Global Water Market 2011: Saudi Arabia

A chapter from Global Water Market 2011
Global Water Market 2011: Saudi Arabia

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If you have any ideas for future research directions, do send an email to our Head of Research Jablanka Uzelac (ju@globalwaterintel.com). Alternatively, if you wish to have our research team undertake a bespoke research project for you, then please get in touch.

### 41. Saudi Arabia

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Municipal Water Reuse Markets 2010
Water Technology Markets

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41. Saudi Arabia

41.1 Demographic indicators

Figure 41.1 Population indicators, Saudi Arabia

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<tr>
<th>Demographic indicator</th>
<th>2009</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Population</td>
<td>21.11 million</td>
<td>24.90 million</td>
</tr>
<tr>
<td>Rural Population</td>
<td>4.68 million</td>
<td>4.97 million</td>
</tr>
<tr>
<td>Total Population</td>
<td>25.80 million</td>
<td>29.87 million</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2005-10</th>
<th>2010-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban population growth rate</td>
<td>2.51%</td>
<td>2.31%</td>
</tr>
<tr>
<td>Rural population growth rate</td>
<td>1.05%</td>
<td>0.81%</td>
</tr>
<tr>
<td>Total population growth rate</td>
<td>2.38%</td>
<td>2.16%</td>
</tr>
</tbody>
</table>


41.2 Economic indicators, Saudi Arabia

Figure 41.2 Economic indicators, Saudi Arabia

<table>
<thead>
<tr>
<th>Economic indicator (2008)</th>
<th>Nominal GDP</th>
<th>GDP at PPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total GDP</td>
<td>$469.4 billion</td>
<td>$592.9 billion</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>$18,855</td>
<td>$23,814</td>
</tr>
<tr>
<td>GDP growth rate</td>
<td>4.45%</td>
<td></td>
</tr>
</tbody>
</table>

Source: IMF, World Economic Outlook Database, October 2009.

4.2 Introduction

At approximately 2.15 million km², Saudi Arabia is the largest of the countries situated on the Arabian Peninsula. It is bordered by Yemen to the south, Oman to the south-east, the United Arab Emirates, Bahrain, Qatar and Kuwait to the east, Iraq to the north and north-east and Jordan to the north-west. It also has coastlines on the Red Sea to the west and the Gulf to the north-east.

Saudi Arabia has annually renewable freshwater resources of 2.4 km³/yr. Abstraction of water for use in the Kingdom is very much greater, at 22 km³/yr. The difference between the two is the abstraction of non-renewable groundwater resources and desalination.

41.3 Overview of challenges

Saudi Arabia faces significant challenges at every level of its water sector. These are summarised below.

41.3.1 Reducing agricultural demand for water

The drive to establish self-sufficiency in food in Saudi Arabia has come at a terrible price in terms of water. In January 2008 the government formally abandoned this strategy, with a view to importing its entire wheat needs by 2016. This policy will be a challenge to implement because there are so many vested interests in the agricultural sector. If it is effective, it will lead to a significant drop in water demand for irrigation. This will alleviate the stress on groundwater resources, although it may not provide a significant surplus of water to meet urban needs. Establishing water rights (quotas) is seen as an effective tool in regulating water for agriculture.

41.3.2 Maintaining and increasing urban water supply

Urban water supply comes from groundwater resources and desalination. The quality and quantity of the groundwater resources is declining, and many of the desalination facilities are reaching the end of their useful life. At the same time the urban demand for water is growing rapidly. The kingdom has a fast-growing population (as shown in figure 41.1), and has been diversifying its economy to provide jobs for the growing number of people entering the workforce. This challenge is being met through increased investment in water-production facilities with the privatisation of the Saline Water Conversion Corporation (SWCC).

