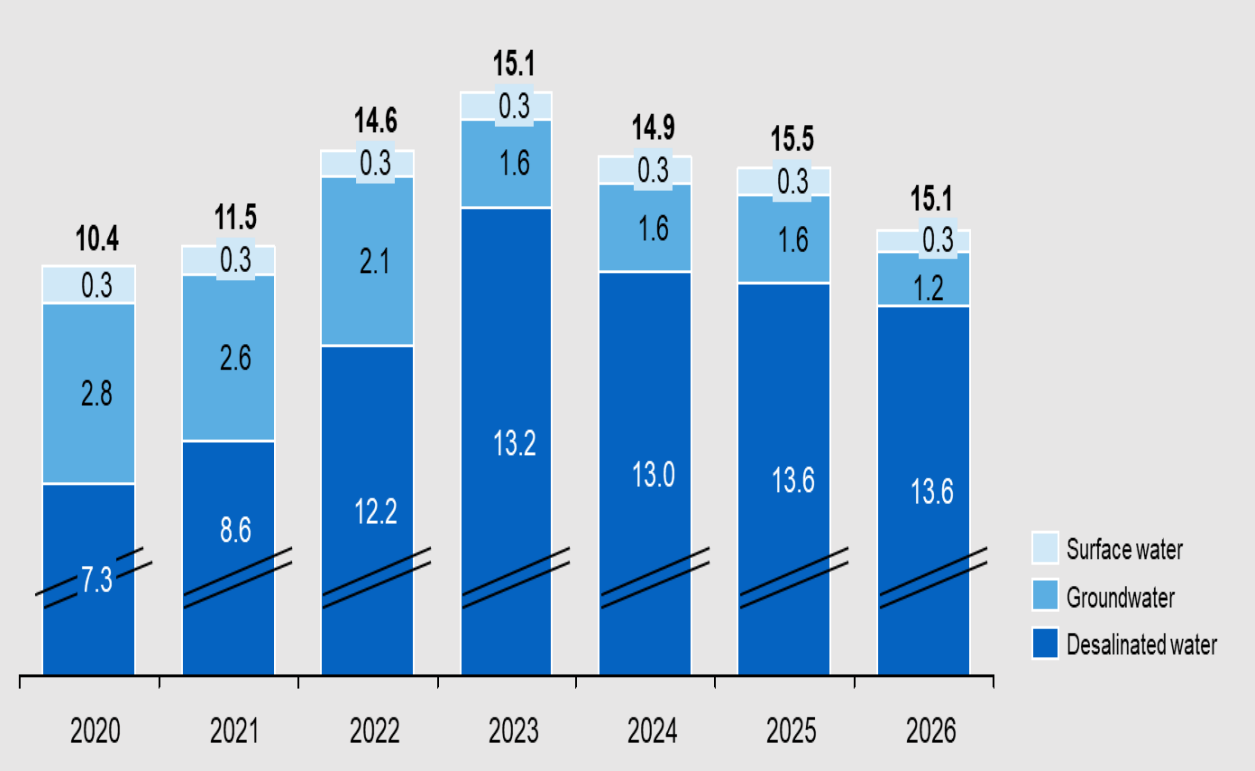


Source: MEWA

As seen in Figure 14, the total supply from the different sources of water is expected to reach 12M m^3/d in 2022, eventually decreasing to 10.2M m^3/d by 2025.

Figure 14: KSA total supply

(Million m^3/d)



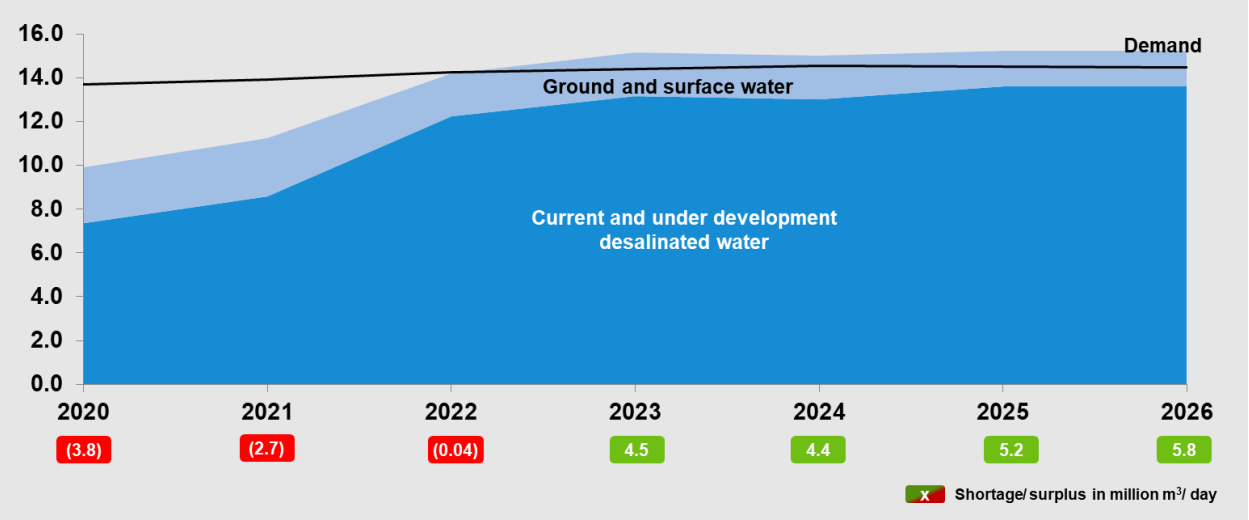
Source: MEWA

3. National Desalinated Water Need & Proposed Plants

Given the identified KSA urban water demand as well as existing and committed water supply, an urban water shortage of 4.5M m^3/d is needed to be filled via new desalination plants by 2026, as shown in Figure 15.

Figure 15: KSA desalination supply, demand and gap

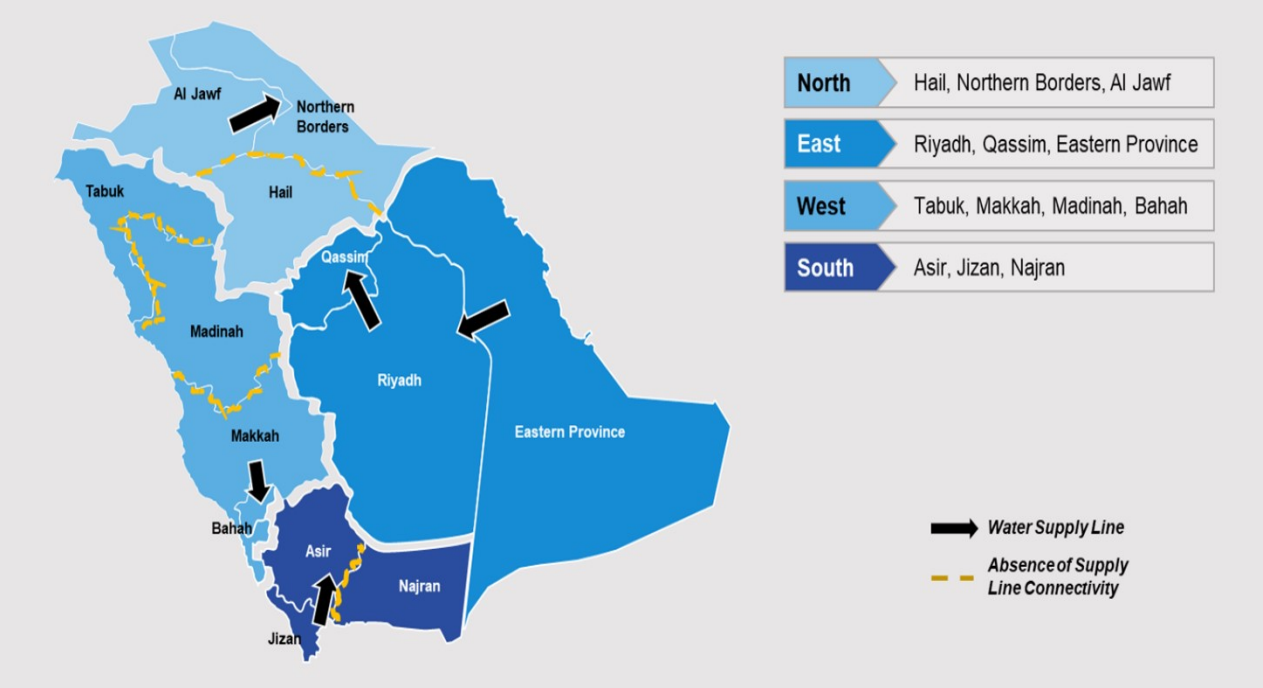
(Million m^3/d)



Source: MEWA

As seen in Figure 16, Saudi Arabia's water supply can be divided into four main supply groups based on the interconnectivity in their water transmission systems along with the unique features of each group. For these reasons, each supply group is considered separately for the water gap analysis.

Figure 16: KSA's four main supply groups



4. Regional Outlook

i. Eastern Supply Group

The Eastern supply group is composed of three regions: Riyadh, Eastern Province and Qassim. These three regions are interconnected by water transmission lines, making it feasible for the regions to be served by the same set of desalination plants.

Population in Riyadh, Qassim and Eastern Province is expected to grow from 15.59M in 2020 to 17.01M in 2026, as shown in Table 6.

Table 6: Riyadh, Eastern Region and Qassim populations

(Million)

	2020	2021	2022	2023	2024	2025	2026
Riyadh	8.77	8.92	9.06	9.20	9.33	9.45	9.57
Eastern Province	5.27	5.36	5.45	5.53	5.61	5.68	5.75
Qassim	1.55	1.58	1.60	1.62	1.65	1.67	1.69
Total	15.59	15.86	16.11	16.36	16.59	16.80	17.01
Annual Growth (%)	1.94	1.82	1.71	1.60	1.50	1.41	1.32

The calculation of urban water demand from the source is driven by various factors such as GDP growth, improvement in water network losses, and price (tariff) elasticity. As such, urban water demand in East supply group is expected to reach 5.75M m^3/d in 2026, as shown in Table 7.

Table 7: Riyadh, Eastern Province and Qassim urban water demand

(Million m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Riyadh	3.17	3.20	3.23	3.26	3.29	3.27	3.25
Eastern Province	1.90	1.92	1.94	1.95	1.97	1.95	1.93
Qassim	0.56	0.56	0.57	0.57	0.58	0.57	0.57
Total	5.63	5.68	5.74	5.78	5.84	5.79	5.75

Source: MEWA

In terms of supply, Riyadh, Qassim and Eastern Province rely on groundwater and desalinated water sources, either currently in service or under development, as shown in Table 8 below.

Table 8: Riyadh, Eastern Province and Qassim current and under-development sources

		COD	Date Out	Capacity (m^3/day)	
Ground Current	Multiple	Multiple	Multiple	-	Reduce sourcing based on NWS 2030
Desalination – Current	Jubail 1	1982	2022	137,729	
	Khobar 2	1983	2022	223,000	
	Jubail 2	1983	2022	947,890	
	Khobar 3	2000	2035	280,000	
	Jubail RO1	2000	2023	90,900	
	Marafiq	2010	2030	500,000	
	Ras Al Khair RO 1	2014	2049	310,656	
	Ras Al Khair MSF 1	2015	2050	714,344	
	Khafji-Solar	2018	2053	60,000	Maintained and phased out based on plants' life-time
Desalination – Under construction	Khobar 4 (Aramco)	2020	2055	210,000	
	Jubail RO2	2021	2057	400,000	
	Khobar RO2	2021	2057	600,000	
Desalination – Under tendering	Jubail 3A	2022	2047	600,000	
	Jubail 3B	2022	2047	600,000	
Desalination - Planned	Jubail 2 RO-MED	2022	2045	1,000,000	
	Ras Al Khair 2	2025	2050	400,000	
	Jubail 6	2022	2057	300,000	

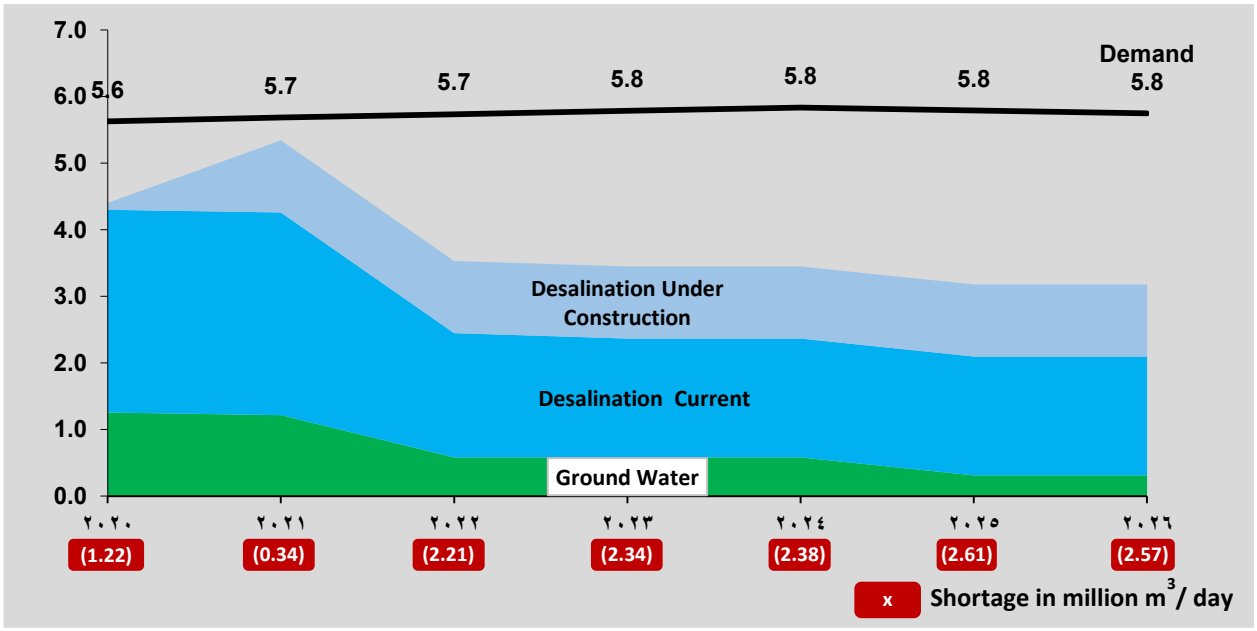
Source: MEWA

For all water supply presented in this section, current water sources include only those with an acceptable quality of water. Under-development water desalination includes all committed plants that are currently under construction or in the tender process. All other projects planned for financing from national budget (NTP-2, SWPC planned, etc.) were not included as part of the supply. The decommissioning date of plants is considered at 35 years for public sector (mainly SWCC) plants and 25 years for SWPC plants (linked to the Water Purchase Agreement).

Taking into account the total urban water demand and current and under-development capacities, the 2020 shortage of 1.2M m^3/d is expected to grow and reach 2.57M m^3/d in 2026, as shown in Figure 17.

Figure 17: Riyadh, Eastern Region and Qassim's desalination supply, demand and gap

(Million m^3/d)



Source: MEWA

SWPC plans to fill the water shortages beyond 2022 through five plants: Ras Al Khair 2, Ras Al Khair 3, Jubail 3 (A&B), Jubail 4 and Al Hasa plants. These plants are shown in Table 9 below.

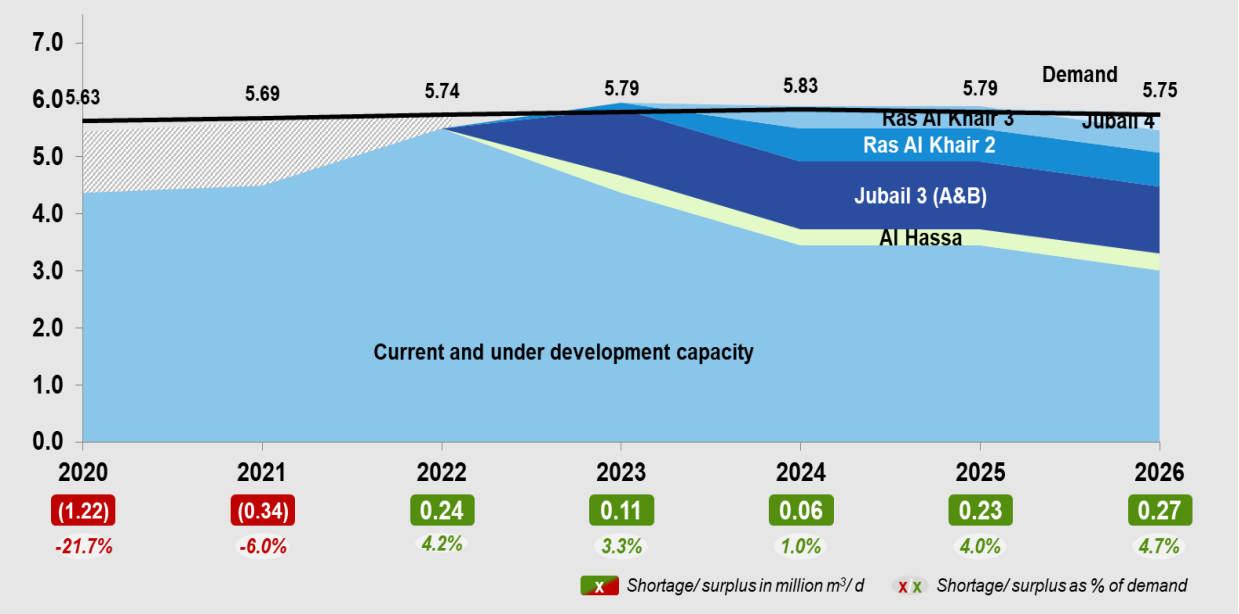
Table 9: East supply group IWP plans

Supply Group	Plant	COD	Capacity (m^3/d)	Early Water
Eastern Region	Jubail 3 (A&B)	2022	1,200,000	-
	Jubail 6 (Al Hasa)	2022	300,000	-
	Ras Al Khair 2	2023	600,000	17% in 2022
	Ras Al Khair 3	2023	400,000	-
	Jubail 4	2025	300,000	-
Total New Capacity			2,800,000	

These plants are expected to be operational by 2025 and will be located in Eastern Province, serving Riyadh, Eastern Province and Qassim as shown in Figure 18.

