MAJID AL FUTTAIM ماجد الفطيم

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EVERYDAY

INVESTING IN THE FUTURE

OPPORTUNITIES FOR CLEAN WATER INVESTMENT

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1. EXECUTIVE SUMMARY

This research and recommendations report establishes the context of water issues, infrastructure and technology in the geographies where Majid Al Futtaim operates in order to identify clean water investment opportunities to support Majid Al Futtaim's commitments to be Net Positive in water by 2040.

The report reviews policy direction as well as the levels of current government and private investment in the region. It focuses on the UAE as the country with Majid Al Futtaim's largest water footprint, and it establishes four options for investment:

(1) Partnering with local authorities to develop renewable-powered reverse osmosis desalination plants
(2) Creating an offsetting strategy and investing into local offsetting
(3) Investing in small-scale on-site water generation technology, and
(4) Investing in innovation.

Investment Opportunity	Financial Investment
Partnering with local authorities e.g. to invest in renewable-powered reverse osmosis desalination plant	Very high
Local offsetting e.g. financing clean water solutions	Low to high
Small-scale water generation e.g. air to water technology	Medium
Investment in innovation	Low to high

Table 1: Investment Opportunity Summary

These options are presented with associated actions for short-term (including actions for 2020) and medium-term as well as with recommended routes to financing.

If Majid Al Futtaim was to pursue these options within the next few years, this would support in eliminating the water footprint compared with the 2016 baseline, subject to offsetting and additionality strategy and rules that will be developed in due course.

2. BACKGROUND

Majid Al Futtaim is committed to the implementation and delivery of a comprehensive sustainability strategy, *Dare Today, Change Tomorrow*, through which Majid Al Futtaim manages the socio-economic and environmental issues that are most material to its business. *Dare Today, Change Tomorrow* has three fundamental business priorities:

- Transforming the lives in the communities Majid Al Futtaim serves, to provide a healthy, fulfilling and sustainable way of life.
- Rethinking resources, addressing Majid Al Futtaim's use of resources to make a Net Positive impact.
- Empowering our people to unlock their full potential.

One of the issues under Rethinking Resources is Net Positive Water, whereby Majid Al Futtaim strives to ensure the availability of more clean water than it consumes across its operations, developments and tenants' activities by 2040.

Water is a key issue in the region Majid Al Futtaim operates in since MENA is the world's most water-scarce region. Activities in the region consistently extract significant amounts of ground and surface water, with water availability running dangerously low as a consequence. While countries in the region have highlighted water resource management as a key item in their policies, it remains a critical issue, especially in countries with older water infrastructure and varying access to technology in the region.

The United Arab Emirates, where 60% of Majid Al Futtaim's water footprint is located, is investing heavily in desalination facilities which now provide the majority of its water supply. However, current methods for desalination are very energy-intensive and many facilities are powered by non-renewable energy sources. While the local water authorities provide desalinated water to businesses and private consumers, agriculture – which uses the largest proportion of water in the region - still heavily relies on ground and surface water extraction.

3. PURPOSE

The purpose of this research and recommendations report is to explore Net Positive solutions to water beyond water use reduction initiatives within Majid Al Futtaim's business. The report will focus on the countries that amount to 90% of Majid Al Futtaim's water footprint due to both the size of the water footprint and the influence that Majid Al Futtaim has through its presence in the region. This report will explore how Majid Al Futtaim can align its clean water investment strategy with local policy and planned developments and recommend areas for further research and collaborations.

4. THE CONTEXT IN WHICH MAJID AL FUTTAIM OPERATES

This section will cover the geographical conditions, types of water supply, water technology options, water distribution networks, policy and regulation, and market access conditions in the regions where Majid Al Futtaim operates. This background information will set up the context in which the investments will need to be made and lead to recommendations for clean water investment opportunities.

4.1. GEOGRAPHICAL CONDITIONS

The map below displays how Majid Al Futtaim's water footprint is distributed across the region where it operates. The majority of Majid Al Futtaim's water footprint (90%) is in the seven countries highlighted in blue, with the UAE contributing to 60% of the water footprint in 2018. Because of this distribution, it is recommended that Majid Al Futtaim concentrates its efforts on the UAE, Egypt, Bahrain, Oman, Saudi Arabia and Lebanon and, with the UAE and Egypt as the Company's primary focus.