41.3.3 Managing demand

Per-capita water abstraction is 2,893 l/c/d (this includes abstraction for agriculture). Per-capita use from the public water supply is 22 l/c/d. This is high by international standards – it is around twice the European average. Improved efficiency within the distribution networks and greater conservation within households are a priority. These are being addressed by the privatisation programme and the Minister of Water and Electricity’s personal drive to promote household water saving.
41.3.4 The performance of the public sector

The Ministry of Water and Electricity (MOWE) has identified poor performance as a critical issue in the Saudi water sector. Unaccounted-for-water (UFW) in Riyadh (before the Veolia management contract came into force) was officially 31%, although the actual figure may have been higher. The UFW level being targeted at the completion of the Riyadh contract in 2012/13 is 15%, with MOWE looking to reduce this further to 5% by 2026. Water supply is intermittent in many parts of the country (especially in summer, for most people have water tanks on their roof tops). MOWE and SWCC are both significantly over-staffed and inefficient. These issues are being addressed by the setting up of the National Water Company, and the privatisation of SWCC’s production facilities.

41.3.5 Tariff reform

Saudi Arabia has some of the most expensive water in the world. Not only does the country rely heavily on desalination, but it also pumps water long distances across the country (from the Gulf coast to Riyadh for example) and it has high levels of UFW. Officially the cost of desalinated water is estimated to be SAR 4/m³ ($1.07/m³), although the actual cost including transport, amortisation of capital costs and energy subsidies is likely to be in the region of $6.00/m³. Most customers pay little more than $0.03/m³ for the water they use. This is only possible because of massive subsidies available at every stage, from water production to transport and distribution. This challenge is not currently being addressed.

41.3.6 The new cities

The government has proposed building six new cities in order to diversify the Saudi economy and meet the needs of its growing population, in terms of housing and employment. These cities will need new water and wastewater infrastructure. The mechanisms for delivering this have yet to be agreed, although the first desalination plant, for the first city, King Abdullah Economic City, has been tendered (initially on a design build basis, but subsequently commuted to design, finance, build, operate).

41.4 Water sector organisation and structure

41.4.1 Government ministries and agencies

41.4.1.1 The Ministry of Water and Electricity

Since 2001, water has been the responsibility of the Ministry of Water, which was expanded in 2003 to become the Ministry of Water and Electricity (MOWE). The Minister of Water, Abdullah Al-Hussayen is supported by Dr Ali Saad Alotohais, Deputy Minister for Water Affairs, Dr Mohammed Bin Ibrahim Al Saud, Deputy Minister for Planning and Development, and Dr Saleh Alwaji, Deputy Minister for Electricity. The minister takes overall responsibility for the sector, while the deputy for planning and development takes responsibility for water services in the 13 directorates outside the four major cities (Riyadh, Jeddah, Madinah/Makkah, Dammam/Al-Khobar). Outside the Ministry, there are two significant agencies, the Saline Water Conversion Corporation and the National Water Company.

41.4.1.2 The National Water Company

The National Water Company (NWC) was set up in 2008 to act as a holding company for the Ministry of Water and Electricity’s water distribution and wastewater collection and treatment assets. It acts as the counter party for the management contracts in Riyadh, Jeddah, Madinah/Makkah and Dammam/Al-Khobar. It is a joint stock company, and may at some stage become a commercial undertaking with some or all of its shares quoted on the stock exchange. The details of how such an arrangement would work have yet to be decided upon.

The NWC’s responsibilities are in three categories: water supply and wastewater collection, wastewater treatment, and water reuse. Water supply and wastewater collection encompasses groundwater production, treatment and transport, as well as piped domestic distribution, and water tanker depots. On the wastewater side it includes sewers and tankers (for septic tank discharge).

41.4.1.3 The Saline Water Conversion Corporation

The Saline Water Conversion Corporation (SWCC) takes responsibility for water production and transmission in the Kingdom. It is headed by the Governor, Feheid Al-Shareef (who holds ministerial rank) and supported by Thabit Al-Lhebi, (Deputy Governor for Operations and Maintenance). It owns and operates 24 water production facilities as well as the pipelines linking these facilities to the major cities. Additionally it has a renowned research centre in Jubail. In total it employs around 9,000 people, most of whom live in compounds owned by the corporation. Complete with schools, medical facilities and shopping malls, these compounds are self-contained communities, which present a significant challenge from the point of view of privatisation.