Figure 18: Riyadh, Eastern Province and Qassim's shortage and plants

(Million m^3/d)

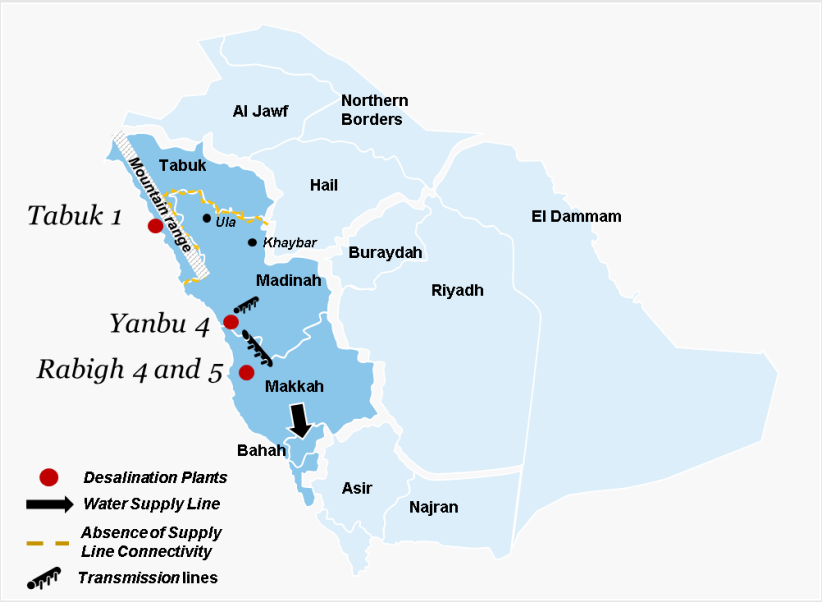


ii. Western Supply Group

The Western supply group is composed of four regions: Tabuk, Makkah, Madinah and Bahah, as illustrated in Figure 19 below. From a water supply perspective, these four regions are served by three supply systems:

- Makkah and Bahah, which are inter-connected and hence can both be served by the same plants; namely, Rabigh 4 and Rabigh 5
- Madinah has an independent supply system. Madinah and Makkah is considered separately despite the fact that Yanbu 4 is planned to serve both regions through two planned independent transmission lines.
- Tabuk Water Transmission System is currently not connected to other regions. However, given the topographic nature of the northwestern area, Tabuk 1 will serve the Tabuk region and Madinah's cities of Ula & Khaybar.

Figure 19: Map of Western supply group



Source: MEWA

Demand in the Western Supply Group is split into three main categories: demand from residents (locals), demand from Hajj and Omra (overseas and local visitors) and demand from development projects.

a- Makkah and Bahah

Population in Makkah and Bahah is expected to grow from 9.51M in 2020 to 10.38M in 2026, as shown in Table 10.

Table 10: Makkah and Bahah population

(Million)

	2020	2021	2022	2023	2024	2025	2026
Bahah	0.52	0.53	0.54	0.54	0.55	0.56	0.57
Makkah	8.99	9.15	9.29	9.43	9.56	9.69	9.81
Total	9.51	9.68	9.83	9.97	10.11	10.25	10.38
Yearly Growth (%)	1.93	1.82	1.71	1.60	1.50	1.41	1.32

In addition to population growth, urban water demand in these two areas is driven by GDP growth, improvement in water losses, and the impact of price (tariff) elasticity. This translates into an urban water demand from residents of 3.39M m^3/d in 2019 increasing to 3.54M m^3/d in 2025.

Hajj & Omra demand from direct sources (i.e. other than storage) is expected to grow from 0.71M m^3/d in 2020 to 1.02M m^3/d in 2026. This demand is driven by the number of visitors, which is expected to reach 4.5M for Hajj and 30M for Omra (foreign visitors) in 2030. This demand is also based on the assumption that each visitor consumes 250 liters per day and resides in Makkah for 20 days. As previously stated, 80% of total Hajj demand is served through the strategic reservoirs, and 30% served through desalination with 10% kept as a buffer.

As a result, total water demand will grow from 4.15M m^3/d in 2020 to 4.51M m^3/d in 2026, as shown in Table 11 below.

Table 11: Makkah and Bahah water demand

(Million m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Bahah – Urban water demand	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Makkah – Urban water demand	3.25	3.29	3.31	3.34	3.36	3.34	3.30
Total urban water demand	3.44	3.48	3.50	3.53	3.55	3.53	3.49
Total Hajj and Omra (Makkah)	0.71	0.79	0.83	0.87	0.92	0.98	1.02
Total water demand from production and storage sources	4.15	4.27	4.33	4.40	4.47	4.51	4.51

Source: MEWA

Current and under-development water sources in Makkah and Bahah include groundwater and desalination, as shown in Table 12. These sources are expected to be operational before or throughout 2022.

Table 12: Makkah and Bahah current and under-development sources

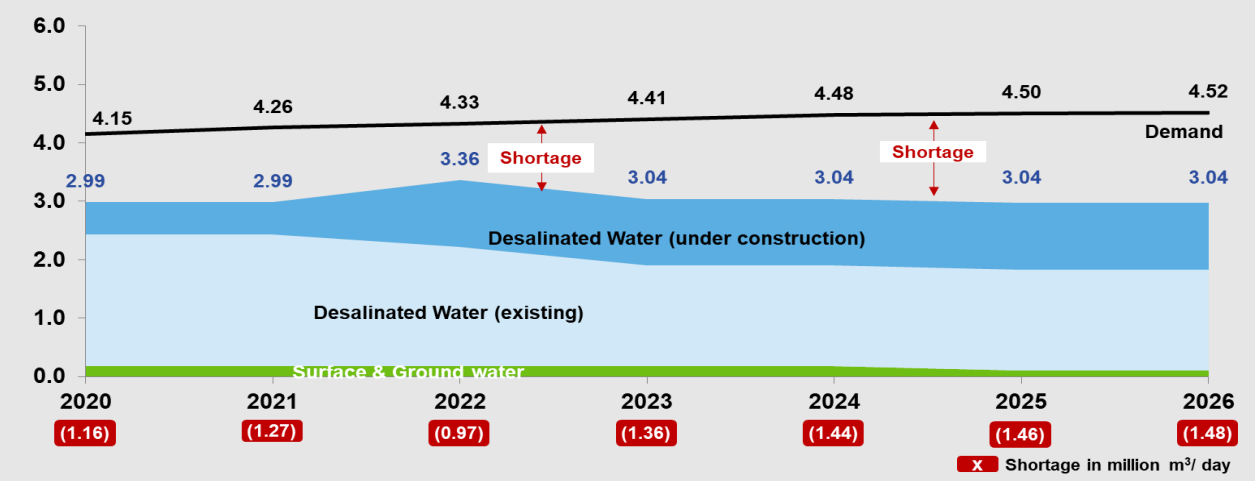
		COD	Date Out	Capacity (m3/d)	
Ground -Current	Multiple	Multiple	Multiple	-	Reduce sourcing based on NWS 2030
Surface- Current	Multiple	Multiple	Multiple	-	Kept at 50% of safe capacity
Desalination – Current	Jeddah 4	1982	2020	221,575	Maintained and phased out based on plants' life-time
	Jeddah RO1	1989	2023	56,800	
	Shoaiba 1	1989	2022	223,000	
	Jeddah RO2	1994	2023	56,800	
	Shoaiba 2	2001	2036	455,000	
	Al Qunfudah 1	2008	2020	9,000	
	Al Lith 1	2009	2020	9,000	
	Rabigh 2	2009	2029	18,000	
	Shoaiba 3	2009	2029	880,000	
	Shoaiba Exp 3.1	2009	2029	150,000	
	Jeddah RO3	2013	2023	240,000	
	Shoaiba MED	2018	2036	92,000	
	Shoaiba Exp 3.2	2019	2044	250,000	
Desalination – Under construction	Al Lith New	2020	2055	42,000	
	Al Qunfudah New	2020	2055	75,000	
	Shoaiba 4 (Jeddah RO4)	2020	2055	400,000	
	Rabigh RO3	2022	2047	600,000	
	Rabigh New	2021	2055	42,500	
Desalination – Under tendering	Ras Mohaisen	2022	2057	600,000	
	Rayis 1 (Yanbu 4)	2023	2047	480,000	
Desalination - Planned	Shoaiba RO1	2022	2057	600,000	
	Rabigh 4	2022	2047	600,000	
	Rayis 2	2025	2050	200,000	

Source: MEWA

Taking into account the total water demand and current and under-development capacities, a shortage of ~1.2M m3/d in 2020 is expected to reach ~1.5M m3/d in 2026, as seen in Figure 20 below.

Figure 20: Makkah and Bahah's desalination supply, demand and gap

(Million m^3/d)



SWPC plans to fill the water shortages in Makkah and Bahah beyond 2022 through several plants to be added between 2022 and 2025. These plants will be located in the Western Supply Group, as shown in Table 13.

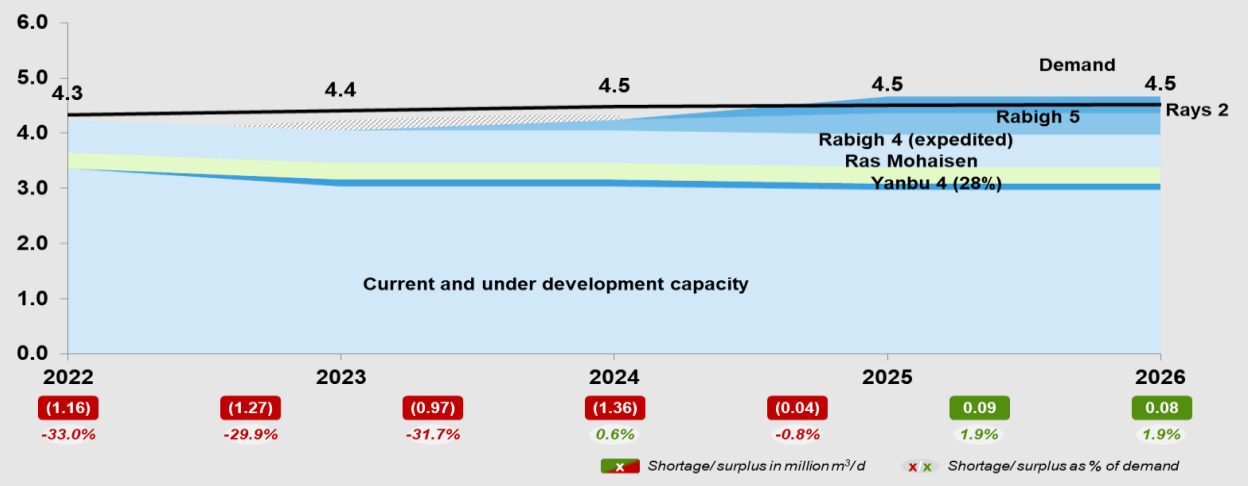
Table 13: Makkah & Bahah planned desalination plants

Supply Group	Plant	COD	Capacity (m^3/d)	Early Water
Western Supply Group	Yanbu 4	2023	450,000 (30% of capacity dedicated to Makkah and Bahah)	-
	Ras Mohaisan	2022	300,000	-
	Rabigh 4	2022	600,000	-
	Rabigh 5	2024	400,000	50% in 2023
	Rayis 2	2025	300,000	-
Total New Capacity			2,050,000	

Hence, as seen in Figure 21 below, these plants will fill the required gap beyond 2022.

Figure 21: Makkah and Bahah's shortage and plants

(Million m^3/d)



b- Madinah

Population in Madinah is expected to grow from 2.28M in 2020 to 2.49M in 2026, as shown in Table 14.

Table 14: Madinah population

(Million)

	2020	2021	2022	2023	2024	2025	2026
Madinah	2.28	2.32	2.36	2.39	2.42	2.46	2.49
Yearly Growth (%)	1.93	1.82	1.71	1.60	1.50	1.41	1.32

This translates into an urban water demand from residents of 0.84M m^3/d in 2026. In addition, Hajj & Omra and development projects demand from direct sources (i.e., other than storage) is expected to grow to reach 0.63M m^3/d in 2026. As such, and as seen in Table 15, the total water demand will grow from 1.22M m^3/d in 2020 to 1.47M m^3/d in 2026.

Table 15: Madinah water demand

(Million m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Urban water demand	0.82	0.82	0.83	0.84	0.84	0.84	0.84
Hajj and Omra	0.21	0.23	0.25	0.26	0.27	0.29	0.30
Dev. Projects	0.19	0.19	0.33	0.33	0.33	0.33	0.33
Total	1.22	1.24	1.41	1.43	1.44	1.46	1.47

Source: MEWA

In terms of supply, Madinah's current and under-development sources include groundwater and desalinated water that will be fully operational in 2021, as shown Table 16 below.

Table 16: Madinah current and under-development sources

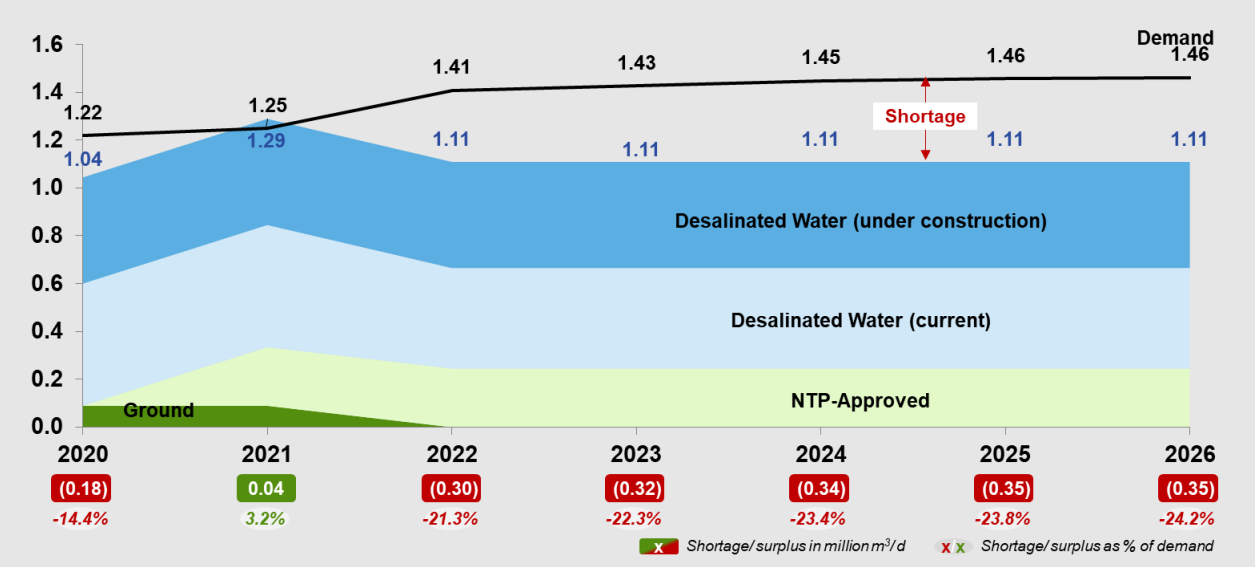
		COD	Date Out	Capacity (m3/d)	
Ground -Current	Multiple	Multiple	Multiple	-	Reduce sourcing based on NWS 2030
Desalination – Current	Yanbu 1	1981	2020	100,800	Maintained and phased out based on plants' life-time
	Yanbu RO	1998	2033	127,800	
	Yanbu 2	1998	2032	143,808	
	Bawarij	2010	2018	43,014	
	Yanbu MED	2013	2032	61,371	
	Yanbu 3 Phase 1	2017	2052	97,000	
	Portable Unit	2018	2053	30,000	
	Yanbu 3 Remaining Units	2019	2052	453,000	
Desalination – Under tendering	Rayis 1 (Yanbu 4)	2023	2048	480,000	
Under Study	Yanbu RO 2	2021	2057	250,000	

Source: MEWA

Taking into account the total water demand and current and under-development capacities, a shortage of 0.25M m^3/d in 2022 will reach 0.30M m^3/d by 2025. This is illustrated in Figure 22 below.

Figure 22: Madinah's desalination supply, demand and gap

(Million m^3/d)



Source: MEWA

Therefore, SWPC plans to fill the water shortage beyond 2022 by introducing Yanbu 4. Yanbu 4 is planned with a 2023 COD and a capacity of 450,000 m^3/d, with 315,000 m^3/d covering Madinah's shortage, as identified in Table 17. The plant will be located in the Southwest of Madinah region.

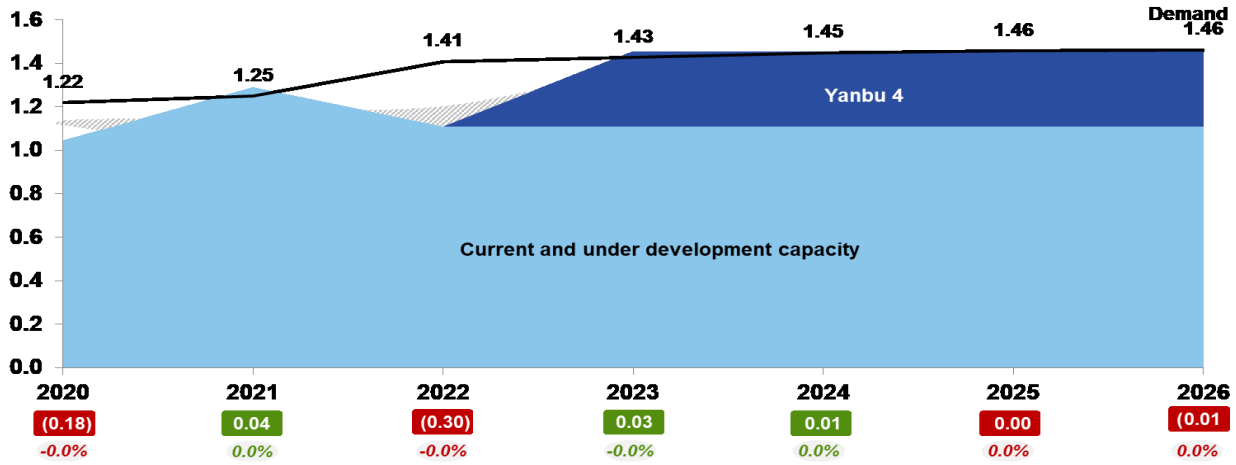
Table 17: Western Region IWP plants (Madinah)

Supply Group	Plant	COD	Capacity (m^3/d)	Early Water
Western Region	Yanbu 4	2023	450,000 (70% of capacity dedicated to Madinah)	-

As seen in Figure 23, Yanbu 4 will be operational by 2023 and will serve the Madinah by filling the required gap.