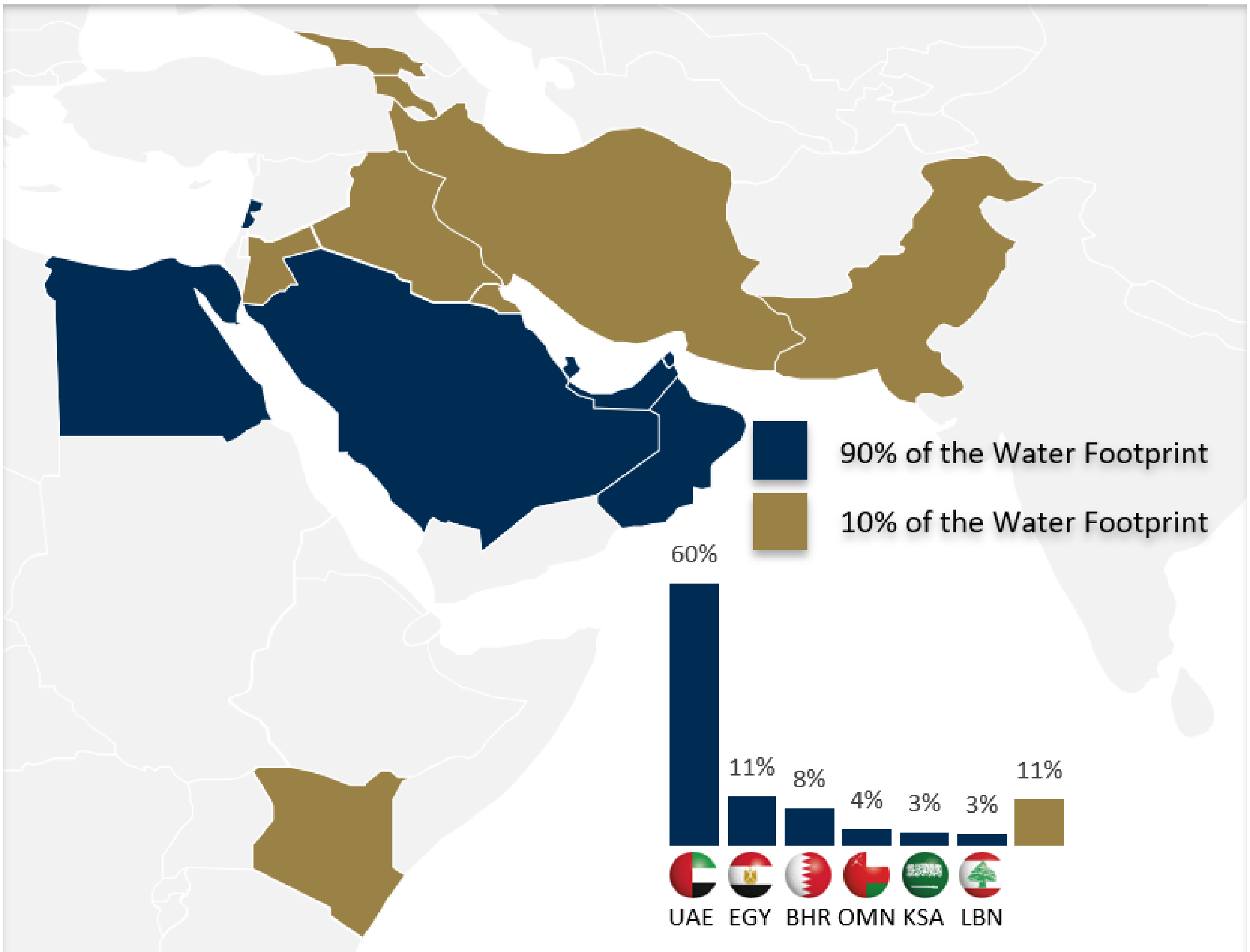

Figure 1: Distribution of Majid Al Futtaim's Water Footprint

As Majid Al Futtaim's operations are spread across multiple geographies, there are different water issues across the business. In order to better understand the challenges and before looking into investment opportunities, the different sources of water in the region need to be understood.

4.2. TYPES OF WATER SUPPLY

There are several different types of water supply utilized in the region, the most common of which are outlined below.

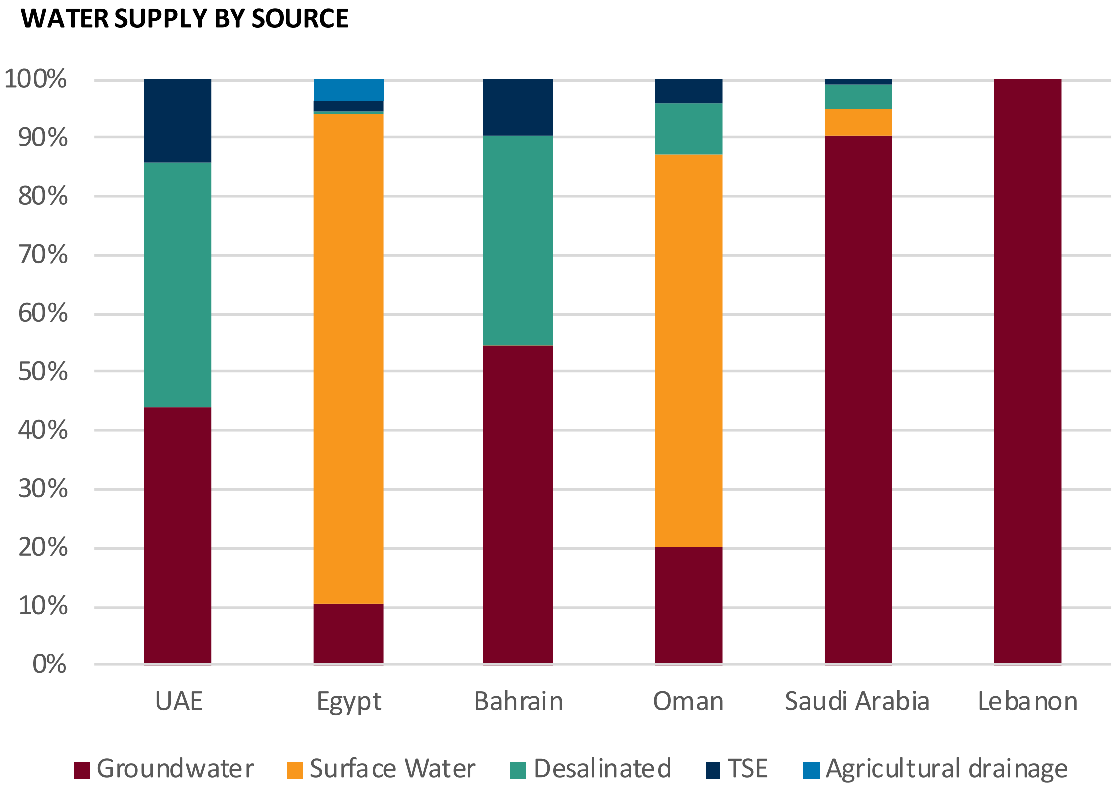

Figure 2: Water Supply by Source Countries with 90% of Majid Al Futtaim's Water Footprint