SWCC supplies water to the MOWE for retail distribution at no charge. However, it incurs significant expenditure. The total budget for 2007 was SAR 3.9 billion ($1.05 billion), of which SAR 383 million ($102 million) was on spare parts, SAR 135 million ($36 million) was on maintenance, and SAR 277 million ($74 million) on rehabilitation contracts.
Figure 41.3 SWCC water and power production, 2003-2007

<table>
<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water production (m³)</td>
<td>1,036,754,638</td>
<td>1,055,998,128</td>
<td>1,025,048,182</td>
<td>1,033,055,909</td>
<td>1,066,825,977</td>
</tr>
<tr>
<td>Power production (MWh)</td>
<td>24,730,394</td>
<td>21,831,994</td>
<td>21,066,534</td>
<td>22,890,578</td>
<td>21,023,694</td>
</tr>
</tbody>
</table>

Source: SWCC

SWCC’s budget in relation to its output is very small. This reflects two things: first that SWCC has a tradition of very low operating costs in comparison to its capital costs, and second that energy costs are not included in total costs (oil feedstock is supplied to SWCC at no cost).

41.4.1.4 The Water and Electricity Company

SWCC is in the process of being privatised. As of the beginning of 2009, the Water and Electricity Company (WEC) had successfully contracted three independent water and power projects (IWPPs). WEC is owned jointly by SWCC and the Saudi Electric Company. It is a limited-liability company chaired by the Governor of SWCC, with Omar Al-Ghamdi as chief. It has less than 50 employees (compared to SWCC’s 9,000). WEC’s role is to issue the requests for proposals (RFPs) for new power and water plants, to adjudicate between the different bids, and to act as counter party for the resulting water and power-purchase agreement.

Since its inception WEC has established a reputation for absolute transparency in the manner in which projects are tendered and for open-mindedness towards technology (it has supported reverse osmosis projects on both coasts). The main criticism of WEC is that it insists on heavy crude as feedstock for the new plants (primarily because it was unable to negotiate access to natural gas). This has environmental implications, which can be somewhat off-set by the use of flue gas desulphurisation (FGD) systems. The feedstock is supplied at a price fixed by the government in the region of $3 per barrel. This reduces the incentive to introduce more energy efficient desalination technologies.

The Ras Azzour IWPP was to be WEC’s fourth IWPP, although private-sector ownership of the project was abandoned in the second quarter of 2009 after the preferred-bidder consortium split up. WEC’s ongoing role in the Saudi power and water sector is under review as of mid-2009. It is expected to continue to act as off-taker for greenfield (i.e. new capacity) IWPPs after the privatisation of SWCC’s production facilities. It has yet to be confirmed whether WEC or a new body will act as off-taker for the brownfield IWPPs proposed for the privatisation of SWCC’s existing facilities.

41.4.1.5 Other water related institutions

Besides MOWE, NWC, SWCC and WEC, a number of other official bodies are involved in the Saudi water sector. These include:

Marafiq, the utility for the Royal Commission for Jubail and Yanbu. These are two industrial cities on either coast of the Kingdom which have their own administration. Marafiq takes responsibility for power and water supply, acting as off-taker for IWPPs and distributing water and power to its largely industrial customer base. Marafiq is owned in equal parts by the Royal Commission, Saudi Aramco, SABIC and the Public Investment Fund. Additionally 0.76% of the shares are held by private investors. Marafiq is headed by CEO Thamer Al Sharhan.

Marafiq’s Jubail assets comprise 12 km of canals delivering filtered seawater to the industries for their cooling operations, two desalination plants producing potable water for household use, and a sanitary and industrial wastewater treatment plant. In Yanbu, assets include seawater cooling, desalination, wastewater treatment and power generation, transmission and distribution networks.

Marafiq considers itself to be Saudi Arabia’s first private utility, and in that sense it is not subject to the overall drive towards privatisation. It is however vigorously pursuing improved performance and puts strong emphasis on meeting its customers’ needs.

The Economic Cities Programme – SAGIA: The government is planning a series of new cities in order to provide employment and housing for its growing population. These are being promoted by SAGIA (the Saudi Arabian General Investment Authority), whose objective is to make Saudi Arabia one of the top 10 locations for inward investment by 2010.
41.5 Supply and demand details