Figure 23: Madinah's shortage and plant

(Million m^3/d)



c- Tabuk:

This section covers Tabuk region, including Ula and Khaybar cities in Madinah region. For simplicity, they are referred to as "Tabuk supply group" in the remainder of this section. Population in Tabuk supply group is expected to grow from 1.12M in 2019 to 1.23M in 2030, as shown in Table 18.

Table 18: Tabuk supply group population

(Million)

	2020	2021	2022	2023	2024	2025	2026
Ula and Khaybar	0.14	0.14	0.15	0.15	0.15	0.15	0.15
Tabuk	1.00	1.01	1.03	1.05	1.06	1.08	1.09
Total	1.14	1.15	1.18	1.20	1.21	1.23	1.24
Yearly Growth (%)	1.93	1.82	1.71	1.60	1.50	1.41	1.32

Urban water demand from residents is expected to grow from 0.41M m^3/d in 2020 to 0.43M m^3/d in 2026, as shown in Table 19 below.

Table 19: Tabuk supply group water demand

(Million m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Ula and Khaybar	0.05	0.05	0.05	0.05	0.05	0.06	0.06
Tabuk	0.36	0.37	0.37	0.37	0.37	0.37	0.37
Total	0.41	0.42	0.42	0.42	0.42	0.43	0.43

Source: MEWA

Water sources in Tabuk supply group include groundwater and desalination. These sources are either currently in service or under-development, as shown in Table 20.

Table 20: Tabuk supply group current and under-development sources

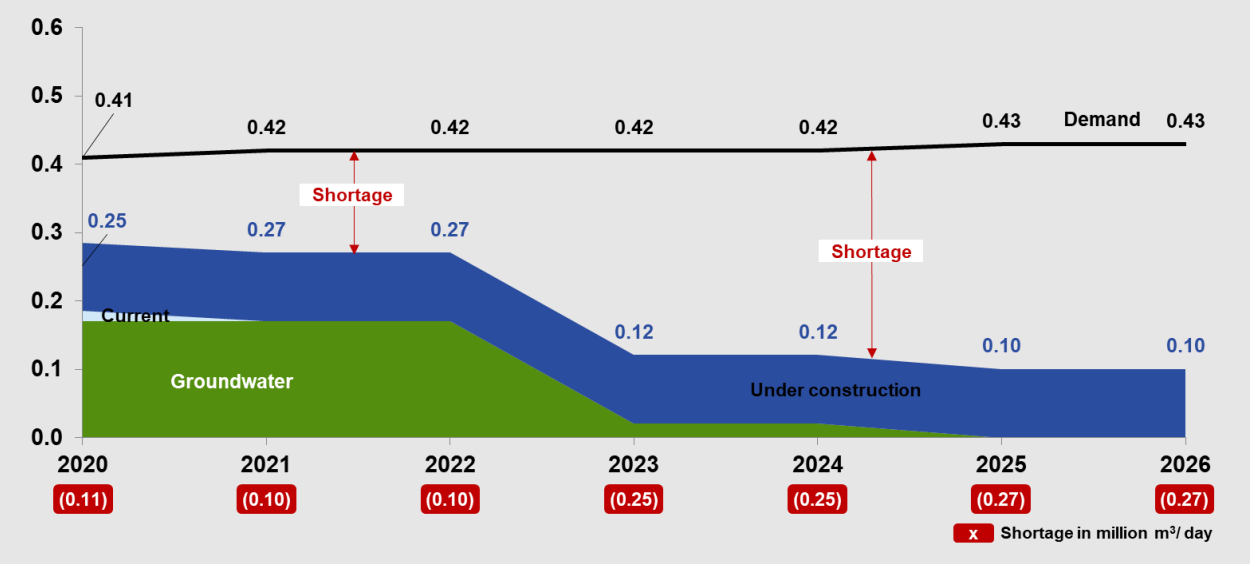
		COD	Date Out	Capacity (m3/d)	
Ground -Current	Multiple	Multiple	Multiple	-	Reduce sourcing based on NWS 2030
Desalination – Current	Umluq RO	1986	2020	4,400	
	Duba RO3	1989	2020	5,760	
	Haql RO2	1990	2020	5,760	
	Al Wajh 3	2009	2020	9,000	
	Umluq 3	2009	2020	9,000	
	Duba	2018	2021	5,000	Maintained and phased out based on plants' life-time
	Haql	2018	2021	5,000	
	Al Wajh	2018	2021	5,000	
	Al Wajh New	2020	2055	25,000	
	Duba New	2020	2055	25,000	
	Haql New	2020	2055	25,000	
	Umluq 4	2020	2055	25,000	
Desalination - Planned	Tabuk 1	2023	2048	400,000	

Source: MEWA

Hence, a shortage of 110K m^3/d is expected to occur in 2020. This shortage is expected to grow to 270K m^3/d in 2026, as identified in Figure 24 below.

Figure 24: Tabuk supply group. desalination supply, demand and gap

(Million m^3/d)



SWPC plans to fill the water shortages beyond 2022 with Tabuk 1. As seen in Table 21, Tabuk 1 will go online in 2023 with 400,000 m^3/d capacity and 50% early water in 2022. This plant will be located in the west of Tabuk region.

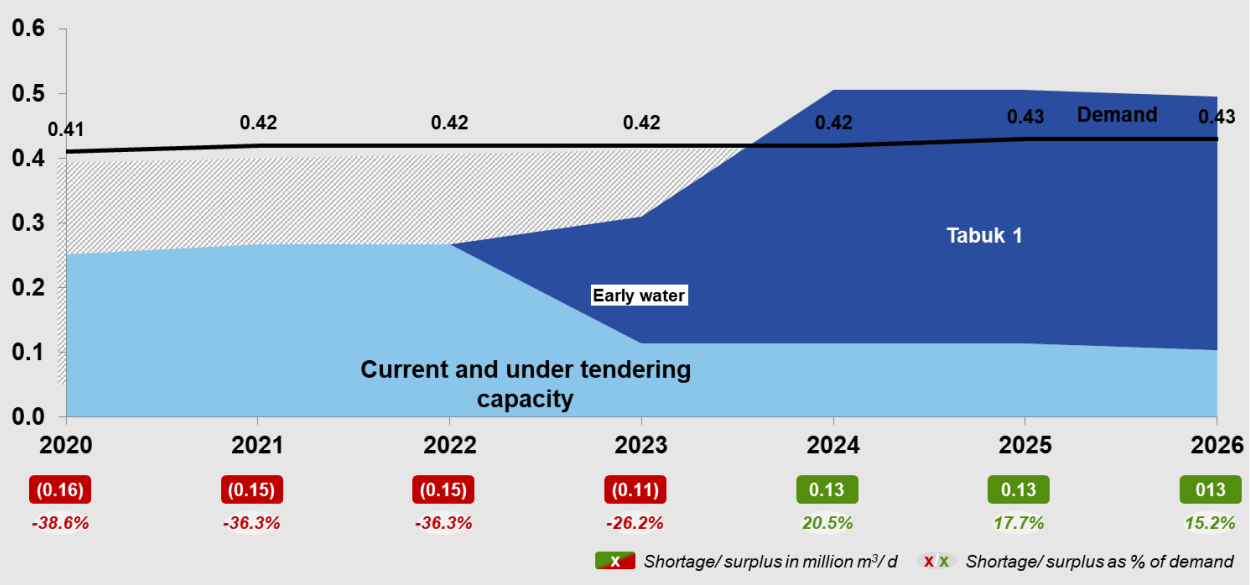
Table 21: Western Region IWP plants (Tabuk Supply Group)

Supply Group	Plant	COD	Capacity (m^3/d)	Early Water
Western Region	Tabuk 1	2023	400,000	50% in 2022

As seen in Figure 25, introducing Tabuk 1 will address the gap in Tabuk supply group.

Figure 25: Tabuk's shortage and plants

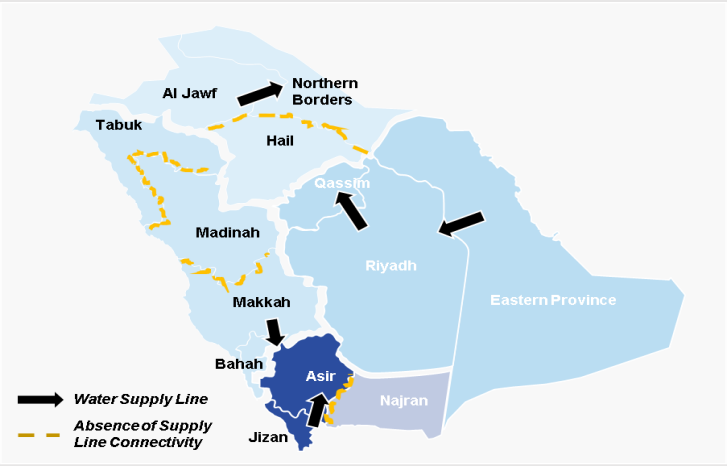
(Million m^3/d)



iii. Southern Supply Group

The Southern supply group is composed of three regions: Asir, Jizan and Najran as shown in Figure 26. Jizan Region is connected to Asir via the Shuqaiq-Abha water transmission system. However, no water transmission connection is currently available between Asir and Najran. Hence, Najran is considered on its own, though it is part of the Southern supply group.

Figure 26: Map of Southern supply group



Population in Asir and Jizan is expected to grow from 4.15M in 2020 to 4.53M in 2026, as shown in Table 22.

Table 22: Asir and Jizan population

(Million)

	2020	2021	2022	2023	2024	2025	2026
Jizan	1.73	1.76	1.79	1.82	1.84	1.87	1.89
Asir	2.42	2.46	2.50	2.54	2.57	2.61	2.64
Total	4.15	4.22	4.29	4.36	4.41	4.48	4.53
Yearly Growth (%)	1.88	1.79	1.69	1.60	1.51	1.42	1.34

Urban water demand is expected to reach 1.52M m^3/d in 2026 as shown in Table 23 below.

Table 23: Asir and Jizan urban water demand

(Million m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Jizan	0.63	0.63	0.64	0.64	0.65	0.64	0.64
Asir	0.87	0.88	0.89	0.89	0.90	0.92	0.88
Total	1.50	1.51	1.53	1.53	1.55	1.56	1.52

In terms of supply, Asir and Jizan current and under-development sources include groundwater and desalination, operational by 2022, as shown in Table 24. Following MEWA's supply/ demand projections and the retirement plan of existing capacity, the supply mix will be significantly affected.

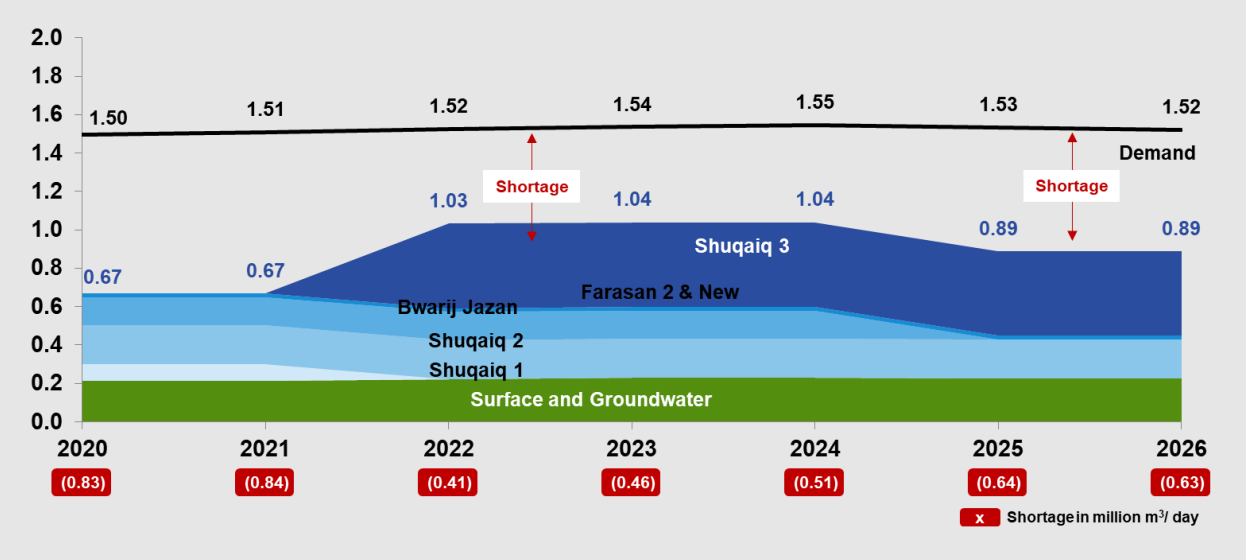
Table 24: Asir and Jizan current and under-development sources

		COD	Date Out	Capacity (m3/d)	
Ground -Current	Multiple	Multiple	Multiple	-	Reduce sourcing based on NWS 2030
Surface- Current	Multiple	Multiple	Multiple	-	Kept at 50% of safe capacity
Desalination – Current	Shuqaiq 1	1989	2022	94,014	Maintained and phased out based on plants' life-time
	Shuqaiq 2	2011	2031	212,000	
	Farasan 2	2008	2020	9,000	
Desalination – Under construction	Shuqaiq 3	2020	2047	450,000	
	Bwarj Jazan	2020	2024	150,000	
	Farasan New	2020	2055	8,500	
Desalination - Planned	Jazan 1	2023	2058	260,000	
	Shuqaiq RO1	2022	2057	400,000	

As such, a shortage of 830K m^3/d exists in 2020, which reduces to 406K m^3/d in 2022 but increases to 630K m^3/d in 2026. This change is due to certain plants being decommissioned over the planning period as shown in Figure 27 below.

Figure 27: Asir and Jizan's desalination supply, demand and gap

(Million m^3/d)



SWPC plans to fill the water shortage beyond 2022 by tendering two plants: Shuqaiq 4 and Jazan 1. Shuqaiq 4 will go online in 2023 with 400,000 m^3/d capacity and 50% early water in 2022, and Jazan 1 will go online in 2023 with 300,000 m^3/d. These are shown in Table 25 below.

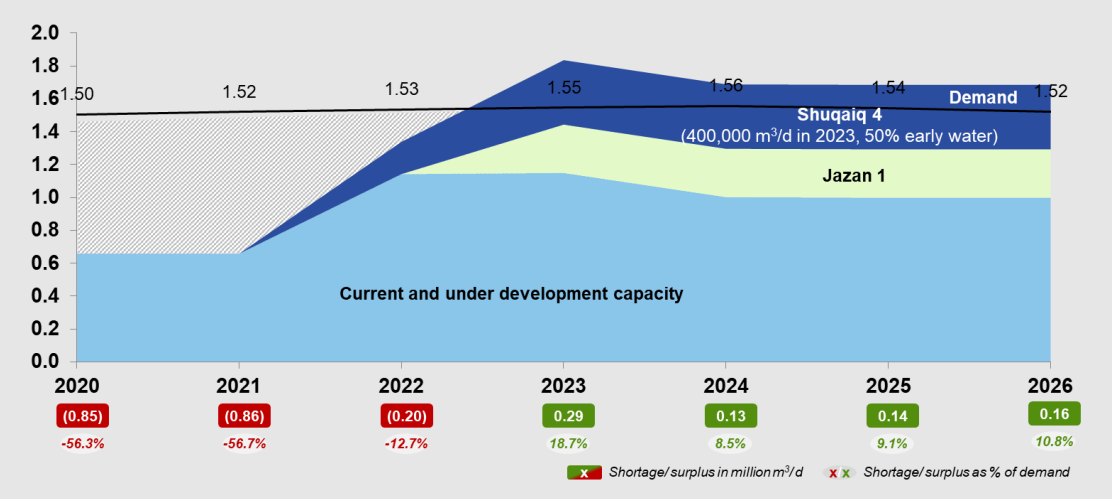
Table 25: Southern Region IWP plants

Supply Group	Plant	COD	Capacity (m^3/d)	Early Water
Southern Region	Shuqaiq 4	2023	400,000	50% in 2022
	Jazan 1	2023	300,000	-
Total New Capacity			700,000	

The two plants will be located in Jizan region and will serve Asir and Jizan starting 2023 by filling the required gap, as shown in Figure 28.

Figure 28: Asir and Jizan's shortage and plants

(Million m^3/d)



VI. SEWAGE TREATMENT CAPACITY PLAN

1. National Water Context Policies

Sewage treatment underlines KSA's commitments to accomplish some of the UN's Sustainable Development Goals by meeting a number of wastewater treatment and reuse objectives.

In addition, the Saudi National Water Strategy (NWS) highlights the need for

"… Reducing the environmental footprint of the water sector, particularly in terms of greenhouse gas emissions, untreated sewage and impact on natural ecosystems".
Furthermore, national strategies and programs have set targets for:

- Wastewater network coverage to grow from 60% in 2015 to 65% in 2020, and finally 95-100% in 2030,
- Treated water production via strategic partners to grow from 0% in 2015 to 100% in 2030,
- Treated sewage effluent reuse, which was 17% in 2015, to reach 35% in 2020 and 70% in 2030.