4.2.1. GROUNDWATER

Groundwater refers to underground sources of water, most commonly accessed through wells. It is a common, traditional source of water and is still largely used today for agricultural purposes and for water supply in more remote areas. At present, the UAE and Bahrain rely on groundwater for over 40% of their needs while Saudi Arabia and Lebanon almost entirely rely on groundwater[2][3][4][5]. However, groundwater extraction rates are unsustainably high and groundwater shortages are forecasted in the near future, particularly during drought events. There is a further complication with groundwater use in that aquifers and water sources can often span multiple countries, and unregulated and excessive extraction can become a political issue. Groundwater in some areas tends to have high salt levels and may require treatment before it is useable[6].

Another issue relates to illegal wells and uncontrolled private water extraction which make it difficult to track the status of groundwater resources, often leading to overutilization[7]. Such practices can also pose a higher risk of contaminating the groundwater source with pollutants. In extreme cases, overutilizing a single aquifer can result in ground subsidence and could have devastating effects across large areas[8].

Groundwater is often used in agriculture and is frequently the only source of water available in more remote areas, away from urban water infrastructure. Connecting large agricultural communities to regulated, sustainable water supplies could be a solution for reducing groundwater use.

4.2.2. SURFACE WATER

Another common source of water is surface water such as lakes and rivers. Egypt and Oman predominately depend on surface water resources with Egypt heavily reliant on the Nile River[9][10]. Surface water has similar issues to groundwater but tends to be more severely affected through untreated wastewater discharge, agricultural runoff and other pollutants. As running water can be used for energy generation, surface water can be affected by installing dams which, along with pollution, can adversely affect users downstream.

Unmonitored extraction of surface water can damage the water ecosystem as well as the environment that feeds off that particular source. Surface water overuse can reduce water inflow into larger bodies of water such as lakes and seas, reducing water levels and raising salinity levels. This can adversely affect the local human activity as shipping routes may need to change and fish population to significantly reduce. These issues are often exacerbated as surface water resources are frequently shared by multiple countries and the countries downstream can be more severely affected. The Aral Sea is an extreme example of surface water overuse that resulted in one of the greatest man-made environmental disasters[11].

4.2.3. AGRICULTURAL DRAINAGE

While agricultural run-off can be a potential pollutant, it can also be a source of water when treated. It is a valuable source of water that has already been extracted from other sources and can be made available for re-use. However, subject to what the agricultural water is used for, it requires careful monitoring and treatment before it can be re-used. Currently only Egypt covers a significant proportion of its water supply from agricultural drainage at 4%[12].

Releasing untreated agricultural drainage into the environment can be very harmful to both the local ecosystem and human activities. As agricultural drainage tends to be rich in nutrients, excessive leakage into surface water sources can cause eutrophication. This effectively unbalances the water ecosystem and can result in algal bloom. Agricultural drainage can also contain harmful pollutants that can adversely affect the local population that relies on water sources[13].

4.2.4. TREATED SEWAGE EFFLUENT (TSE)

Sewage effluent is similar to agricultural run-off in that it can be a major source of surface water or groundwater pollution. However, TSE technology allows to not only neutralize the potential pollutants in sewage effluent but also to make it fit for re-use in agriculture and irrigation or, with sufficient treatment, even as potable water. TSE is a great option in countries with water pollution problems, such as Egypt and Lebanon, and in some instances can be taken far enough to supply the majority of a country's drinking water supply as is the case in Namibia[7][12][14]. TSE is widely used for irrigation purposes around the world as it is easier to treat wastewater to an appropriate standard for irrigation and the nutrients found in TSE can be beneficial in agriculture as that lowers the need for fertilisers[41].

If untreated sewage effluent is released into the environment and reaches surface water resources or aquifers, it can have devastating effects. Untreated human sewage can contain pathogens and in more extreme cases may lead to outbreaks of various diseases in populations reliant on the water source in question[15]. Similar to agricultural drainage, untreated sewage effluent can lead to eutrophication and unbalance the local ecosystems[13].

4.2.5. SALT WATER AND BRINE

Finally, the most abundant type of water on earth is sea water which most of the countries Majid Al Futtaim operates in have access to. However, sea water requires treatment before it is available for use in any way – it needs to be desalinated not only for domestic use but also for applications in agriculture and industrial processes. Desalination technology has helped to alleviate water stress in a water scarce region that cannot continue to rely on its already low ground and surface water resources[17].

New desalination technology offers energy efficiency improvements, but currently uses methods that require a lot of electricity to run. In the UAE, desalination is typically coupled with a power plant that produces electricity for this reason. The majority of these power plants run on fossil fuels and therefore contribute to a high electricity and water carbon footprint in the region. The UAE's electricity emission conversion factor is relatively high at 0.71 $kgCO_2e/kWh$[18] when compared to the United Kingdom's 0.28 $kgCO_2e/kWh$[19] as an example and is typical of the region. Due to the high energy use, it is also an expensive way to produce water. The UAE (42%), and Bahrain (36%) rely heavily on water desalination[2][3][16].