41.5.1 Water supply

Figure 41.4 Water resources in Saudi Arabia

<table>
<thead>
<tr>
<th>Water resource</th>
<th>Volume (km³/yr)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewable natural resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater (renewable, actual)</td>
<td>2.20 km³/yr</td>
<td>FAO AQUASTAT, 2010</td>
</tr>
<tr>
<td>Surface water (renewable, actual)</td>
<td>2.20 km³/yr</td>
<td>FAO AQUASTAT, 2010</td>
</tr>
<tr>
<td>Total water resources (renewable, actual)*</td>
<td>2.40 km³/yr</td>
<td>FAO AQUASTAT, 2010</td>
</tr>
<tr>
<td>Higher quality nonconventional resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desalination</td>
<td>4.12 km³/yr</td>
<td>Global Water Market 2011, GWI</td>
</tr>
<tr>
<td>Reuse - tertiary or better</td>
<td>0.09 km³/yr</td>
<td>Global Water Market 2011, GWI</td>
</tr>
<tr>
<td>Total nonconventional resources</td>
<td>4.21 km³/yr</td>
<td></td>
</tr>
</tbody>
</table>

* This may not be the total of groundwater + surface water because of overlap between surface-water and groundwater resources, non-exploitable surface water, or irrigation water running back into rivers/aquifers to be “counted twice”.

Sources: Given in table

The vast majority of water used in the Kingdom does not originate from precipitation. It comes from non-renewable fossil groundwater. The figure below illustrates how the exploitation of Saudi Arabia’s water resources has developed over the years.

Figure 41.5 Historical water usage by source in Saudi Arabia, 1990-2004

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface water &amp; shallow aquifers (renewable)</td>
<td>2.1 km³/yr (13%)</td>
<td>2.140 km³/yr (7%)</td>
<td>2.140 km³/yr (12%)</td>
<td>2.190 km³/yr (9.8%)</td>
</tr>
<tr>
<td>Groundwater (non-renewable)</td>
<td>24.489 km³/yr (83%)</td>
<td>28.576 km³/yr (90%)</td>
<td>15.376 km³/yr (83%)</td>
<td>18.615 km³/yr (83.6%)</td>
</tr>
<tr>
<td>Desalination</td>
<td>0.540 km³/yr (3%)</td>
<td>0.795 km³/yr (2%)</td>
<td>0.795 km³/yr (4%)</td>
<td>1.241 km³/yr (5.5%)</td>
</tr>
<tr>
<td>Treated wastewater</td>
<td>0.110 km³/yr (0.7%)</td>
<td>0.185 km³/yr (0.6%)</td>
<td>0.185 km³/yr (1%)</td>
<td>0.225 km³/yr (1.1%)</td>
</tr>
<tr>
<td>Total</td>
<td>27.239 km³/yr</td>
<td>31.696 km³/yr</td>
<td>18.496 km³/yr</td>
<td>22.271 km³/yr</td>
</tr>
</tbody>
</table>

Source: Abderrahman 2001/SWCC/GWI

41.5.2 Sectoral water use

According to FAO AQUASTAT, 88% of withdrawn water in Saudi Arabia is consumed by agriculture, 9% by domestic users and 3% by industry. Agricultural water supply has grown significantly since the early 1980s when the government took the decision to become self-sufficient in food production. It achieved this goal in 1992 as a result of significant subsidies for local cereal production and high tariffs on imports. Water to meet the additional agricultural demand was supplied from fossil-groundwater resources, in most cases mined from a very great depth.

Groundwater quality has deteriorated to the point where it can no longer be used for municipal supply without treatment. Furthermore, only half the groundwater reserves are located near the main demand centres and the coastal areas suffer increasingly from seawater intrusion.

Figure 41.6 Sectoral water withdrawal, Saudi_Arabia

<table>
<thead>
<tr>
<th>Sector</th>
<th>% Withdrawal</th>
<th>Volume</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>88%</td>
<td>20.83 km³/yr</td>
<td>FAO AQUASTAT, 2010; actual data from 2006.</td>
</tr>
<tr>
<td>Industrial</td>
<td>3%</td>
<td>0.71 km³/yr</td>
<td>FAO AQUASTAT, 2010; actual data from 2006.</td>
</tr>
<tr>
<td>Municipal</td>
<td>9%</td>
<td>2.13 km³/yr</td>
<td>FAO AQUASTAT, 2010; actual data from 2006.</td>
</tr>
<tr>
<td>Total annual withdrawal *</td>
<td>100%</td>
<td>23.67 km³/yr</td>
<td>FAO AQUASTAT, 2010; actual data from 2006.</td>
</tr>
</tbody>
</table>

* Total annual withdrawal may include contributions from sources other than groundwater and surface water, such as desalination or wastewater reuse.