KSA population is expected to grow from 33.6M in 2018 to 40.1M in 2030 and the total wastewater generated is projected to grow from 7.2M m^3/d in 2018 to 10.8M m^3/d in 2030.

The average population growth is forecast between 1.28% and 2.05% per year. Average water consumption per capita is estimated to be 250 LCD in 2030. Total Hajj and Omra water demand is expected to grow from ~1.1M m^3/d in 2018 to ~2.1M m^3/d in 2030. The wastewater generated is estimated at 212.5 liters per capita per day. Estimates for Infiltration into wastewater networks and unaccounted for inflows in coastal and inland cities are as follows:

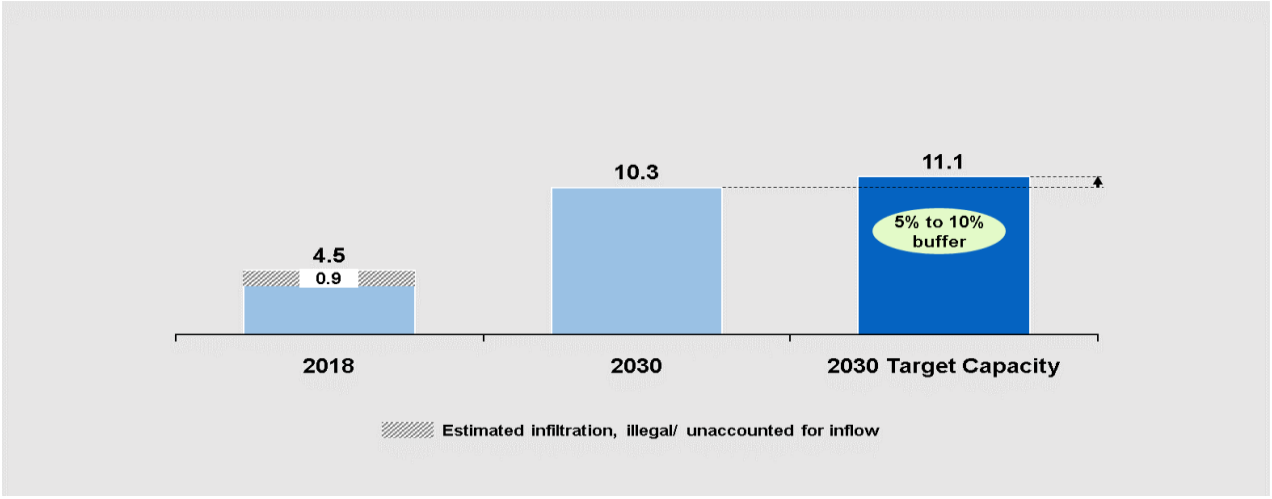
- **Coastal cities**: 20% in 2018 (figure is higher in some cities such as Dammam and Jeddah) and 10% in 2030,
- **Inland cities**: 10% in 2018 and 5% in 2030.

As for the current and forecasted sewage network coverage of total wastewater generated, around 50% is currently collected; a 95%-100% coverage/ wastewater collection is targeted in 2030.

The planned expansion of sewage collection networks will drive the wastewater collected to reach 10.3M m^3/d in 2030, resulting in a required treatment capacity of 11.1M m^3/d after accounting for a 5% to 10% buffer. This capacity buffer is added to ensure proper treatment of unexpected increases in sewage inflow and to avoid any negative environmental impact related to untreated sewage. This is illustrated in Figure 29.

Figure 29: Wastewater collected for treatment and required capacity

(Million m^3/d)

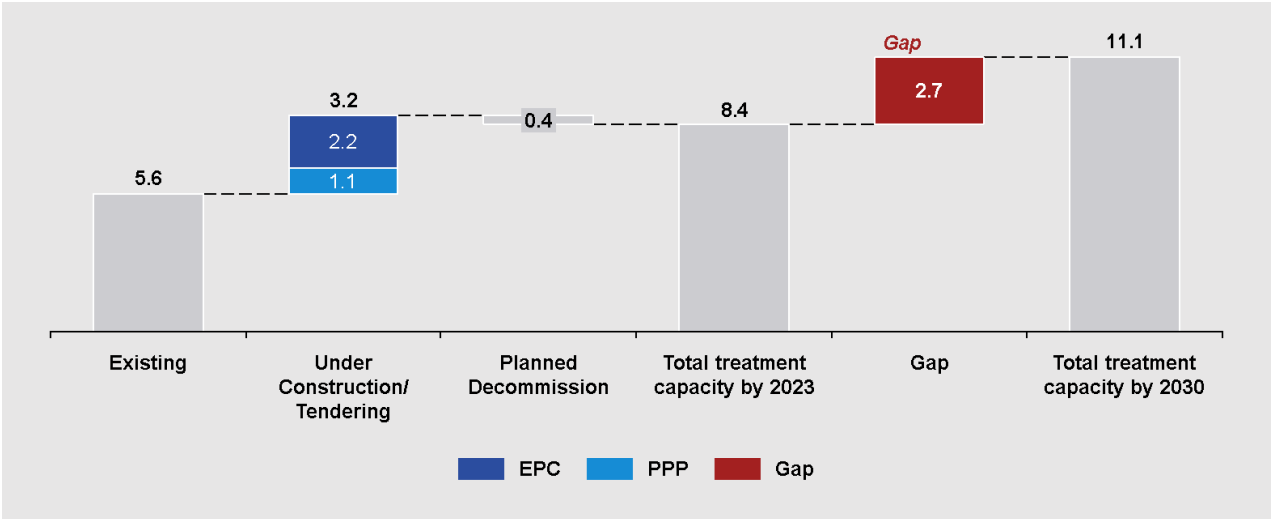


Current treatment capacity is around 5.6M m^3/d, with 3.2M m^3/d under construction or under tendering and 0.4M m^3/d planned for decommissioning. Hence, a total of ~8.4M m^3/d of capacity needs to be online by 2023 to achieve the set treatment targets. This is illustrated in Figure 30.

These results in a 2.7M m3/d capacity gap by 2030, taking into account the 11.1M m3/d of total treatment capacity needed by 2030.

Figure 30: Total wastewater treatment capacity by 2030

(Million m^3/d)



Source: MEWA, NWC

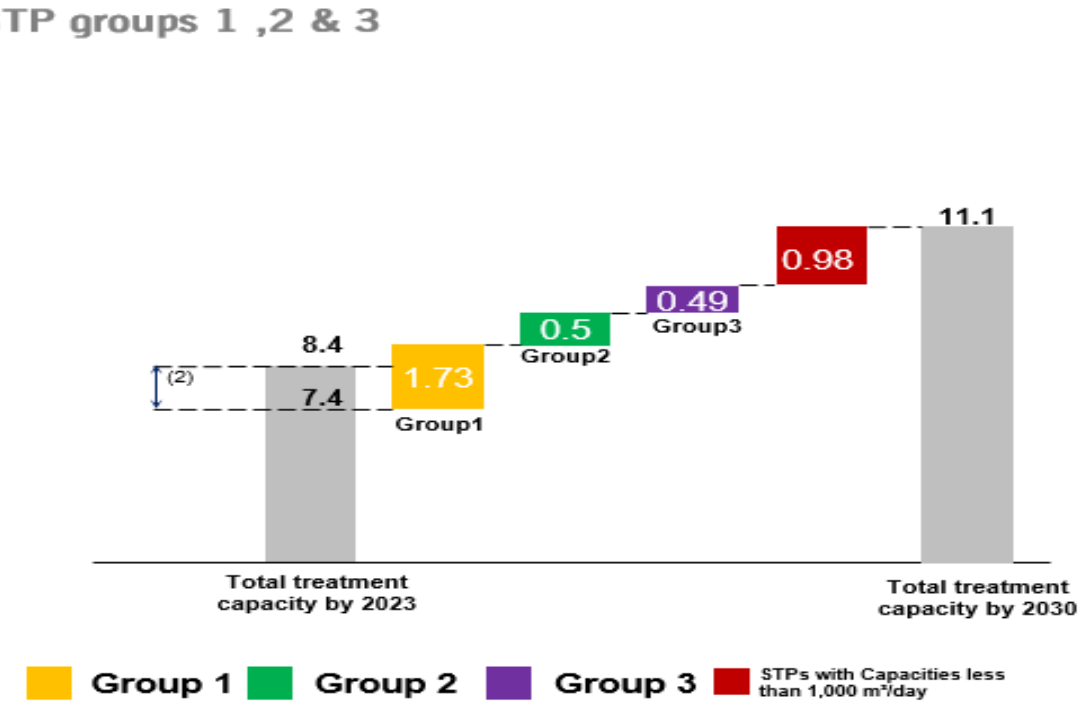
Two types of treatment plants, according to specific selection criteria, will address this gap:

1. ***Medium to large plants*** (total capacity of 50,000 m^3/d and above) in key cities tendered through PPPs: These plants are economically attractive to build, finance and operate by the private sector
2. ***Small plants*** (total capacity of 25,000 m^3/d and less) for which optimal tendering approach is currently being determined: A study was conducted in 2019 to identify the optimal option to tender these plants (e.g., bundle plants under one tender, centralize plants, other tendering options), and determine the extent to which the private sector can be involved in their construction, finance and operation. This study concluded that a number of 147 small plants should be implemented among the kingdom.

These two types of treatment plants are illustrated in Figure 31 below.

Figure 31: Total wastewater treatment capacity

(Million m^3/d)



Eleven STPs are needed to reach full sewage treatment targets in 2030 and serve large cities in terms of population that are amenable to private sector participation. These plants are identified in Table 26. In addition, small ISTPs with a capacity of 490,000 m3/d are planned for KSA as Group 3.

Table 26: List of STPs needed for selected cities

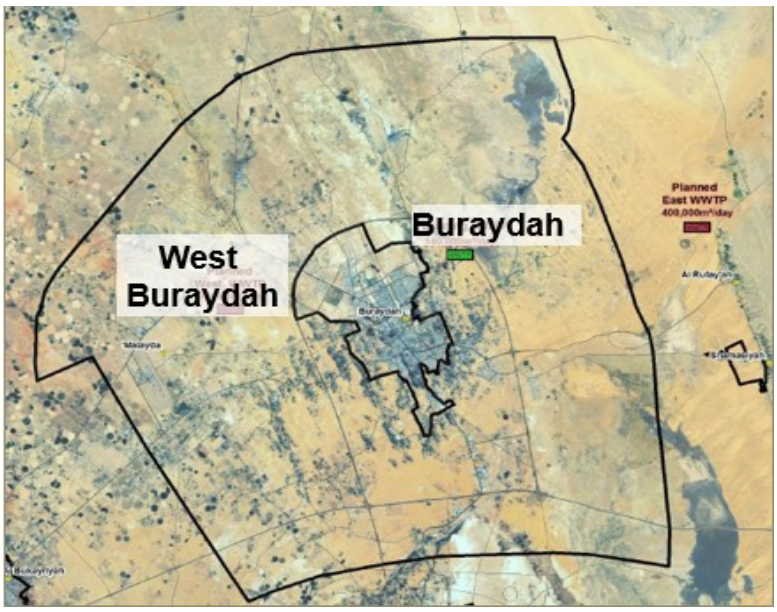
Region	City	Plant	Capacity (m3/d)	PCOD
Qassim	Buraydah	Buraydah 2	150,000	2022
Madinah	Madinah	Madinah 3	200,000 in 2023 up to 375,000 in 2026	2023
Riyadh	Riyadh	Al Haer 2	100,000 in 2023 up to 200,000 in 2026	2023
Riyadh	Riyadh	Riyadh East	50,000 in 2023 up to 100,000 in 2028	2023
Tabuk	Tabuk	Tabuk 2	90,000	2023
Assir	Khamis Mushait	Khamis Mushait 2	25,000 in 2023 up to 50,000 in 2027	2023
Jazan	Jazan	Abu Arish 3	25,000 in 2024 up to 50,000 in 2028	2024
Najran	Najran	Najran South	25,000 in 2024 up to 50,000 in 2028	2024
Makkah	Jeddah	Jeddah North 1	25,000 in 2025 up to 50,000 in 2029	2025
Eastern Province	Hafar Al Batin	Hafar Al Batin 2	50,000 in 2026 up to 100,000 in 2030	2026
Riyadh	Kharj	Kharj 3	25,000 in 2026 up to 50,000 in 2030	2026

2. Regional Outlook for Medium to Large ISTPs

i. Buraydah

Buraydah is the capital of Al-Qassim region in northcentral Saudi Arabia. Buraydah City is composed of two catchment areas: Buraydah and West Buraydah, as shown in Figure 32. Only Buraydah catchment area will be considered for the wastewater treatment capacity/ flow estimation, which is given in Table 27.

Figure 32: Buraydah city catchment areas



Source: NWC

Table 27: Buraydah STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	90.2	92.7	95.1	99.6	104.0	108.5	113.0
Current Supply	150.0	150.0	-	-	-	-	-
Planned Additional Capacity	-	-	150.0	150.0	150.0	150.0	150.0
Shortage/Surplus	59.8	57.3	54.9	50.4	46.0	41.5	37.0

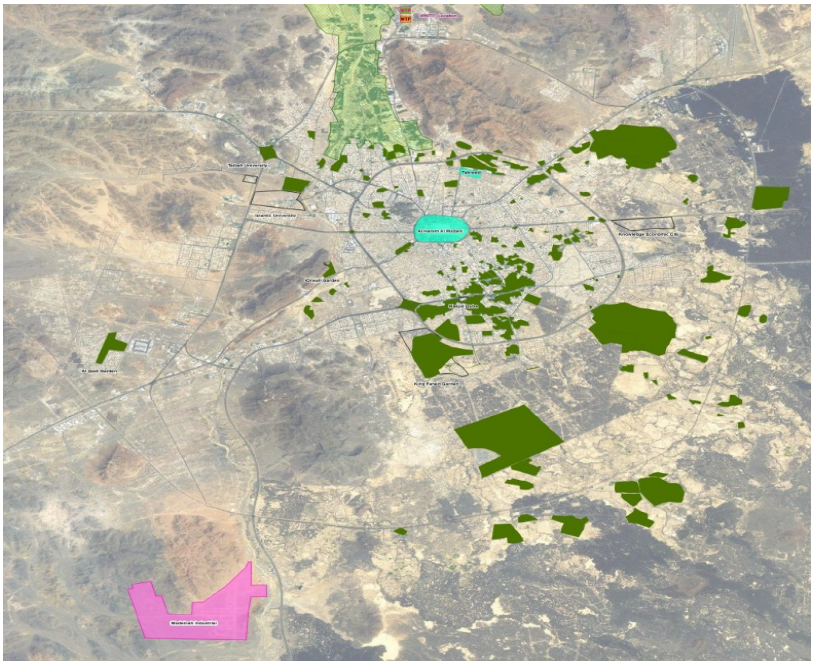
Source: NWC

The wastewater collected for treatment is expected to grow to 113,000 m^3/d in 2026. In terms of supply, Buraydah includes one plant to be decommissioned in 2021, called Buraydah First. With no available treatment capacity in Buraydah post 2021, a shortage of ~132,000 m^3/d is expected by 2030. To cover for this shortage, Buraydah 2 is planned by SWPC to come online with 150,000 m^3/d in 2022.

ii. Madinah

Madinah City, located in western Saudi Arabia, has only one catchment area: Madinah, as illustrated in Figure 33 below. Therefore, the whole city of Madinah is taken into account for the wastewater treatment capacity/ flow estimation, as shown in Table 28 below.

Figure 33: Madinah city catchment areas



Source: NWC

Table 28: Madinah STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	470	488	591	610	629	651	674
Current Supply	440	440	440	440	440	440	440
Planned Added Capacity	-	-	-	200	200	200	375
Shortage/ Surplus	(30)	(48)	(151)	30	11	(11)	141

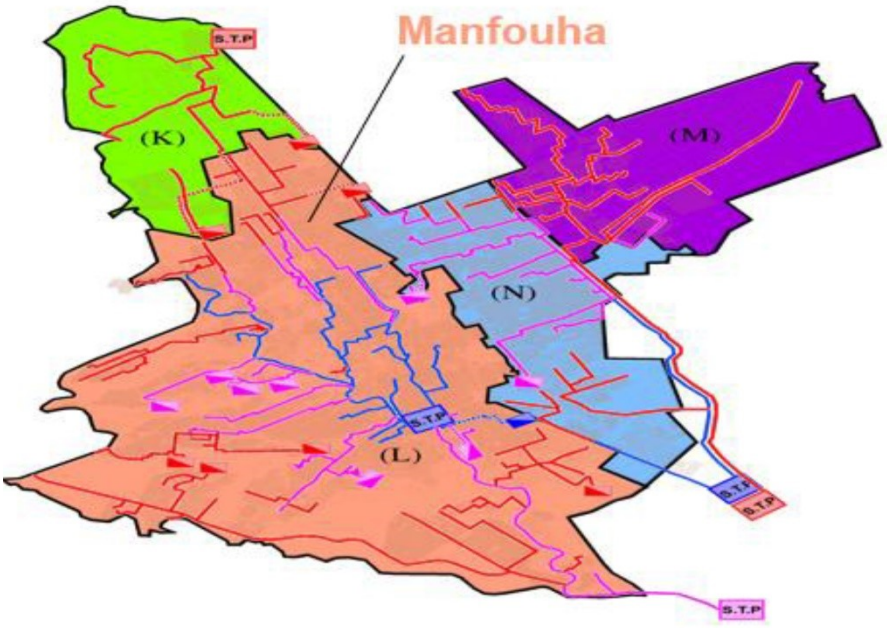
Source: NWC

The wastewater collected for treatment is expected to reach 674,000 m^3/d in 2026, driven by the increase in population and network coverage. In terms of supply, Madinah is currently served by two plants with a design capacity of 240,000 m^3/d and 200,000 m^3/d. Madinah 3 STP is planned to come online with a capacity of 200,000 m^3/d in 2023 to cover for the shortage of ~141,000 m^3/d that is expected by 2026.

iii. Riyadh - Manfouha

As illustrated in Figure 34 below, Riyadh City comprises four catchment areas: East Riyadh (M), North Riyadh (K), Heet (N) and Manfouha (L). Given the topography, the wastewater treatment capacity/ flow estimation is applied to only one catchment area, in this case Manfouha as shown in Table 29 below.