Another concern with desalination is the treatment of desalination waste. One of the by-products of desalination is salt and highly concentrated salt water (brine) which is continuously being pumped into the Arabian Gulf. The mean annual salinity in the Arabian Gulf is 40.5 g/kg but local salinity levels near the Arabian coast can rise as much as 4.3 g/kg above this level due to brine discharge from desalination[20]. Significantly increased salt levels adversely affect local ecosystems, which means that the process as it stands is often considered harmful to the environment. However, another effect of increasing salinity in the Arabian Gulf is the need to desalinate a continuously saltier source of water, making the process less efficient as time goes on. A further complication is the disposal of chemicals used in the desalination process itself. However, there are ways of mitigating these risks such as placing brine in evaporation ponds or securing it underground[21].

4.3. WATER TECHNOLOGY OVERVIEW

The water industry worldwide is now moving towards Reverse Osmosis (RO) desalination plants due to their significantly lower energy consumption while other technologies are continuously being explored. RO is a water purification process based on partially permeable membrane to remove ions, molecules and larger particles from drinking water – the membrane allows water to pass but blocks other components such as salt molecules. However, in areas where feedwater (salt water used as input for desalination) has challenging characteristics, Forward Osmosis (FO) could be used as an alternative method or precursor to RO due to is inherently low fouling characteristic, which means that less unwanted material accumulates in the machinery during the process. In challenging conditions, RO may require additional processes to filter feedwater before it can be used for desalination while FO can be applied directly. FO has already been successfully applied in Gibraltar, China and Oman. This technology allows for wider application of desalination, where traditional methods would not be efficient[22].

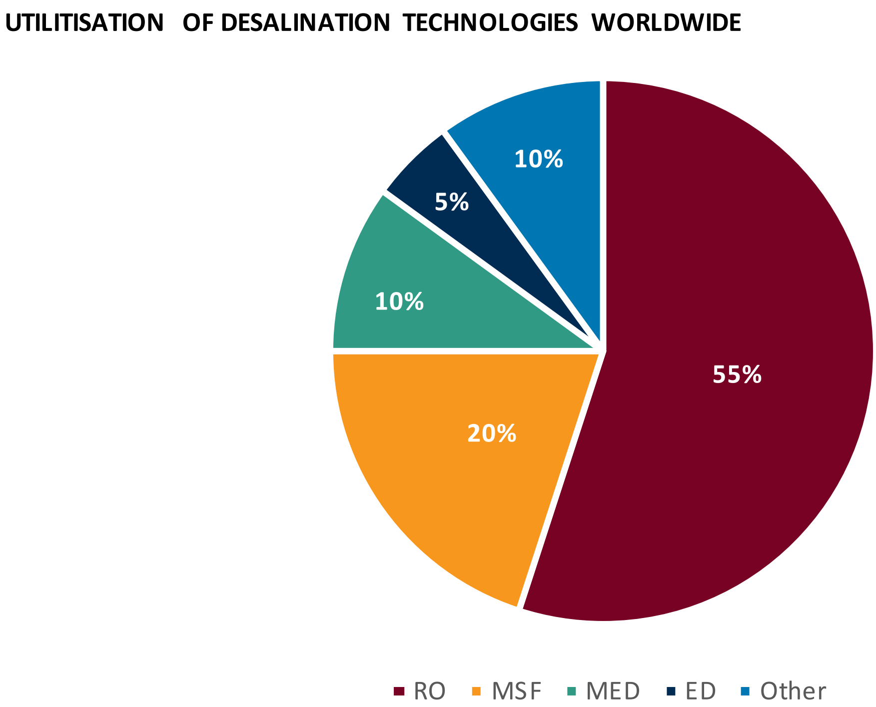

Figure 3: Utilisation of Desalination Technologies Worldwide[23]

Figure 3 illustrates the utilisation of various desalination technologies worldwide. Reverse Osmosis (RO) is now the most-widely used water desalination technology while older Multi Stage Flash (MSF) still holds about 20% of the market and Multi-Effect Distillation (MED) and Electrodialysis (ED) taking up another 15% of the market[23].

Other methods for desalination are continuously being explored, in order to address some of the known issues with RO: sensitivity to high-salinity water – something that may become an issue as the Arabian Coast becomes more saline over time, and RO's inability to have a zero-liquid discharge, which can lead to environmental issues when not treated properly[23].

Even in 2030, with desalination projected to have lower energy requirements, desalinated water would have a large carbon footprint originating from associated energy use. Using IEA's electricity emission conversion factors for the UAE for 2019, the carbon footprint for desalination would be 11.3 kgCO_2e/m^3 water produced. However, this figure could be reduced to zero by coupling water desalination with renewables, which most of the new desalination plants are designed to do in the UAE[24].

PV technology cost is at an all-time low and continues to decrease – recent bids in the Middle East has PV costs as low as 5.84, 2.99, 2.94, 2.4 and 2.34 USD cent/kWh. At costs less than 3 USD cent/kWh renewable electricity becomes cheaper to produce than electricity from fossil fuels – at this point PV-powered desalination would become cheaper than desalination using electricity from fossil fuels. However, in order to benefit from the clean energy supply for desalination, enough investment to generate the required renewables capacity is required. Taking a conservative figure of 3 USD cent/kWh (0.11 AED/kWh), we can calculate that in 2030 the energy cost for water desalination will be at 1.75 AED/m^3[25]. However, this figure only includes the generation of energy required for desalination.