Source: Given in table

In the early 1990s, peak water usage was at the height of the food self-sufficiency drive. This significantly depleted non-renewable groundwater resources. In 1992 wheat production in the kingdom peaked at 4.25 million tonnes against national demand of
1.22 million tonnes). The following year the acreage eligible for wheat price supports was reduced by 75%, and thereafter fell sharply during the 1990s. This is illustrated in the figure below.

**Figure 41.7 Sectoral water demand in Saudi Arabia, 1980-2004**

![Sectoral water demand in Saudi Arabia, 1980-2004](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual domestic and industrial usage</th>
<th>Annual agricultural usage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>million m³</td>
<td>million m³</td>
<td>million m³</td>
</tr>
<tr>
<td>1980</td>
<td>502 (21.3%)</td>
<td>1,850 (78.7%)</td>
<td>2,352</td>
</tr>
<tr>
<td>1990</td>
<td>1,650 (6.1%)</td>
<td>25,589 (93.9%)</td>
<td>27,239</td>
</tr>
<tr>
<td>1992</td>
<td>1,870 (5.9%)</td>
<td>29,826 (94.1%)</td>
<td>31,696</td>
</tr>
<tr>
<td>1997</td>
<td>2,063 (11.2%)</td>
<td>16,406 (88.8%)</td>
<td>18,469</td>
</tr>
<tr>
<td>2004</td>
<td>2,336 (10.4%)</td>
<td>20,304 (89.6%)</td>
<td>22,271</td>
</tr>
</tbody>
</table>

Source: Abderrahman/GWI/MOWE

### 41.6 Municipal water and wastewater infrastructure

#### 41.6.1 Key performance indicators: water

**Figure 41.8 Water supply indicators, Saudi Arabia**

<table>
<thead>
<tr>
<th>Water supply indicator</th>
<th>Value</th>
<th>Source and notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal water supply</td>
<td>2,088 million m³/yr</td>
<td>Ministry of Water and Electricity, Saudi Arabia, 2009</td>
</tr>
<tr>
<td>No. of WTPs</td>
<td>50</td>
<td>GWI, Water Market Middle East 2010</td>
</tr>
<tr>
<td>Design capacity of WTPs</td>
<td>5.39 million m³/d</td>
<td>GWI, Water Market Middle East 2010</td>
</tr>
<tr>
<td>Operational capacity of WTPs</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Per capita water consumption from municipal supply</td>
<td>222 l/c/d</td>
<td>Calculation.</td>
</tr>
<tr>
<td>No. of water connections</td>
<td>1.50 million</td>
<td>GWI, Water Market Middle East 2010</td>
</tr>
<tr>
<td>Length of distribution network</td>
<td>40,000 km</td>
<td>GWI, Water Market Middle East 2010</td>
</tr>
<tr>
<td>Unaccounted-for water</td>
<td>35.0%</td>
<td>GWI, Water Market Middle East 2010</td>
</tr>
<tr>
<td>Meter coverage</td>
<td>100.0%</td>
<td>GWI, Water Market Middle East 2010</td>
</tr>
</tbody>
</table>

Note: n/a means that the data item was not available.

Sources: Given in table
41.6.2 Key performance indicators: wastewater

Figure 41.9 Wastewater indicators, Saudi Arabia

<table>
<thead>
<tr>
<th>Wastewater indicator</th>
<th>Value</th>
<th>Source and notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of WWTPs</td>
<td>32</td>
<td>GWI, Water Market Middle East 2010</td>
</tr>
<tr>
<td>Design capacity of WWTPs</td>
<td>2.55 million m³/d</td>
<td>GWI, Water Market Middle East 2010</td>
</tr>
<tr>
<td>Wastewater produced</td>
<td>1,680 million m³/yr</td>
<td>Ministry of Water and Electricity, Saudi Arabia (2009)</td>
</tr>
<tr>
<td>Wastewater collected</td>
<td>40.0%</td>
<td>Ministry of Water and Electricity, Saudi Arabia (2009)</td>
</tr>
<tr>
<td>Collected wastewater treated to secondary level</td>
<td>122%</td>
<td>More wastewater is treated than is collected in the central sewerage system, as large quantities of wastewater are transported to WWTPs by truck. Therefore, this figure is &gt;100%</td>
</tr>
<tr>
<td>Collected wastewater treated to tertiary level or better</td>
<td>14%</td>
<td>More wastewater is treated than is collected in the central sewerage system, as large quantities of wastewater are transported to WWTPs by truck</td>
</tr>
</tbody>
</table>

| No. of wastewater connections              | n/a                 | GWI, Water Market Middle East 2010                                               |
| Length of sewerage network                | 11,000 km           | GWI, Water Market Middle East 2010                                               |