Figure 34: Riyadh city catchment areas - Manfouha



Source: NWC

Table 29: Manfouha STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	1,075	1,104	1,133	1,152	1,170	1,186	1,207
Current Supply	1,300	1,300	1,300	1,100	1,100	1,100	1,100
Proposed Additional Capacity	-	-	-	200	200	200	200
Shortage/ Surplus	255	196	167	148	148	130	93

Source: NWC

The increase of the population and network coverage leads to the increase of wastewater collected for treatment in Manfouha, resulting in 1.21M m^3/d in 2026. In terms of supply, Riyadh has four existing STPs (South Manfouha which will be decommissioned in 2023, North Manfouha, Eastern Manfouha and Al Haer) and 1 STP under construction (Manfouha phase 4). With an available treatment capacity of 1.1M m^3/d in Manfouha, a shortage of ~93,000 m^3/d is expected by 2026. Hence, SWPC is planning to cover this shortage with an STP plant, Al Haer 2, to come online with 200,000 m^3/d in 2023.

iv. Riyadh - East Riyadh

Riyadh City, Saudi Arabia's capital and main financial hub has four catchment areas as seen in Figure 35: East Riyadh (M), North Riyadh (K), Heet (N) and Manfouha (L). The STP plant planned by SWPC will treat sewage inflow from East Riyadh only, which is considered in the capacity estimation shown in Table 30 below.

Table 30: East Riyadh STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	0.00	0.00	0.00	9.5	19.2	29.0	39.0
Current Supply	-	-	-	-	-	-	-
Planned Added Capacity	-	-	-	50.0	50.0	50.0	50.0
Shortage/ Surplus	-	-	-	40.5	30.8	21.0	11.0

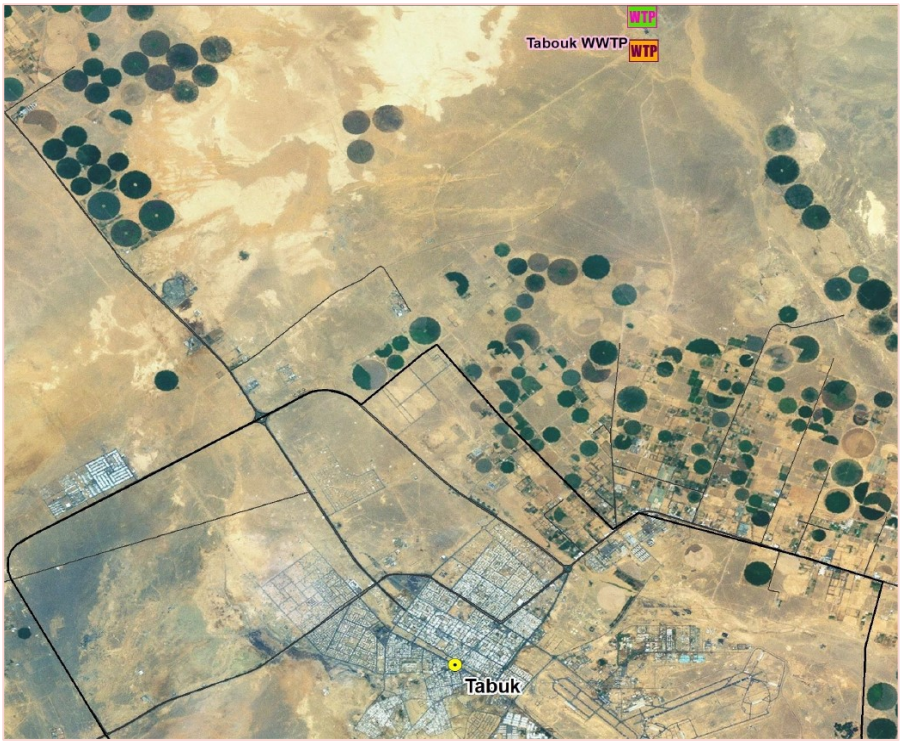
Source: NWC

The population and network coverage increase in East Riyadh leads to an increase of wastewater collected for treatment, reaching **38,974** m^3/d in 2026. There is no available treatment capacity in Riyadh East, which leads to a shortage of ~38,974 m^3/d by 2025. To address this gap, SWPC will introduce Riyadh East plant in 2023 with a 50,000 m^3/d treatment capacity.

v. Tabuk

Tabuk city is formed of one catchment area as seen in Figure 35: Tabuk catchment area. Therefore, the whole city of Tabuk is taken into account for the wastewater treatment capacity/ flow estimation, as shown in Table 31.

Figure 35: Tabuk catchment area



Source: NWC

Table 31: Tabuk STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	126	129	133	137	140	143	147
Current Supply	90	90	90	90	90	90	90
Planned Added Capacity	-	-	-	90	90	90	90
Shortage/ Surplus	-	-	-	43	40	37	33

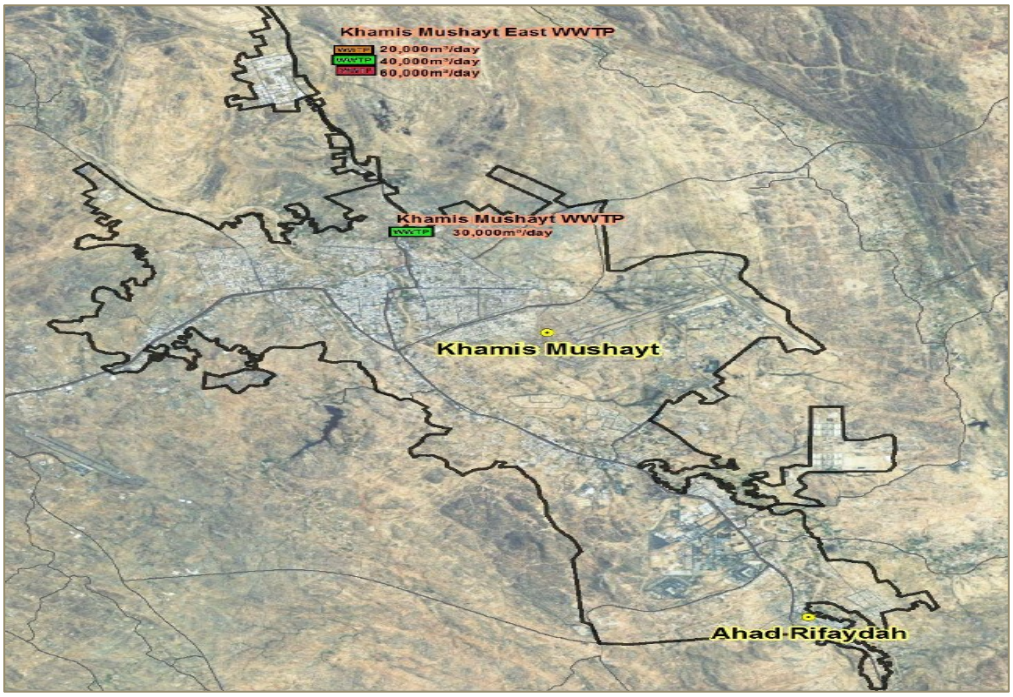
Source: NWC

The population and network coverage increase in Tabuk leads to an increase of wastewater collected for treatment, reaching 147,000 m^3/d in 2026, compared to only 90,000 m3/d of available treatment capacity. To address this gap, SWPC will introduce Tabuk 2 plant in 2023 with a 90,000 m^3/d treatment capacity.

vi. Khamis Mushait

Khamis Mushait is a city in south-west Saudi Arabia, located east of Abha. As seen in Figure 36 below, the city has only one catchment area, also named Khamis Mushait, which will be considered for the wastewater treatment capacity/ flow estimation shown in Table 32 below.

Figure 36: Khamis Mushait city catchment area



Source: NWC

Table 32: Khamis Mushait STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	91.7	94.2	96.6	101.2	105.7	110.3	114.8
Current Supply	90.0	90.0	90.0	90.0	90.0	90.0	90.o
Planned Added Capacity	-	-	-	25.0	25.0	25.0	25.0
Shortage/ Surplus	(1.7)	(4.2)	(6.6)	13.8	9.3	4.7	0.2

Source: NWC

The population and network coverage increase in Khamis Mushait leads to an increase of the wastewater collected for treatment, resulting in 114,800 m^3/d in 2026. Two plants – Khamis Mushait and East Al Khamis – presently serve the city with a total capacity of 90,000 m^3/d. Hence, a shortage of 43,900 m^3/d is expected by 2030. SWPC plans to cover this shortage by introducing a new plant, Khamis Mushait 2, which is proposed to come online with 25,000 m^3/d in 2023, with capability to expand to 50,000 in 2027 if required at that time.

vii. Abu Arish

Abu Arish is a city in Jizan Province, in southwestern Saudi Arabia and consists of only one catchment area, as shown in Figure 37. As such, given the area's topography, the wastewater treatment capacity/ flow estimation (population, coverage, available capacity, etc.) is applied to the whole city of Abu Arish, as shown in Table 33 below.

Figure 37: Abu Arish city catchment area

Source: NWC

Table 33: Abu Arish STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	0.5	1.4	2.3	7.7	13.1	18.5	24.1
Current Supply	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Planned Added Capacity	-	-	-	-	25.0	25.0	25.0
Shortage/ Surplus	2.5	1.6	0.7	(4.7)	14.9	9.5	3.9

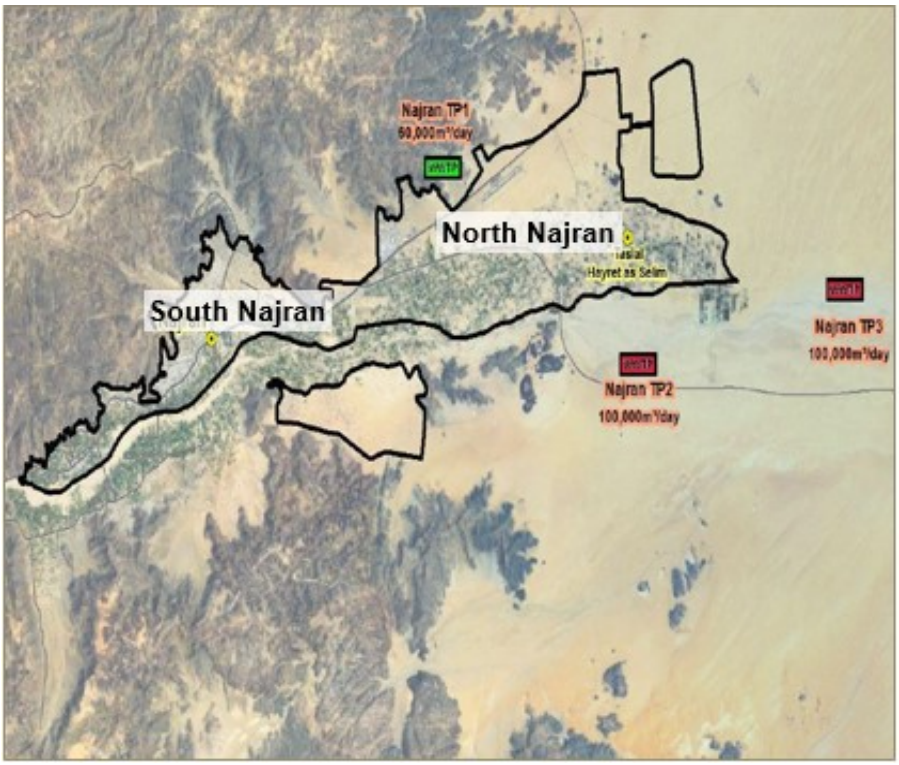
Source: NWC

The population and network coverage growth in Abu Arish leads to the increase of the wastewater collected for treatment to 18,500 m^3/d in 2025. Abu Arish is currently served by 2 plants – Abu Arish phase 1 and Abu Arish phase 2 Al Aridhah – with total design capacity of only 3,000 m^3/d. Abu Arish 3 STP is planned by SWPC to come online with a capacity of 25,000 m^3/d starting 2024 to cover for the shortage of 43,700 m^3/d expected in 2030.

viii. South Najran

Najran City is composed of two catchment areas: South Najran and North Najran, as per Figure 38. Given the topography, the wastewater treatment capacity/ flow estimation is applied to only one catchment area: South Najran, as summarized in Table 34.

Figure 38: Najran city catchment areas



Source: NWC

Table 34: South Najran STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	0.8	1.2	1.6	5.2	8.9	12.7	16.5
Current Supply	-	-	-	-	-	-	-
Planned Added Capacity	-	-	-	-	25.0	25.0	25.0
Shortage/ Surplus	(0.8)	(1.2)	(1.6)	(5.2)	16.1	12.3	8.5

Source: NWC

The wastewater collected for treatment is expected to grow and reach 16, 500 m^3/d in 2026. With no available treatment capacity in South Najran, a shortage of 12,700 m^3/d is expected by 2025. SWPC plans to cover for this shortage by introducing South Najran STP, which is planned to come online with 25,000 m^3/d in 2024.

ix. North Jeddah

Jeddah, a Saudi Arabian port city on the Red Sea, composes four catchment areas: North Jeddah, North Central Jeddah, South central Jeddah and South Jeddah, as shown in Figure 39 below. Given the area's topography, one catchment area is considered for the wastewater treatment capacity/ flow estimation: North Jeddah, as summarized in Table 35.

Figure 39: Jeddah city catchment areas

Source: NWC

Table 35: North Jeddah STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	1.2	1.3	1.3	4.7	8.2	11.7	15.2
Current Supply	-	-	-	-	-	-	-
Planned Added Capacity	-	-	-	-	-	25.0	25.0
Shortage/ Surplus	(1.2)	(1.3)	(1.3)	(4.7)	(8.2)	13.3	9.8

Source: NWC

The wastewater collected for treatment in North Jeddah is expected to increase to 15,200 m^3/d in 2026. Having no available treatment capacity, a shortage of 11,700 m^3/d is expected by 2025. North Jeddah 1 is planned by SWPC to come online to cover the shortage with 25,000 m^3/d in 2025.

x. Hafar Al Batin

Hafar Al Batin, an inland city in the Eastern Province, composes one catchment. Given the area's topography, one catchment area is considered for the wastewater treatment capacity/ flow estimation: Hafar Al Batin, as summarized in Table 36.

Table 36: Hafar Al Batin STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	2.9	4.9	7.0	18.2	29.7	41.3	53.2
Current Supply	51.8	51.8	51.8	51.8	51.8	51.8	51.8
Planned Added Capacity	-	-	-	-	-	-	50.0
Shortage/ Surplus	48.9	46.9	44.8	33.6	22.1	10.5	48.6

Source: NWC

The wastewater collected for treatment in Hafar Al Batin is expected to increase to 53,200 m^3/d in 2026. Currently Hafar Al Batin has available treatment capacity of 51,800 m^3/d, however a shortage of 1,400 m^3/d is expected by 2026. Hafar Al Batin is planned by SWPC to come online to cover the shortage with 50,000 m^3/d in 2026.

xi. Kharj 3

Kharj, an inland city in the Riyadh region, composes one catchment as shown in Figure 40 below. Given the area's topography, one catchment area is considered for the wastewater treatment capacity/ flow estimation: Kharj 3, as summarized in Table 37.

Figure 40: Kharj catchment area

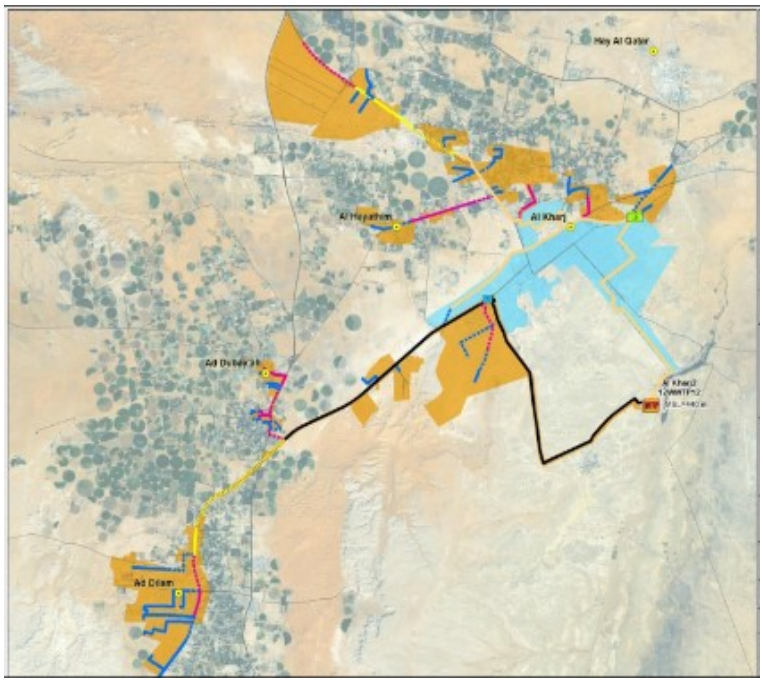


Table 37: Kharj 3 STP capacity plan

('000 m^3/d)

	2020	2021	2022	2023	2024	2025	2026
Wastewater Collected for Treatment	29.7	30.9	32.1	38.3	44.5	50.9	57.3
Current Supply	51.0	51.0	51.0	51.0	51.0	51.0	51.0
Planned Added Capacity	-	-	-	-	-	-	25.0
Shortage/ Surplus	21.3	20.1	18.9	12.7	6.4	0.1	18.7

Source: NWC

The wastewater collected for treatment in Kharj 3 is expected to increase to 57,300 m^3/d in 2026. Currently Kharj STPs have available treatment capacity of 51,000 m^3/d; however, a shortage of 6,300 m^3/d is expected by 2026. Kharj 3 is planned by SWPC to come online to cover the shortage with 25,000 m^3/d in 2026.