As stated above, many new desalination projects are coupled with renewable energy, minimizing or eliminating the carbon footprint of these operations. Dubai Electricity and Water Authority (DEWA) has announced plans to build a solar-powered RO plant to produce 305 million gallons a day of drinkable water by 2030. There are also plans for large, 6-billion-gallon water reservoirs that could eliminate the need for energy storage equipment necessary to run solar-powered operations during the night. Abu Dhabi is taking a similar approach, contracting a Spanish company Abengoa to build solar desalination plants. Saudi Arabia also plans to launch a commercial solar desalination plant in 2021[21].

Small-scale desalination could be achieved by utilizing solar vacuum tube desalination. It is currently only suitable for small-scale desalination but has a better yield than traditional desalination approaches. Another advantage of the system is that it is possible to couple it with greywater recycling to maximise available space.

Majid Al Futtaim is already exploring air to water technology such as Zero Mass Water, Eshara water and Veragon that can generate safe drinking water from air[37][38][39]. Such small-scale solutions can generate significant amounts of drinking water using air humidity. Further research into this technology through the Enterprise Hub and Innovation Centre for Excellence could generate efficiency and scalability improvements and could enable offsetting opportunities as well.

4.4. WATER DISTRIBUTION NETWORKS

One of the issues plaguing water infrastructure around the world, regardless of the water source, is leakage. Large amounts of water are lost around the world to leaks in the system with estimates at 32 billion m^3 of physical water losses in 2016[26]. Statistics available from 2013 state that the UAE lost more than 10% of its water to leakage while Saudi Arabia lost 35%, Oman lost 36% and Bahrain around 23%. This water is mainly lost during transmission and distribution and while these figures are close to or under the global 35% average, they are too high for the most water-scarce region in the world[27].

These leaks are caused by a number of factors that include soil characteristics, high pressure and erosion of the pipelines that come under constant stress around the water network[27]. Furthermore, while large leakages are not difficult to detect, smaller leakages can be difficult to assess and fix as many pipes run underground. However, Dubai has recently recorded a milestone in reducing water network losses to 6.6% in 2019 – this makes Dubai's water distribution network one of the most efficient in the world[28].

4.5. POLICY & REGULATION

The policy direction in the region is very mixed as the different countries have different issues to address. The UAE has a very strong focus on installing more desalination capacity with new desalination plants planned or already under development. DEWA and Abu Dhabi already supply most of their end users with desalinated water. However, while the desalinated water capacity is growing, there is also increased investment into renewable power desalination plants and Reverse Osmosis (RO) desalination plants that require less energy to run. There is also improvement in other areas of water infrastructure as seen in Dubai's strong water leakage performance[28].

In the UAE, the majority of desalination is currently performed using an older, Multi Stage Flash desalination technology[29]. This technology is very energy intensive and uses 23.4 kWh of electricity for each cubic meter of desalinated water produced. This comes in stark contrast to what RO of sea water uses at 5 kWh/m^3 of desalinated water[30]. In Dubai, for example, only 5% of desalinated water comes from RO plants and is therefore very energy intensive to produce. However, plans are in place to increase RO capacity to 41% of all desalinated water by 2030[24]. When considering this ratio, producing one cubic meter of desalinated water in 2030 would require 15.8 kWh of electricity on average across the total water supply, which is a significant improvement.

In Egypt the policy focuses more on irrigation as agriculture is overwhelmingly the highest water consumer in the country. There are efforts to diversify the water supply and rely less heavily on the Nile. As a result, desalination and water re-use are gaining more traction in Egypt[12]. Bahrain is now in the tail-end of their long-term master plan for water supply from 2006-2020 with emphasis on desalination. While the country saw a lot of investment into desalination, the policies in the country are fragmented and landowners can extract as much ground water as they require[31].

Oman, Saudi and Lebanon rely heavily on their conventional water resources[4][10]. Lebanon stands out with poor water usage data, which can be attributed to prevalent illegal water extraction and private distribution. Policies in Lebanon focus on optimizing their existent facilities and on improving their wastewater treatment to prevent polluting water sources[7].

Table 2 summarises water sources and country water policy focus across the countries that comprise 90% of Majid Al Futtaim's water footprint.

Country	Water Sources	Policy Focus
UAE[21][28][42]	Groundwater: 44% Surface Water: 0% Desalination: 42% TSE: 14% Agricultural Drainage: 0%	Large investments into RO desalination and coupling with renewable energy Water use rationalization and conservation visible through tight leakage controls
Egypt[9][12]	Groundwater: 10% Surface Water: 84% Desalination: 0% TSE: 2% Agricultural Drainage: 4%	Focus on desalination, modern irrigation, water reuse and harvesting sources other than the Nile
Bahrain[3][31]	Groundwater: 55% Surface Water: 0% Desalination: 35% TSE: 10% Agricultural Drainage: 0%	Long-term plans focused on desalination are already underway, substituting the largely unregulated, privately-owned groundwater extraction
Oman[10][16]	Groundwater: 20% Surface Water: 67% Desalination: 9% TSE: 4% Agricultural Drainage: 0%	Working with the private sector to invest in desalination and wastewater treatment Regulations in place to control groundwater extraction
Saudi Arabia[4][15]	Groundwater: 90% Surface Water: 5% Desalination: 4% TSE: 1% Agricultural Drainage: 0%	National Water Strategy 2030 announced – aiming to build relevant desalination and TSE capacities for sustainable development of water
Lebanon[5][7]	Groundwater: 100% Surface Water: 0% Desalination: 0% TSE: 0% Agricultural Drainage: 0%	Optimisation of surface water extraction and storage, artificial recharge of aquifers, irrigation rehabilitation and wastewater collection and treatment

Table 2: Water Source and Policy Focus Summary for Countries with 90% of Majid Al Futtaim's Water Footprint

4.6. MARKET ACCESS

The UAE has recently seen new forms of water infrastructure financing as they allowed for the first privately financed desalination plants to be developed. New privately funded independent water projects (IWP) are being built in Ras Al Khaimah and Umm Al Quwain, and Abu Dhabi has been using the public-private partnership model (PPP) to fund cogeneration power and water production facilities[32].