Note: n/a means that the data item was not available.
Sources: Given in table

Approximately 40% of the wastewater produced in Saudi Arabia is collected in the country’s central sewerage systems. The remainder is collected in septic tanks. Some of this septic wastewater is taken by truck to wastewater treatment plants. Overall, an average of around 2.5 million m³/d of wastewater is treated in Saudi Arabia. Of this, approximately 9% (260,000 m³/d) is tertiary treated for advanced reuse. A much larger volume - perhaps around 1.6 million m³/d - is reused informally without tertiary treatment.

A significant proportion of the remaining septic wastewater is taken to wastewater lagoons or designated areas of the desert where it is dispersed without treatment. Jeddah, for example, has a wastewater lagoon with a capacity of 10 million m³. Effluent from the Manfouha plant in Riyadh is discharged into the Riyadh River, a man-made waterway leading out into the desert, which has become something of a local beauty spot. Effluent from the Jeddah treatment plants is discharged into the sea, although around 30,000 m³/d from Al Khumrah is tertiary treated with reverse osmosis and sold as irrigation water.

41.6.3 Water production facilities

The following figures provide details of SWCC, WEC and Marafiq’s water production facilities.
### Figure 41.10 SWCC’s water production facilities

<table>
<thead>
<tr>
<th>Location</th>
<th>Process type</th>
<th>Water capacity (m³/d)</th>
<th>Electricity (MW)</th>
<th>Year of operation</th>
<th>Expected remaining life (years)</th>
<th>No. of desalination units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WEST COAST</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jeddah Phase 2</td>
<td>MSF</td>
<td>37,916</td>
<td>71</td>
<td>1978</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Jeddah Phase 3</td>
<td>MSF</td>
<td>75,987</td>
<td>200</td>
<td>1979</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Jeddah Phase 4</td>
<td>MSF</td>
<td>190,555</td>
<td>500</td>
<td>1981</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Jeddah RO Phase 1</td>
<td>RO</td>
<td>48,848</td>
<td></td>
<td>1989</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Jeddah RO Phase 2</td>
<td>RO</td>
<td>48,848</td>
<td></td>
<td>1994</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Yanbu Phase 1</td>
<td>MSF</td>
<td>94,625</td>
<td>250</td>
<td>1981</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Yanbu Phase 2</td>
<td>MSF</td>
<td>120,096</td>
<td>35</td>
<td>1999</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>Yanbu RO</td>
<td>RO</td>
<td>106,904</td>
<td></td>
<td>1999</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>Shoaiba Phase 1</td>
<td>MSF</td>
<td>191,780</td>
<td>157</td>
<td>1989</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Shoaiba Phase 2</td>
<td>MSF</td>
<td>390,909</td>
<td>340</td>
<td>2002</td>
<td>21</td>
<td>10</td>
</tr>
<tr>
<td>Shuaiqi Phase 1</td>
<td>MSF</td>
<td>83,432</td>
<td>62</td>
<td>1989</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Haql Phase 2</td>
<td>RO</td>
<td>3,784</td>
<td></td>
<td>1990</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Duma Phase 3</td>
<td>RO</td>
<td>3,784</td>
<td></td>
<td>1989</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Al Wajh Phase 2</td>
<td>MSF</td>
<td>473</td>
<td></td>
<td>1979</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Al Wajh Transferred Phase 1</td>
<td>MED</td>
<td>825</td>
<td></td>
<td>1981</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Al Wajh Transferred Phase 2</td>
<td>MED</td>
<td>1,032</td>
<td></td>
<td>1983</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Al Wajh Transferred Phase 3</td>
<td>MSF</td>
<td>473</td>