3. Regional Outlook for Small ISTPs

SWPC plans to start a kingdom wide program to to increase the treatment coverage through partnership with private sector. This program has adopted a wider approach from the pre-feasibility study, which proposed 147 Small Scale Sewage Treatment Plants and its combined collection sewage networks in six clusters in 13 different regions. This program aims to procure approximately 490,000 cubic meter per day of treated water generated from the 147 proposed ISTPs in whole Kingdom.

Same criteria to identify each STP capacity in all regions were followed, including:

- Sewage flow between 1,000 till 25,000 m^3/day at year 2030,
- Consideration of each STP topography and population density,
- Prioritising the environmentally affected area,
- Availability of networks and coverage percentage, and
- Possibility of combining adjacent centers.

Table 38: Summary of the Small Sewage Treatment Plants

Clusters for procurement	Southern Cluster	Western Cluster	Central Cluster	North Western Cluster	Northern Cluster	Eastern Cluster
Regions Covered	Jazan, Al Baha, Asir & Najran	Makkah	Riyadh	Madinah & Tabuk	Qassim, Hail, Jouf & Northern Borders	Eastern Province
Cluster Capacity (m^3/d)	164,500	80,500	91,000	49,000	81,000	23,250
COD	2023	2024	2025	2026	2026	2027

VII. STRATEGIC RESERVOIRS CAPACITY PLAN

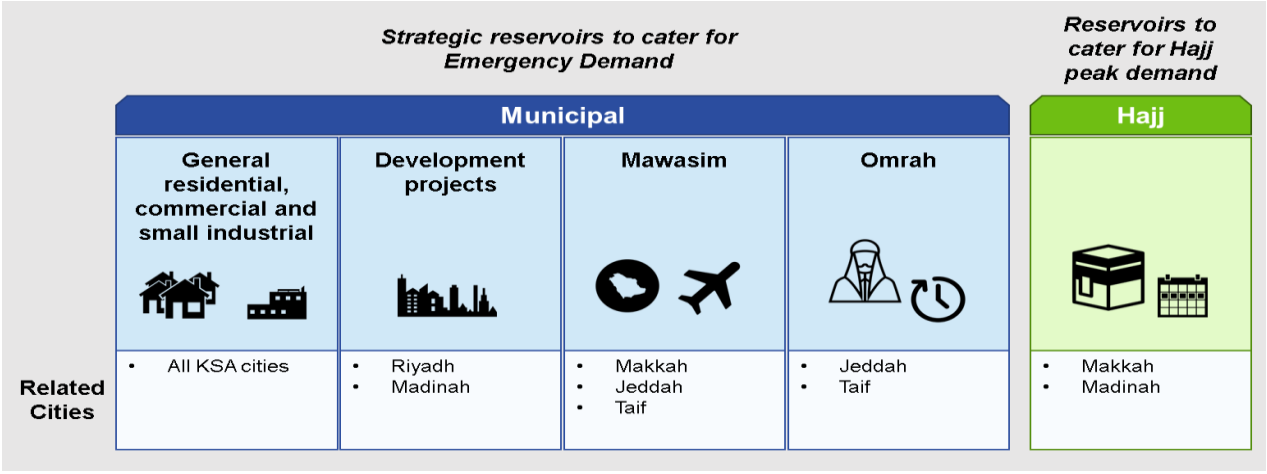
1. National Water Context Policies

Strategic water storage underlines one of KSA's commitments to fulfill some of the UN's Sustainable Development Goals. It is also in line with KSA's water policies, in particular the National Water Strategy, which recognizes strategic storage as a means for strengthening sector resilience.

Strategic reservoirs will also be used for two main purposes as detailed below and described further in Figure 41:

- Emergency water demand for all the regions of the Kingdom
- Peak demand in Makkah and Madinah during the Hajj season

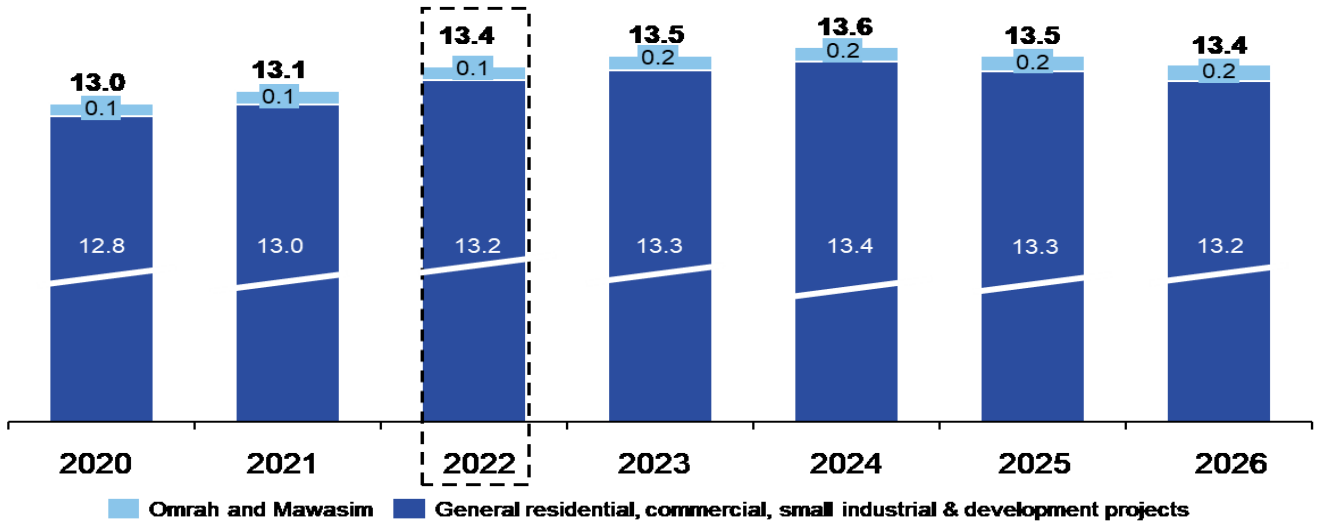
Figure 41: Strategic reservoirs uses



Based on the above goals and policies, KSA sets targets for emergency water strategic reservoirs via strategies and programs such as Vision 2030, National Transformation Program and National Water Strategy. These targets translate into a number of storage days required to meet emergency demand, which will grow from 1.3 days in 2017, to 3 days in 2022 and 7 days in 2030.

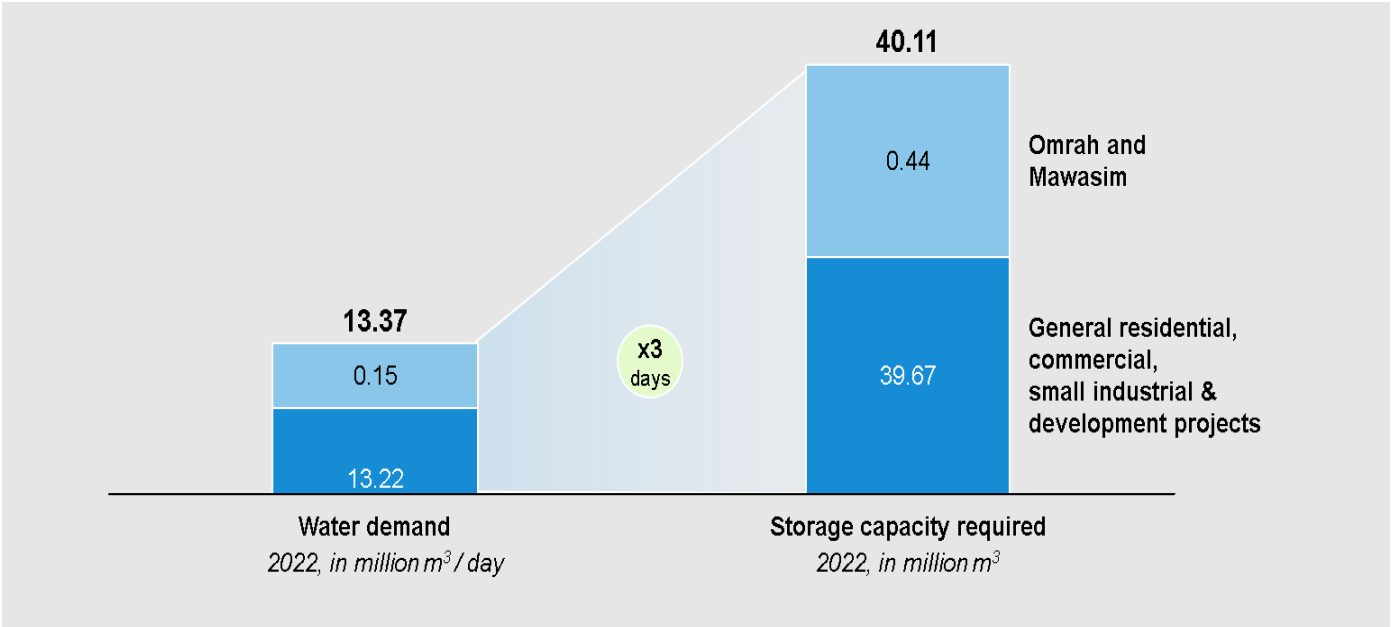
Strategic storage demand is mainly driven by factors such as population growth, average GDP growth, water losses which will be gradually reduced by 2030, and price elasticity. Strategic storage capacity required for municipal emergency demand amounts to 40.11 M m^3 in 2022. This capacity is equivalent to three days of total KSA municipal daily water demand, which is expected to reach 13.4 M m^3/d in 2022, as shown in Figure 42 and Figure 43 below.

Figure 42: Municipal water demand



(Million m^3/d)
Source: MEWA

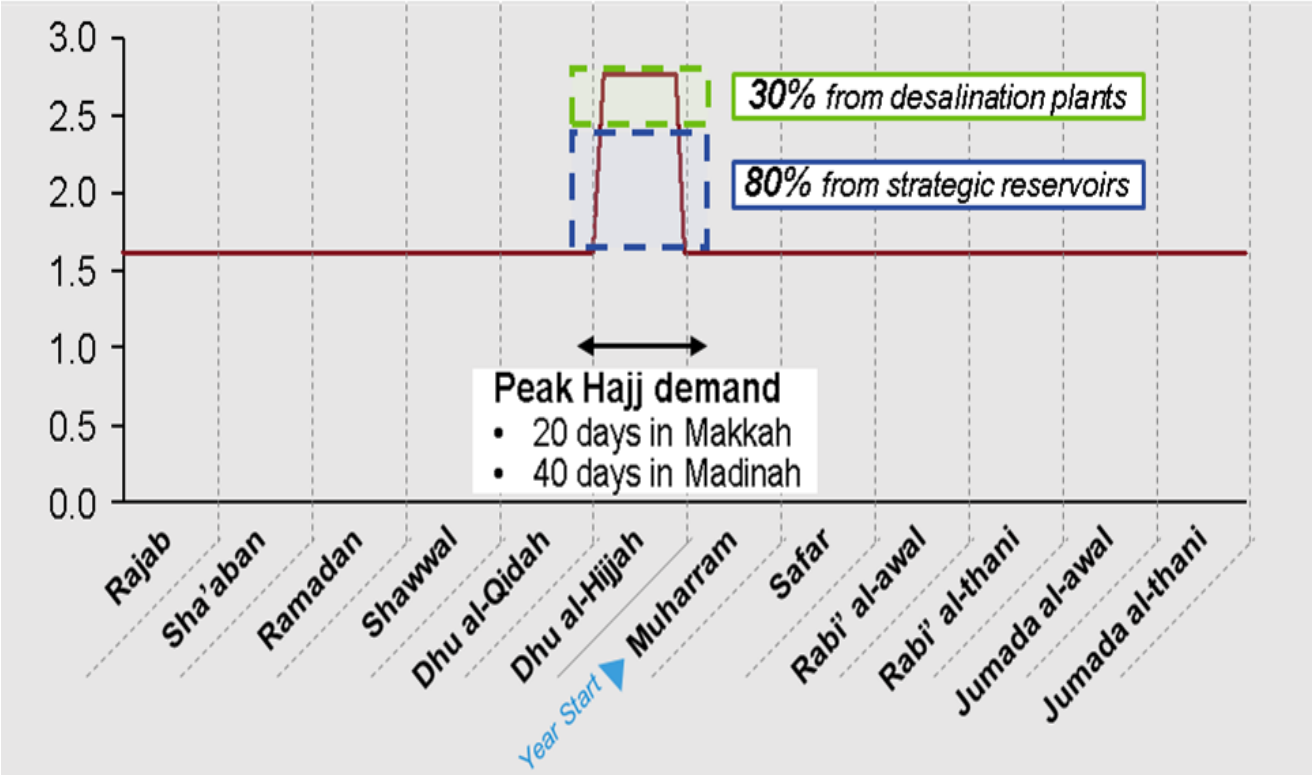
Figure 43: Strategic storage capacity required by 2022 for municipal emergency demand



In addition to their emergency role, strategic reservoirs will be used to cover 80% of Hajj peak demand in Madinah & Makkah, as illustrated in Figure 44 below.

Figure 44: Hajj water demand peak

(Million m^3/d)



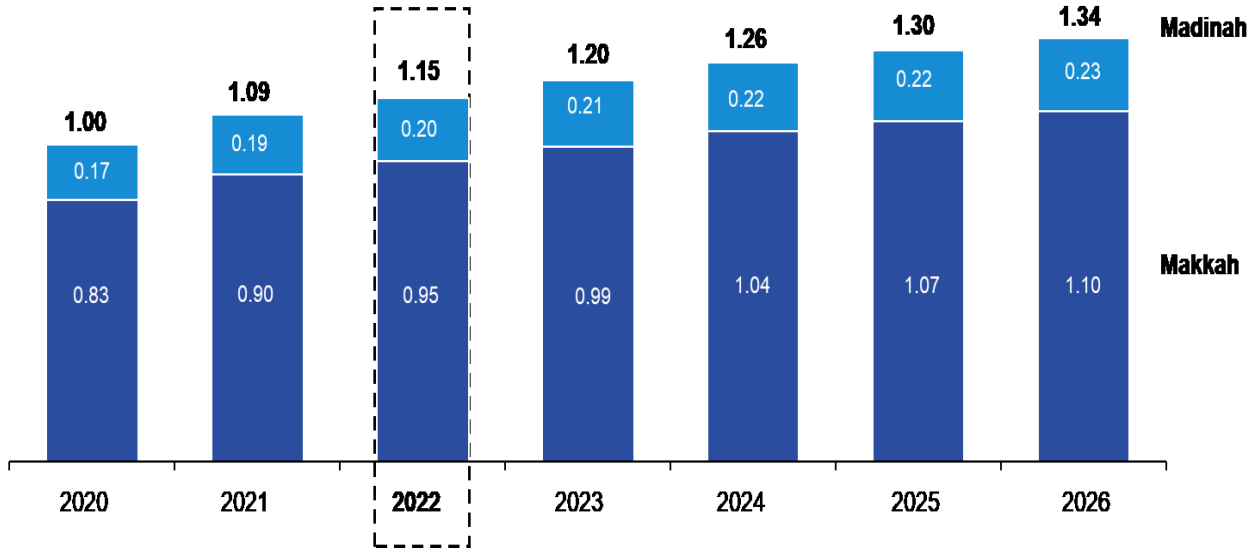
Source: MEWA

The peak demand of Hajj season occurs over a span of approximately 20 days in Makkah and 40 days in Madinah at the beginning of Dhu al-Hijjah, resulting in a short-term peak demand of water. MEWA adopted a policy for serving 80% of Hajj demand through storage tanks and 30% of Hajj demand through desalination plants (10% is kept as a buffer) in order to avoid having large idle capacities during off-peak periods.

Total Hajj water demand of 20 days in Makkah and 40 days in Madinah is expected to reach 1.15M m^3/d in 2022, as seen in Figure 45 below.

Figure 45: Hajj water demand

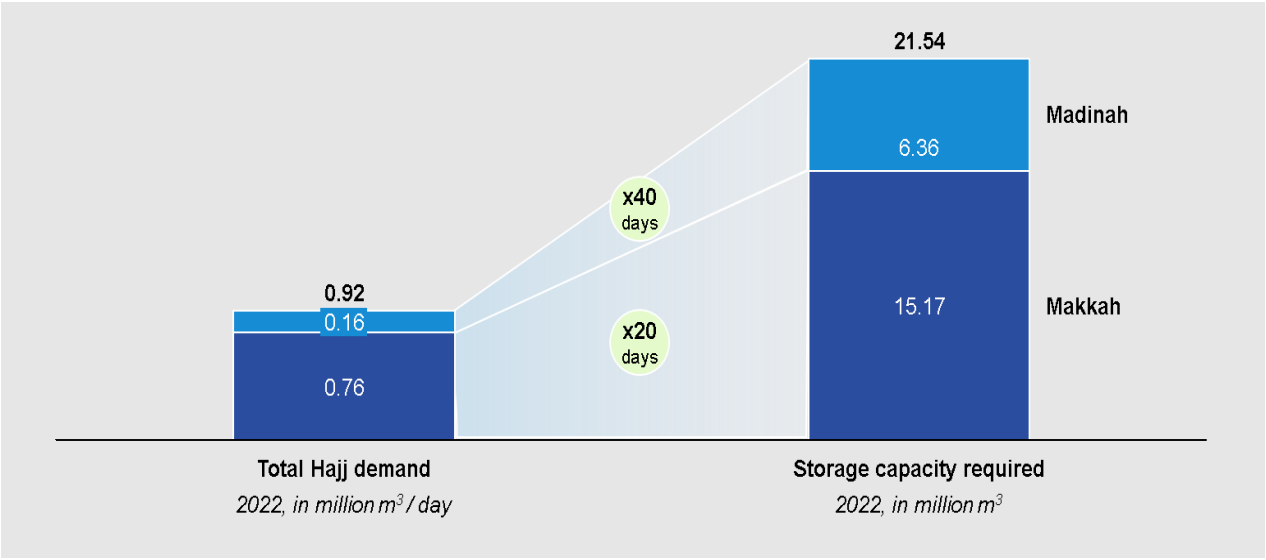
(Million m^3/d)



Source: MEWA

80% of the expected demand, or the equivalent of 21.54M m^3, will be supplied exclusively from strategic reservoirs, as illustrated in Figure 46 below.