Abu Dhabi and Dubai projects have historically permitted private sector to own up to 40% of the project company but Federal Electricity & Water Authority will allow a successful bidder to own 100% - within the current requirements of 51% ownership by a UAE national[32].

In Abu Dhabi, a private entity is permitted to purchase and own shares in any entity including water producers and to participate in the management and business affairs of such entity. Abu Dhabi's government has full power to regulate all licensed operators, license water activities and license use of pipelines. Typically, licensees enter into a water purchase agreement and are not allowed to supply water outside of what is required by the grid. Without specific licenses, only small-scale desalination is permitted – up to 2 million litres/day per facility or 10 million litres/day net declared capacity – and only for captive, non-commercial use[32].

A good example of a fully privately-owned water company is the Al Hamra Water Company. Al Hamra Water Company is a private entity that developed a 719 million AED RO water desalination plant in Ras Al Khaimah. It is a joint venture between Utico Middle East (60% ownership) and a Spanish energy firm Grupo Cobra (40% ownership). The 60% to 40% split satisfies the UAE's limitations on foreign ownership and the plant supplies water into Ras Al Khaimah's water network. The facility is marketed as environmentally friendly, due in part to the possibility of water re-use within the plant[33].

Similar opportunities are available in other countries in the region, most notably Egypt, where Majid Al Futtaim has its second largest water footprint. Egypt has recently launched ambitious Public Private Partnerships (PPP) for new desalination and wastewater treatment plants. PPPs have been available in Egypt since a major wastewater treatment project was awarded in 2010 but faced numerous financial and political problems at the time. The conditions have since improved, and Egypt is planning to use PPPs to help develop 2 million m^3/day desalination capacity by 2037[34].

4.7. RECOMMENDATIONS

Due to the large water footprint and presence of Majid Al Futtaim in the UAE, it is recommended that Majid Al Futtaim initially focuses on clean water investment efforts in the UAE. The UAE offers increasingly more favourable conditions for private businesses to invest in utilities and there are opportunities to collaborate with both internal and external partners. There is a lot of desalination investment locally with new RO plants, frequently coupled with renewable energy generation which provides an avenue to zero carbon water generation and the opportunity to eliminate carbon from Majid Al Futtaim's water supply. Dubai also has some of the best water distribution networks in the world and the UAE could offer investment opportunities in other areas of the country. Finally, the country permits small-scale water generation for own needs, which would allow Majid Al Futtaim to run its own small water generation projects such as TSE plants and water from air.

It may be possible to take similar approaches in many other countries in the region but as the water footprint outside of the UAE is considerably smaller, it would be beneficial to focus on water efficiency measures initially. Experience gained through clean water investments in the UAE can be translated into other countries in the region later throughout the Net Positive journey. However, it is important to consider that some countries – most notably Armenia, Georgia and Kenya – have significantly different water contexts and continued expansion into other countries may require taking different approaches to investment.

5. INVESTMENT OPPORTUNITIES FOR FURTHER INVESTIGATION

This section will translate the context covered in the previous section into investment opportunities. As already outlined, the focus will be on the UAE investment as it's recommended building a collection of successful business cases in the country with Majid Al Futtaim's largest water footprint and largest sphere of influence. Trialling clean water investment in the UAE, where the investment environment in water infrastructure is becoming increasingly more favourable, will help Majid Al Futtaim engage with authorities in the other regions with examples of success.

The three options recommended are:

- Partnering with local authorities on solar-powered RO desalination plants
- Local offsetting strategy
- Small-scale water generation for internal use on-site

The next section will go into more detail on each investment opportunity, building on the context that has been already established.

5.1. PARTNERING WITH LOCAL AUTHORITIES

The recent developments in the UAE that allowed for fully privately-owned water generation infrastructure have opened clean water investment opportunities in the country. These investments are typically large in scale in order to benefit from low costs of renewables but there are options to partner with the UAE and foreign investors to raise the required capital. This is further supported by the UAE's plans to nearly double its desalination capacity – predominately through new RO plants – by 2030.

However, it is important to note that water generation licenses in the UAE contain water purchase agreements and the local water authority is the sole buyer of any water generated. This means that Majid Al Futtaim would not be able to directly supply itself with the water generated but could nonetheless claim an equivalent amount of sustainable water generation towards its Net Positive Water footprint.

The technology for this investment opportunity already exists and is widely used. Solar powered RO plants have seen a lot of investment around the world recently as they are able to provide clean water with lower energy requirements and run on clean energy. While wind power and solar power are equally viable to run desalination facilities, solar power has recently surpassed fossil fuels in the Middle East in terms of energy generation costs, highlighting a good investment opportunity.

RO plants have now become the mainstream technology for desalination but in some areas FO plants may be more suitable and new desalination technology is continuously being developed. For this reason, it is important to keep track of these technologies and adjust investment strategies when a more efficient, less energy intensive method becomes commercially available.

The following routes to market are recommended for consideration for these investment opportunities:

- Approach an existing water utilities operator and establish a partnership for partial ownership of a future water treatment facility
- Approach the local authorities directly to investigate opportunities to buy shares in planned water treatment facility developments
- Establish a new Business Unit within Majid Al Futtaim for water utilities or explore opportunities with Enova and approach the local authorities to secure a full private license to develop a water treatment facility. As this would be a very large investment, this would likely require partnering with a local or foreign business. As per the UAE's foreign investment policy, this could allow a foreign investor to access the UAE market by partnering with Majid Al Futtaim
- Establish a new Business Unit within Majid Al Futtaim for water utilities and approach the local authorities to establish a partnership to develop a water treatment facility. This would reduce the required investment as the local authority would own a large percentage of the facility

5.2. LOCAL OFFSETTING

Local offsetting is another means to become Net Positive in water and would require Majid Al Futtaim to invest in water positive projects in the region it operates in. This section will describe some opportunities for local clean water investment, but it is important to note that Majid Al Futtaim would need to develop a formalised offsetting approach to support the Net Positive programme. The offsetting approach would need to detail investment principles, rules and methodologies for a robust and auditable approach that can support Majid Al Futtaim's Net Positive commitments. Majid Al Futtaim will be developing the offsetting approach in due course and local offsetting will need to align with this approach.

Once the approach is established, multiple projects can be run in parallel across all countries where Majid Al Futtaim operates. These projects can vary in size of investment and on the impact that they bring. While project choice will depend on the approach, some considerations are:

- Reducing leakage in water distribution networks
- Enabling new renewable water access in remote areas and for agriculture, removing pressure from ground and surface water
- Providing access to clean drinking water solutions such as Zero Mass Water[37]

The approach taken could be direct investment through building new infrastructure and/or improving existing infrastructure or through investment in research and innovation through the Enterprise Hub and Innovation Centre For Excellence.

Dubai has achieved world-leading water distribution network efficiencies; therefore, one approach would be to replicate DEWA's approach to improving their network in other areas, which would provide areas for direct investment. Another approach would be to invest in research for leak detection technologies in order to improve monitoring across water networks, which would be an indirect investment leading to water savings.

Access to new renewable water in remote areas and for agriculture can involve any of the technologies covered in this report. If there is sea water access in the area, then desalination appears to be the best solution with FO working well for small-scale generation where water inflow is challenging. TSE technology could be effectively applied in any area where sewage is collected and can significantly vary in scale, making it a flexible investment opportunity. It is important to take appropriate measures to prevent associated negative environmental impacts, however.

Access to clean drinking water is an issue in more remote or deprived areas. There are several solutions available for exploration that vary in size as well as application. They can range from personal water purifiers to rainwater collection facilities and small-scale TSE plants.

Overall, as each country in Majid Al Futtaim's portfolio has its unique set of issues, the offsetting opportunities are numerous as well. It is therefore imperative to establish a robust offsetting strategy in order to guide the organisation through the decision-making process between various projects and approaches. Offsetting provides long-term solutions for water positive investments that can be variable in size and contrasts the larger scale option of partnering with the local authorities described in the previous section. A robust offsetting strategy can be applied to all operations in all countries, including new expansion plans and will need to be detailed enough to satisfy the requirements for Net Positive but flexible enough to allow access to opportunities across all geographies.

5.3. SMALL-SCALE WATER GENERATION

Majid Al Futtaim has invested in multiple water efficiency initiatives across its portfolio. However, while water use cannot be eliminated, on-site water use can be further addressed through small-scale water generation. It is important to make the distinction from water saving opportunities as small-scale water generation specifically refers to creating clean water rather than using less water. Small-scale water generation projects are projects that can be done on-site and typically fall outside of the local authority restriction for private water generation technology. Majid Al Futtaim already utilizes some small-scale water treatment solutions such as TSE in community developments. However, it is important to ensure that the use of a particular technology or the scale of water generation falls within the boundaries of the local legislation when considering investment.

One technology that could address aspects of all three Sustainable Business Commitments under Rethinking Resources would be Anaerobic Digestion. Anaerobic Digestion can utilize food waste, therefore aligning with the principles of circular economy, in order to generate energy and to contribute to Net Positive Carbon. However, wastewater or wet sludge can be a by-product of anaerobic digestion and may provide a viable source of water when treated. Current technology can achieve rates of 1 Litre of water per 3.6 kg of waste but cannot be used to generate energy, therefore the choice between waste to water and waste to energy technologies is required[35]. This is an area for innovation that could be further explored through the Enterprise Hub and Innovation Centre for Excellence.

Majid Al Futtaim already utilizes TSE in community developments and it therefore is a tested technology that the organization is familiar with and one that could be used as standard practice in community developments.

There is also an opportunity in treating sewage collected within the other Business Units but practical application needs to be further investigated.

Currently technologies such as solar vacuum tube desalination or air to water are relatively new to the market and can be expensive to produce or install. Majid Al Futtaim could consider investing in research and development through the Enterprise Hub and Innovation Centre for Excellence to improve commercial viability of such technologies, which would benefit Majid Al Futtaim directly and could also contribute to offsetting.

Technologies such as small-scale desalination and air to water can all be installed on a case-by-case basis on various Majid Al Futtaim sites to provide small-scale water generation in addition to various water efficiency measures that are already being rolled out in the business. In addition to on-site installation, Majid Al Futtaim can utilize the Enterprise Hub and Innovation Centre for Excellence to invest in water technology research to continuously innovate in the area of water generation as this could lead to large water positive projects.