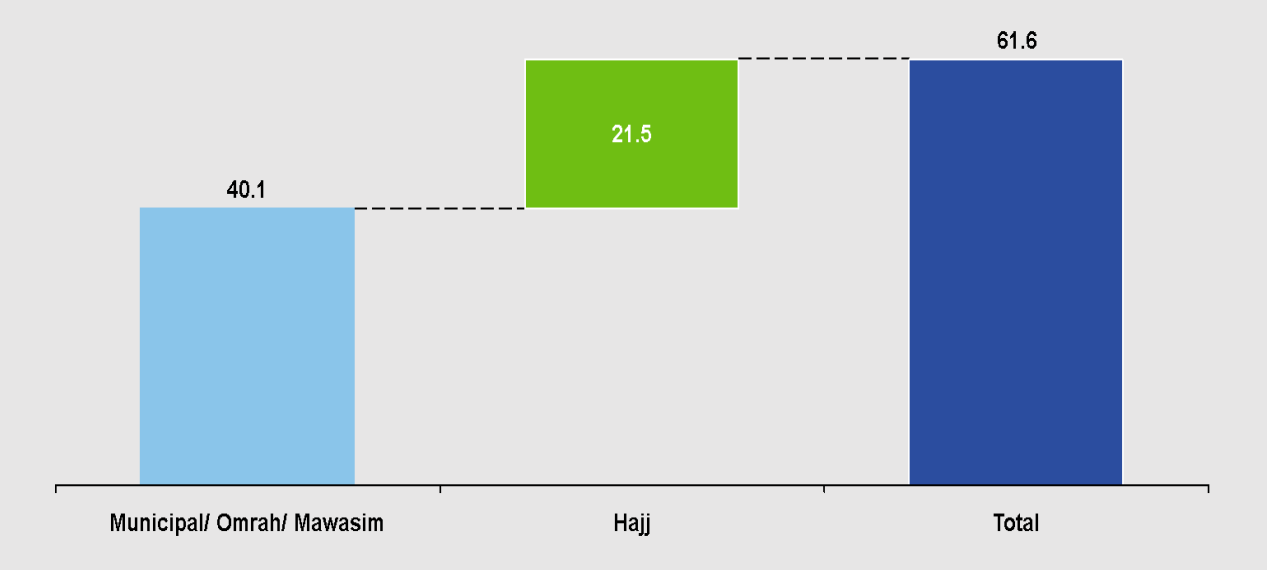
Figure 46: 2022 Storage capacity required for Hajj



In total, the storage capacity required for strategic and peak Hajj demand amounts to 61.6M m^3 in 2022, as illustrated in Figure 47.

Figure 47: National water requirements in 2022

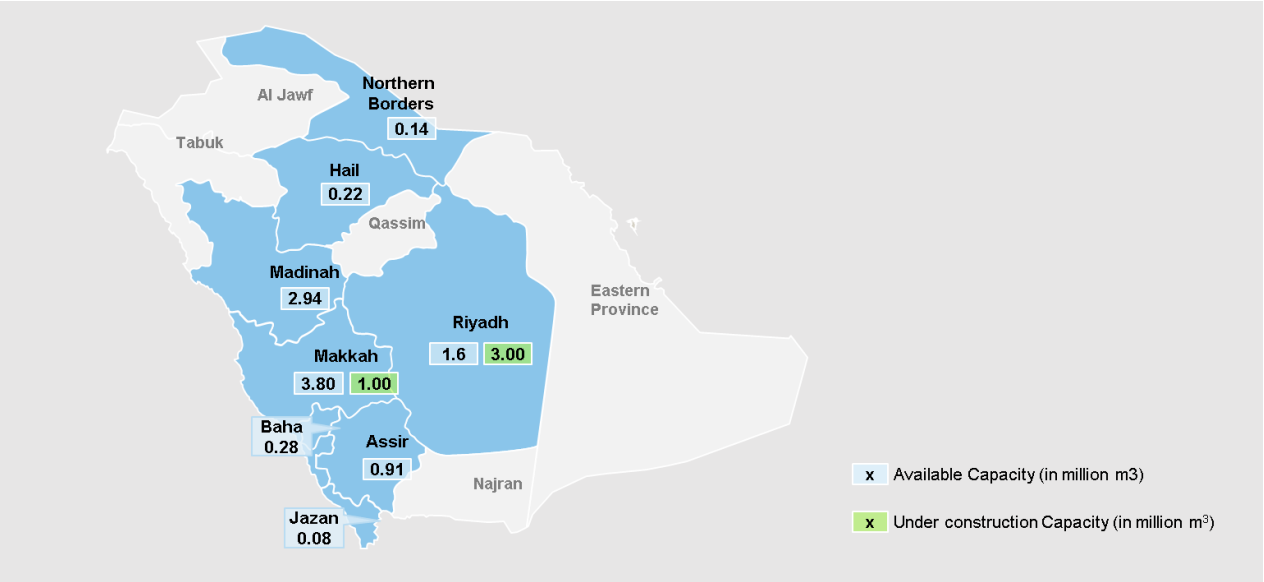
(Million m^3)



Currently, a capacity of **12.0** M m^3 of strategic storage is available. NWC is the main developer/ operator of available strategic reservoirs in KSA and has currently seven projects under-development with a capacity of 7.1 M m^3 expected to be online by 2022. Available and under-development capacity is spread across eight regions, as seen in Figure 48.

Around **76%** of current and under construction capacity is found in Makkah & Riyadh regions. Regions of Tabuk, Al Jawf, Qassim, Najran and Eastern Province do not currently have any strategic reservoirs

Figure 48: Existing and under construction strategic reservoirs in KSA

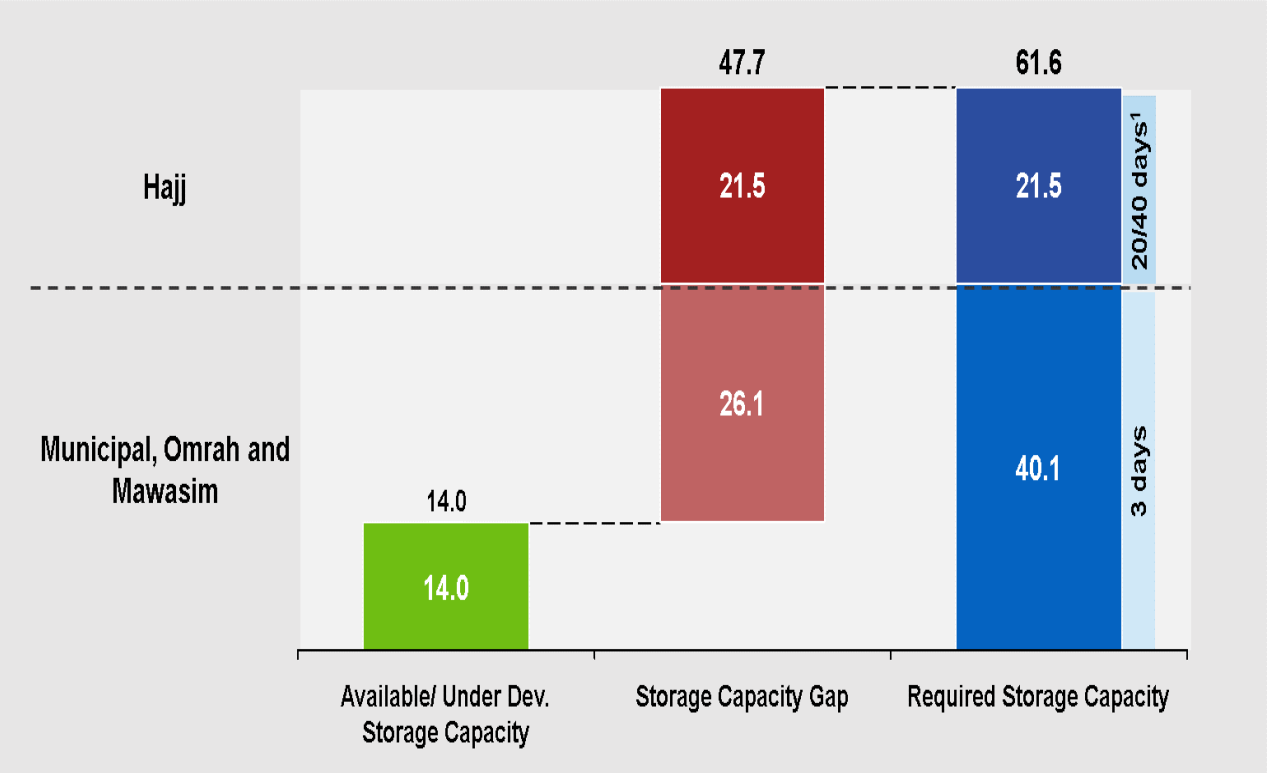


Source: MEWA, NWC

As such, a gap in water storage capacity of 47.7 M m^3 needs to be filled by 2022, which is comprised of 65% of the required emergency demand and 100% of the required Hajj peak demand. This is illustrated in Figure 49.

Figure 49: Water storage capacity gap against 2022 targets

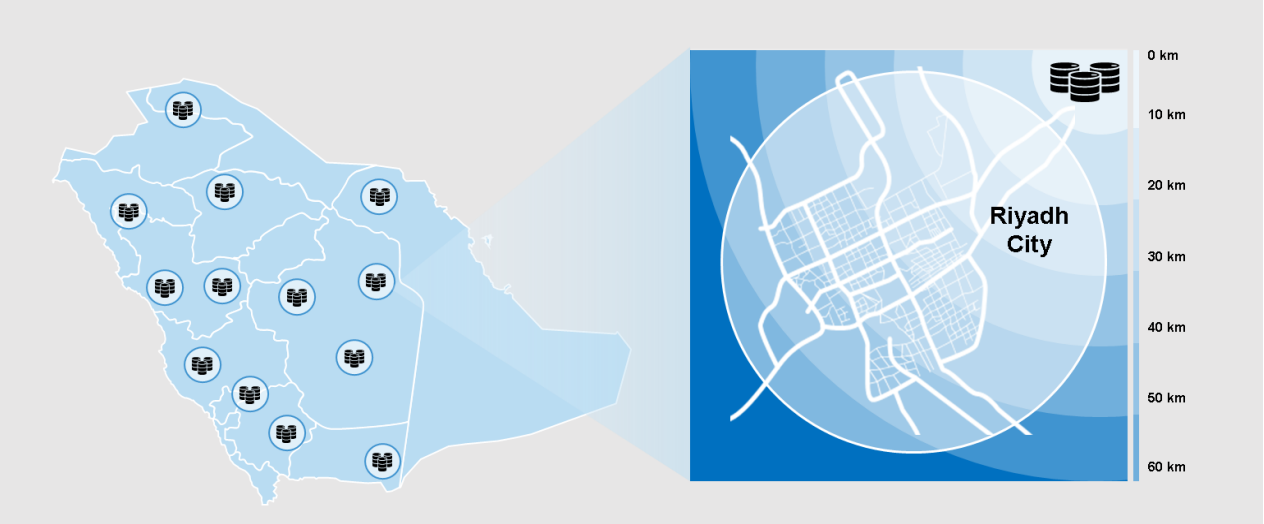
(Million m^3)



To fill this gap, strategic reservoirs need to be located in close vicinity to the cities in order to ensure proximity to users and in an effort to reduce transmission risks and costs. Strategic reservoirs are implemented so as to cover a service area within a radius of 60 kilometers of the city, while taking into account the direction of the transmission lines, as illustrated in Figure 49 below. This policy was set by MEWA in order to not only reduce transmission risks but also to allow for greater maneuverability in emergency cases, facilitating for instance, the transport of water via tankers from the reservoirs to the nearby city.

Storage gaps were identified per city/ group of cities with primary focus placed on cities with gaps over ~1M m3.

Figure 50: Water reservoirs area coverage



Source: MEWA

2. Regional Outlook

The focus throughout this section is in regards to meeting the strategic storage requirements for 2022 in the cities with the largest gaps identified and summarized in the table below:

Table 39: Regional outlook strategic reservoirs capacity plan

Region	Capacity required by 2022 (M m^3/d)
Makkah Cities	17.00
Madinah City	6.44
Riyadh City	2.87
Eastern Province Cities	4.90
Qassim Cities	1.01
Tabuk	0.74
Jazan Cities	0.61
Total capacity (m^3)	33.57

i. Makkah

The water needed to meet municipal demand in Makkah reaches 758,000 m^3/d in 2022. With a 3-day target, a strategic storage capacity of 2.27M m^3 is required in 2022 for municipal demand. In addition, Hajj demand in Makkah is expected to reach 0.95M m^3/d in 2022, as shown in Table 40. After taking into consideration 80% of the Hajj demand and the 20-day target in Makkah, storage capacity reaches 15.17M m^3 in 2022. The total storage capacity required for strategic and peak Hajj demand in Makkah amounts to 17.44M m^3 in 2022. . In terms of available supply, Makkah available/ under construction strategic storage capacity is 3.84M m^3, distributed across five storage sites as described in Table 41. As such, a storage capacity gap of 13.60 M m^3 exists to meet the 2022 target in Makkah. As only Mughammas & Juaranah areas are ready for construction, only a storage capacity of 10.0M m^3 will be constructed initially.

Table 40: Makkah population forecast, municipal water requirements and Hajj demand

	2020	2021		2022	2023	2024	2025	2026
Population Forecast (Million)	2.02	2.06		2.09	2.12	2.15	2.18	2.21
Municipal Water Requirements ('000 m^3/d)	743	751		758	764	769	763	763
Hajj Demand (Million m^3/d)	0.83	0.90		0.95	0.99	1.04	1.07	1.10

Table 41: Available water reservoirs in Makkah by 2022

Storage Site	COD	Type	Capacity *in* m^3
Almoaisem in Mena		Steel	760,000
Old Almoaisem Tank		Steel	600,000
Alshhada'a Tanks		Steel	560,000
Arafat Tanks		Steel	560,000
Almagmas Tanks	UC	Steel	1,360,000
Total			3,840,000

ii. Madinah

Madinah city's water needed for municipal demand, increases throughout the years and reaches 855,000 m^3/d in 2022. With a 3-day target, a strategic storage capacity of 2.57M m^3 is required in 2022 for municipal demand purposes. Furthermore, Hajj demand exists in Madinah and is expected to reach 0.20M m^3/d in 2022, as shown in Table 42. After catering for 80% of the demand (which will be supplied by storage tanks) and taking into consideration the 40-day target in Madinah, storage capacity for Hajj demand reaches 6.36M m^3/d in 2022. In total, the storage capacity required for strategic and peak Hajj demand in Madinah amounts to 8.9M m3 in 2022.

Table 42: Madinah population forecast, municipal water requirements and Hajj demand

	2020	2021	2022	2023	2024	2025	2026
Population Forecast (Million)	1.42	1.44	1.47	1.49	1.51	1.53	1.55
Municipal Water Requirements ('000 m^3/d)	705	710	855	859	863	858	858
Hajj Demand (Million m^3/d)	0.17	0.19	0.20	0.21	0.22	0.22	0.22

On the other hand, Madinah's available strategic storage capacity is of 2.49M m3, distributed across the seven storage sites shown in Table 43. As such, a storage capacity gap of 6.44M m3 should be filled in 2022 in Madinah through construction of new strategic reservoirs.

Table 43: Available water reservoirs in Madinah by 2022

Storage Site	COD	Type	Capacity *in* m^3
Main Station Tank	1981	Concrete	90,000
High Pressure Tanks	1992	Concrete	250,000
Low Pressure Tanks	1992	Concrete	200,000
Shelf Tank	2002	Concrete	100,000
Azizia Tanks	2007	Concrete	350,000
Tanks South of the City	2012	Concrete	1,000,000
Tanks East of the City	2013	Concrete	500,000
Total			2,490,000

iii. Jeddah

The growing population in Jeddah leads to the increase of water needed to meet municipal demand requirements, resulting in 1.75M m^3/d in 2022, as shown in Table 44. With a 3-day target and the need for additional storage capacity to receive water from Rabigh and Shuaibah due to the phase-out of the Jeddah plants, a strategic storage capacity of 9.06 M m^3 is required in 2022. On the other hand, Jeddah's available/ under-construction strategic storage capacity is 4.06M m^3, distributed across six storage sites, as shown in Table 45. As such, a storage capacity gap of 5.00M m^3 should be filled in 2022 through construction of new strategic reservoirs.

Table 44: Jeddah population forecast and municipal water requirements

	2020	2021	2022	2023	2024	2025	2026
Population Forecast (Million)	4.52	4.60	4.67	4.74	4.81	4.87	4.93
Municipal Water Requirements (Million m^3/d)	1.71	1.73	1.75	1.77	1.78	1.77	1.76

Table 45: Available water reservoirs in Jeddah by 2022

Storage Site	COD	Type	Capacity *in* m^3
Phase 1	2014 / 2015	Concrete	2,062,500
Phase 2	2017	Steel	1,000,000
No.1	UC	Concrete	250,000
No.2	UC	Concrete	250,000
No.3	UC	Concrete	250,000
No.4	UC	Concrete	250,000
Total			4,062,500

iv. Taif

The growing Taif population leads to the increase of water needed to meet municipal demand requirements, resulting in 425,000 m^3/d in 2022, as shown in Table 46. With a 3-day target, a strategic storage capacity of 4.03M m^3 is required in 2022, which includes additional storage capacity as Taif has only a single supply source. In terms of available supply, Taif available/ under construction strategic storage capacity is 2.03M m^3, distributed across four storage sites as described in Table 47 below. Therefore, a storage capacity gap will result in 2.00 M m^3 that should be filled by 2022 through construction of new strategic reservoirs.

Table 46: Taif population forecast and municipal water requirements

	2020	2021	2022	2023	2024	2025	2026
Population Forecast (Million)	1.00	1.01	1.03	1.05	1.06	1.07	1.09
Municipal Water Requirements ('000 m^3/d)	412	420	425	431	436	436	436

Table 47: Available water reservoirs in Taif by 2022

Storage Site	COD	Type	Capacity *in* m^3
Alhada Tank	2018	Steel	300,000
Alkhaldyah Alhada Tanks	UC	Steel	1,530,000
Alrahmanyah Tank	UC	Steel	100,000
Ashareef Tank	UC	Steel	100,000
Total			2,030,000

v. Eastern Province Cities

"Eastern Province cities" consist of nine adjacent cities, the largest in terms of population size being: Al Ahsa, Khobar, Dhahran, Dammam, Saihat, Qatif, Safwa, Ras Tanura, Nabiyah and Jubail. The growing population in these cities leads to an increasing total water demand that will reach 1.65M m^3/d in 2022. This is shown in Table 48 below. With a 3-day strategic storage target, a capacity of 3.51M m^3 is required for emergency municipal demand. Due to the lack of current storage capacity in the Eastern Province cities, the gap will result in 3.51M m^3 that should be filled by 2022 through construction of new strategic reservoirs.

Table 48: Eastern Province cities population forecast and municipal water requirements

	2020	2021	2022	2023	2024	2025	2026
Population Forecast (Million)	4.42	4.49	4.56	4.63	4.70	4.76	4.78
Municipal Water Requirements (Million m^3/d)	1.60	1.62	1.63	1.65	1.66	1.65	1.65

vi. Riyadh

As shown in Table 49, Riyadh has an urban or municipal demand for water of 2.49M m^3/d in 2022. Municipal demand will then require a strategic storage capacity of 7.47M m^3 in 2022. In terms of available supply, Riyadh available/ under construction strategic storage capacity is 4.60M m^3, distributed across five storage sites as described in Table 50. Therefore, a storage capacity gap of 2.87M m^3 should be filled in 2022 through the construction of new strategic reservoirs.

Table 49: Riyadh population forecast and municipal water requirements

	2020	2021	2022	2023	2024	2025	2026
Population Forecast (Million)	6.74	6.86	6.97	7.07	7.17	7.27	7.36
Municipal Water Requirements (Million m^3/d)	2.44	2.47	2.49	2.51	2.53	2.51	2.50

Table 50: Available water reservoirs in Riyadh by 2022

Storage Site	COD	Type	Capacity *in* m^3
TGNW	2018	Steel	1,000,000
TGW	2016	Steel	600,000
TGE	UC	Steel	1,000,000
SALBOUKH	UC	Steel	1,000,000
TGSW	UC	Steel	1,000,000
Total			2,490,000

vii. Qassim Cities

This section covers four cities, referred to as "Qassim cities": Buraydah, Unaizah, Badayea and Bukayriyah. These cities fall within less than 60km apart and have a large population size. The water needed to meet municipal demand in these cities increases to 0.34M m^3/d in 2022 as shown in Table 51. Given the 3-day target, a strategic storage capacity of 1.01M m^3 is required in 2022 for municipal demand. There are no existing or under construction strategic storage capacity serving the Qassim cities. Therefore, a storage capacity gap of 1.01M m^3 should be filled in 2022 through the construction of new strategic reservoirs.

Table 51: Qassim cities population forecast and municipal water requirements

	2020	2021	2022	2023	2024	2025	2026
Population Forecast (Million)	0.91	0.92	0.94	0.95	0.97	0.98	0.97
Municipal Water Requirements (Million m^3/d)	0.33	0.33	0.34	0.34	0.34	0.34	0.34

viii. Tabuk

The water needed for municipal demand in Tabuk increases throughout the years and reaches 245,000 m^3/d in 2022 as shown in Table 52 below. With a 3-day target, a strategic storage capacity of 735,000 m^3 is required in 2022 for municipal demand purposes. With no available capacity in Tabuk, the gap will result in 735,000 m^3 that should be filled by 2022 through construction of new strategic reservoirs.

Table 52: Tabuk population forecast and municipal water requirements

	2020	2021	2022	2023	2024	2025	2026
Population Forecast (Million)	0.663	0.674	0.685	0.700	0.705	0.715	0.724
Municipal Water Requirements (Million m^3/d)	240	240	250	250	250	250	250

ix. Jazan Cities

Four cities are covered in this section, Jazan, Abu Arish, Sabya and Damad, which are referred to as "Jazan cities". These cities fall within less than 60km apart and have a large population size. The water needed to meet municipal demand in these cities increases to 231,000 m^3/d in 2022 as shown in Table 53. Given the 3-day target, a strategic storage capacity of 692,000 m^3 is required in 2022 for municipal demand. In terms of supply, Jazan cities' available strategic storage capacity is a steel tank with capacity of 80,000 m^3 that has been operating since 2017. Therefore, a storage capacity gap of 612,000 m^3 should be filled in 2022 through the construction of new strategic reservoirs.

Table 53: Jazan cities population forecast and municipal water requirements

	2019	2020	2021	2022	2023	2024	2025
Population Forecast (Million)	0.624	0.635	0.645	0.655	0.664	0.673	0.681
Municipal Water Requirements ('000 m^3/d)	226	229	231	233	234	232	232

VIII. WATER TRANSMISSION LINES

1. National Policies and Context

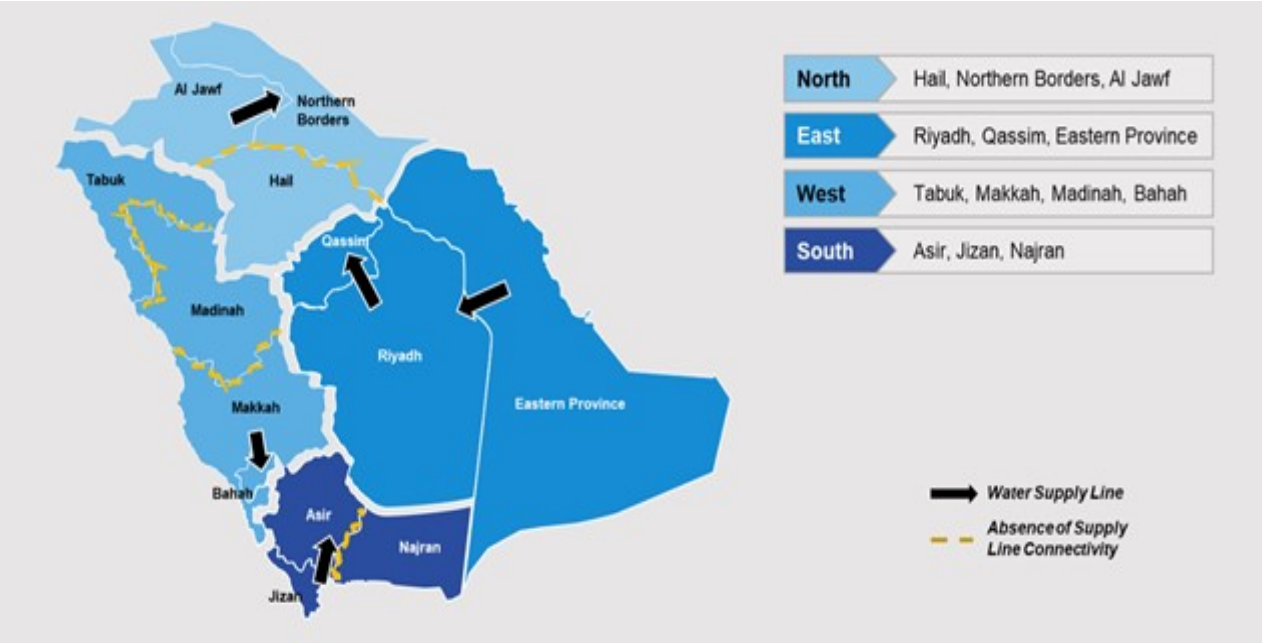
The regular supply situation is considered part of the national supply strategy and includes supplying the regions through local sources to the maximum extent possible, in addition to linking with the neighboring regions when needed. The water supply in the Kingdom of Saudi Arabia is developed and partially connected and does not need improvement except with regard to future demand growth developments and further linkage could improve the water supply in several regions in the event of the interruption of the main supply systems. The Saudi Water Partnerships Company relies on the development of its projects on the seven-year resource plan that it issues, and the Ministry of Environment, Water and Agriculture adopts it, which is built on a number of policies, especially the National Water Strategy 2030 and the Ministry's supply and demand plan. According to that, this statement is in line with the strategic direction of the water sector in KSA by translating the current policies into applicable executive plans, draw the privet sector rout for the SWPC projects. For that, to reach the final goal of the NWS 2030, which is filling the gap between supply and demand, it has been decided that SWPC adds the water transmission projects to it list.

The WSA could be divided into four areas, as follows:

- Northern Supply Group: is composed of three regions: Hail, Northern Borders and Al Jawf.
- Eastern Supply Group: is composed of three regions: Riyadh, Eastern Province and Qassim.
- Western Supply Group: is composed of four regions: Tabuk, Makkah, Madinah and Bahah.
- Southern Supply Group: is composed of three regions: Asir, Jizan and Najran.

There are several transmission systems are available as of now between most of the areas, as shown in figure 50 below:

Figure 51: KSA's four main supply groups



This section focuses on the demand of the transmission lines in the Kingdom's regions with the designed capacity as the table below:

Table 54: Water Transmission Systems

Water Transmission System (WTS) Projects	Capacity* (m^3/d)	Length* (Km)	Makkah	Baha	Madinah	Asir	Jazan	Tabuk	Eastern Province	Riyadh	Qassim
Rabigh - Jeddah	600,000	120	100%								
Riyadh – Qassim	500,000	572									100%
Yanbu - Rayis - Rabigh	1,500,000	136	100%								
Ras Mohaisan – Baha - Makkah	400,000	800	86%	14%							
Ras Al-Khair – Khafji – Hafr Albatin	200,000	350							100%		
Tabuk - Ula	400,000	380			16%			84%			
Jazan	300,000	250					100%				
Jubail – Nuairyah - Buraydah	600,000	560	100%								
Total	4,500,000	3,168									

* All capacities and lengths mentioned here are in the study and design stage, the figures will be confirmed after the sites survey and final design.

IX. SWPC PROCUREMENT PLAN

Today SWPC has four operational desalination projects located in Makkah and Jazan regions, providing 1.49M m^3/d of water and 1.75 GW of electricity. The construction of Rabigh 3 IWP and Shuqaiq 3 IWP is well under way in Makkah and Jazan, which will provide 1,050,000 m^3/d starting from 2021. SWPC has also progressed in the tendering and development of other projects, with project agreements signed for Dammam West ISTP, Jeddah Airport 2 ISTP and Taif ISTP, and the desalination projects Yanbu 4 IWP and Jubail 3A & 3B IWP are under bids evaluation.

This section further summarizes SWPC's procurement plan over the planning period 2020 to 2026, inclusive, with particular emphasis on 2020 and 2021. This covers the procurement for water desalination plants, sewage treatment plants and strategic reservoirs. Procurement timelines for each of these plants and/or strategic reservoir are based on the following construction timelines:

- 12 to 14 months for tendering any particular plant;
- for constructing a water desalination plant:
  - 36 months for a large desalination plant (e.g.: 600,000 m^3 per day)
  - 32 months for a medium desalination plant (e.g.; 300,000 m^3 per day)
- for constructing a sewage treatment plant:
  - 33 months for large and medium sewage treatment plant (e.g.: 150,000 m^3 per day)
  - 24 months for a small sewage treatment plant (e.g.: 25,000 m3 per day); and,
- 24 months for constructing a strategic reservoir.

These timelines are indicative only, and may vary depending on the size, location and unique features of the plant involved. Changes in Government policies and direction may also alter these timelines.

The required water desalination, sewage treatment and strategic reservoirs required during the planning period were identified earlier in this statement. It shows their CODs, capacities and when tenders are likely expected to be issued to the market. Taking into consideration the above timelines, SWPC plans to issue the following tenders. These timelines are subject to change.

The procurement options for strategic reservoirs are under consideration by SWPC and may involve isolated tanks or tank farms, or strategic reservoirs bundled with IWPs or a combination of both.

		Appoint Advisors	EOI	RfQ	RfP
IWP	Jubail 3B	√	√	√	Q1 2020
	Rabigh 4	Q1 2020	Q2 2020	Q2 2020	Q2 2020
	Jubail 6 (Al Hassa)	Q1 2020	Q4 2020	Q4 2020	Q1 2021
	Jazan 1	Q1 2020	Q4 2021	Q4 2021	Q1 2022
	Ras Mohaisan	Q1 2020	Q2 2020	Q3 2020	Q3 2020
	Shuqaiq 4	Q4 2021	Q1 2023	Q1 2023	Q2 2023
	Ras Al Khair 2	Q4 2021	Q2 2022	Q2 2022	Q2 2022
	Ras Al Khair 3	Q4 2021	Q3 2022	Q3 2022	Q4 2022
	Tabuk 1	Q1 2020	Q1 2021	Q1 2021	Q1 2021
	Rabigh 5	Q1 2023	Q2 2023	Q2 2023	Q3 2023
	Jubail 4	Q1 2023	Q4 2023	Q4 2023	Q1 2024
	Rayis 2	Q1 2023	Q2 2024	Q3 2024	Q3 2024
ISTP	Buraidah 2	√	Q1 2020	Q1 2020	Q1 2020
	Tabuk 2	√	Q1 2020	Q1 2020	Q1 2020
	Madinah 3	√	Q2 2020	Q2 2020	Q2 2020
	Al Haer	Q1 2020	Q1 2021	Q1 2021	Q2 2021
	Riyadh East	Q1 2020	Q1 2021	Q1 2021	Q2 2021
	Khamis Mushait	Q1 2020	Q1 2022	Q1 2022	Q1 2022
	South Najran	Q1 2020	Q1 2022	Q1 2022	Q1 2022
	Abu Arish 3	Q1 2020	Q1 2022	Q1 2022	Q1 2022
	North Jeddah 1	Q1 2020	Q1 2022	Q1 2022	Q1 2022
	Hafar Al Batin 2	Q3 2023	Q1 2024	Q1 2024	Q1 2024
	Kharj 3	Q3 2023	Q1 2024	Q1 2024	Q1 2024
Small STP	Jazan Cluster	Q1 2020	Q2 2020	Q3 2020	Q3 2020
	Western Cluster	Q1 2020	Q2 2021	Q2 2021	Q2 2021
	Central Cluster	Q1 2020	Q1 2022	Q1 2022	Q2 2022
	Northern Cluster	Q1 2020	Q4 2022	Q1 2023	Q1 2023
	Northwestern Cluster	Q1 2020	Q2 2023	Q2 2023	Q2 2023
	Southern Cluster	Q1 2020	Q4 2024	Q1 2025	Q1 2025
	Eastern Cluster	Q1 2020	Q1 2025	Q1 2025	Q2 2025
ISWR	Makkah 1 (Moghammas)	√	Q3 2020	Q3 2020	Q3 2020
	Makkah 2 (N & S Jeddah)	√	Q3 2021	Q3 2021	Q3 2021
	Makkah 3 (Jmoom, Taif)	√	Q3 2022	Q3 2022	Q3 2022
	Eastern Province	Q4 2022	Q2 2023	Q2 2023	Q2 2023
	Madinah	Q4 2022	Q2 2024	Q2 2024	Q2 2024
	Qassim Cities	Q4 2024	Q2 2025	Q2 2025	Q2 2025
	Riyadh	Q4 2024	Q2 2025	Q2 2025	Q2 2025
	Tabuk	Q4 2024	Q2 2026	Q2 2026	Q2 2026
	Jazan Cities	Q4 2024	Q2 2026	Q2 2026	Q2 2026
IWTP	Yanbu – Rayis - Rabigh	√	Q2 2020	Q2 2020	Q3 2020
	Riyadh - Qassim	√	Q4 2020	Q4 2020	Q2 2021
	Ras Mohaisen-Baha-Makkah	√	Q4 2021	Q1 2022	Q1 2022
	Jubail - Nuayriah - Buraydah	√	Q4 2022	Q4 2022	Q1 2023
	Rabigh - Jeddah	Q3 2022	Q1 2023	Q2 2023	Q2 2023
	Tabuk - Ula	Q3 2022	Q2 2023	Q3 2023	Q3 2023
	Jazan	Q3 2022	Q1 2024	Q1 2024	Q2 2024
	Ras Alkhair - Khafji - Hafr AlBatin	Q3 2022	Q4 2024	Q4 2024	Q1 2025
					√ = *Completed*

XI. CONCLUSION

This 7-year statement is SWPC's plan for future projects covering the period 2020 to 2026. It is an ongoing forward plan for the Company and as such, is subject to change depending on not only general economic conditions but also Government policy and direction regarding water sector development in the Kingdom. This statement has been formally reviewed. This review take into consideration MEWA direction as well as the future plans of SWCC and NWC, as their plans have a material impact on SWPC's ability to make available potable water to the citizens throughout the Kingdom.

Future updates will continue to focus on a 7-year time horizon, as this period allows sufficient lead time to plan and construct new plants. It also provides sufficient lead time for developers, suppliers, manufacturers and others in the industry both inside and outside the Kingdom to plan their future activities to meet the growing demand for desalination water and sewage treatment facilities.

Sustainable Development Goals (SDGs) transform the world, Climate Change drives international community to act against water challenges, Saudi Arabia Vision 2030 has demonstrated that Public-Private Partnership in water business is successful not only on commercial level but also as a promising and realistic solution to water shortage even in most and vast arid countries. As a state owned company, SWPC is very keen to work with water sectors stakeholders and business partners to insure water solutions' viability and sustainability. SWPC long term plans and mega projects feeds water market dynamics which, eventually, helps technology providers to prepare more efficient and competent solutions. In parallel, "Independent Water Project" developers work out better business deals and economic water tariff and thus, SWPC and all these components work together, integrate and bring global sustainable solutions to water challenges.

SWPC
7 YEARS STATEMENT
2020-2026

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