5.4. FINANCING WATER GENERATION INVESTMENTS

The recommended investment options would require a significant amount of funding. One of the routes to financing these projects could be through an existing or new Green Sukuk as these projects have a significant renewable power generation component as well as a component for clean water generation. As such, the renewable energy generation portion of these investments would comply with Green Sukuk rules. However, water generation does not fall under either water recycling or water reuse categories and as such does not strictly comply with Majid Al Futtaim's current Green Sukuk requirements. This route could allow Majid Al Futtaim to generate funds for partnering with local authorities on large projects but may still require a local or foreign business partner.

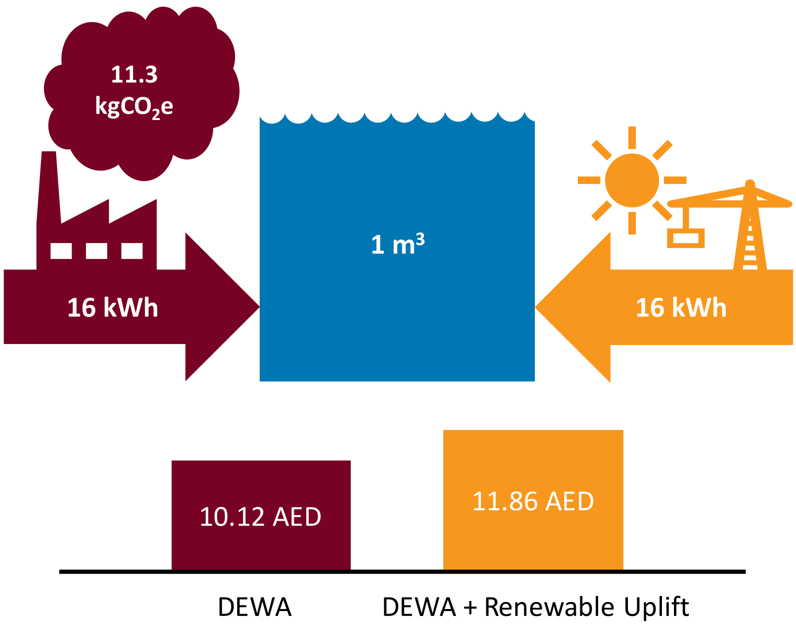

Figure 4: Illustration of Carbon Offsetting in Water Desalination in the UAE

Another route to generate funds for smaller and medium investments could be through establishing a novel internal carbon tax on water. As illustrated in Figure 4, currently a cubic meter of water from DEWA costs 10.12 AED[40] while new renewable energy generation capacity required to desalinate a cubic meter of water would cost 1.74 AED (assuming the UAE's desalination plant portfolio plans for 2030[24] and a conservative renewables generation cost figure of 0.11 AED/kWh[25]). Using these numbers, Majid Al Futtaim could invest 1.74 AED for each cubic meter of desalinated water purchased into PV projects in order to completely remove the carbon component of the water footprint. As the diagram above illustrates, a 17% uplift in operating expenses associated with water use could generate a dedicated revenue or investment stream to fund enough renewable capacity to desalinate water using clean energy.

This 17% uplift in cost could be applied uniformly across the entire company, with each Business Unit paying an internal carbon tax for each cubic meter of water purchased. This approach could encourage each Business Unit to seek further water efficiency measures as water use would become more expensive in their day-to-day operations. The carbon tax could also be used as a valuable variable to add to project appraisals when projects being considered have associated water use – this, used in conjunction with the carbon and water forecasting tool, would allow Majid Al Futtaim to more accurately value future projects while considering the Net Positive commitment.

It is also worth noting that once the water treatment facilities are operational, Majid Al Futtaim would start generating return on investment, however it is currently difficult to calculate what this return on investment might look like as the cost at which the local authorities are purchasing water from private suppliers is not available in the public domain. This would likely depend on the water purchase agreement in place and would therefore require engaging with the local authorities in order to determine figures for a feasibility assessment.

5.5. ACTIONS FOR 2021

The recommendations set out in this report all require medium- to long-term investment and raising large amounts of funding. Therefore, it is important to start running feasibility studies on a variety of projects and approaches in order to ensure sufficient time to generate required funding, establish necessary partnerships and complete project development before the 2030 deadline. This section sets out the actions required in 2021 in order to set up and kick off water investment projects sufficiently early.

- Create a robust water offsetting approach
  - This will require assessing best practice and various industry standards for water offsetting in the region and worldwide against Majid Al Futtaim's Net Positive Water commitment 2021

- Run large investment feasibility studies and investigate routes to market in the UAE
  - This will require engaging with the local authorities to obtain greater clarity on the legal obligations of a Public Private Partnership for a solar-powered RO desalination plant and to get more financial information to support a costed feasibility analysis e.g. the price at which the local authority would purchase electricity and water
  - This will require engaging with renewable energy developers to understand the minimum investment required in order to generate renewable energy at 0.11 AED or less in order for renewables to achieve cheaper prices than fossil fuels
  - This will require engaging with water treatment developers to understand costs of developing and operating a RO desalination facility

- Continue identifying small-scale water generation projects and running feasibility studies
  - This will require investigating limitations of retrofit for the current portfolio and appraising the value of waste (for waste to water against waste to energy projects), sewage effluent (for TSE project to support irrigation) and air to water applications
  - This will require planning guidelines for new developments to include TSE and other water generation projects as standard practice in all developments

- Investigate new water technologies in the Enterprise Hub and Innovation Centre for Excellence
  - This will require recording water generation projects that were narrowly rejected in feasibility studies
  - This will require identifying key feasible water generation projects that can be rolled out at a larger scale
  - For both types of projects, this will require engaging with providers and research groups working on these technologies in order to identify where research and development investment could help improve the feasibility of such projects

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