<td></td>
<td>1979</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Al Wajh Phase 3</td>
<td>MED</td>
<td>9,000</td>
<td></td>
<td></td>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>Ummuluj Phase 2</td>
<td>RO</td>
<td>3,784</td>
<td></td>
<td>1986</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Ummuluj Phase 3</td>
<td>MED</td>
<td>9,000</td>
<td></td>
<td></td>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>Rabigh Phase 1</td>
<td>MSF</td>
<td>1,204</td>
<td></td>
<td>1982</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Rabigh Transferred Phase 1</td>
<td>MSF</td>
<td>774</td>
<td></td>
<td>1979</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Rabigh Transferred Phase 2</td>
<td>MED</td>
<td>18,000</td>
<td></td>
<td></td>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>Al Azizia Phase 1</td>
<td>MED</td>
<td>3,870</td>
<td></td>
<td>1987</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Al Birk Phase 1</td>
<td>RO</td>
<td>1,952</td>
<td></td>
<td>1983</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Farasan Phase 1</td>
<td>MSF</td>
<td>430</td>
<td></td>
<td>1979</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Farasan Transferred Phase 1</td>
<td>MSF</td>
<td>1,075</td>
<td></td>
<td>1978</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Al-Qunfidah Phase 1</td>
<td>MED</td>
<td>9,000</td>
<td></td>
<td></td>
<td>2009</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>1,458,360</td>
<td>1,615</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EAST COAST</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jubail Phase 1</td>
<td>MSF</td>
<td>118,447</td>
<td>238</td>
<td>1982</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Jubail Phase 2</td>
<td>MSF</td>
<td>815,185</td>
<td>762</td>
<td>1983</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Jubail RO</td>
<td>RO</td>
<td>78,182</td>
<td></td>
<td>2002</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>Al Khobar Phase 2</td>
<td>MSF</td>
<td>191,780</td>
<td>500</td>
<td>1982</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Al Khobar Phase 3</td>
<td>MSF</td>
<td>240,800</td>
<td>311</td>
<td>2002</td>
<td>24</td>
<td>8</td>
</tr>
<tr>
<td>Khafji Phase 2</td>
<td>MSF</td>
<td>19,682</td>
<td></td>
<td>1986</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>1,464,076</td>
<td>1,811</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td></td>
<td>2,922,436</td>
<td>3,426</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: SWCC/GWI/Leading Edge Technologies
Figure 41.11 SWCC’s principal water transmission pipelines

<table>
<thead>
<tr>
<th>Project name</th>
<th>Total length (km)</th>
<th>Pipe diameter (mm)</th>
<th>No. of pumping and blending stations</th>
<th>Reservoir capacity (m³)</th>
<th>Beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al Shoaiba-Jeddah</td>
<td>164</td>
<td>1500</td>
<td>1P</td>
<td>840,000</td>
<td>Jeddah, Makkah, Taif</td>
</tr>
<tr>
<td>Al Shoaiba Phase 3</td>
<td>344</td>
<td>1,100-3,000</td>
<td>5P</td>
<td>790,000</td>
<td>Jeddah, Makkah, Taif</td>
</tr>
<tr>
<td>Makkah-Taif</td>
<td>233.8</td>
<td>1,050-1,400</td>
<td>4P</td>
<td>720,000</td>
<td>Makkah, Taif</td>
</tr>
<tr>
<td>Yanbu-Madinah Phase 1</td>
<td>226</td>
<td>600-800</td>
<td>2P</td>
<td>40,000</td>
<td>Yanbu &amp; Madinah</td>
</tr>
<tr>
<td>Yanbu-Madinah Phase 2</td>
<td>371.6</td>
<td>300-1,500</td>
<td>2P</td>
<td>1,256,000</td>
<td>Yanbu, Madinah, Khaibar</td>
</tr>
<tr>
<td>Aseer</td>
<td>216.504</td>
<td>500-1,200</td>
<td>4P</td>
<td>256,000</td>
<td>Abha, Khamis Mushait, Hald, Rafaed, Military City</td>
</tr>
<tr>
<td>Rabigh City Feeder</td>
<td>130</td>
<td>250 - 450</td>
<td></td>
<td>18,000</td>
<td>Rabigh City, Mastoorah, Thoal</td>
</tr>
<tr>
<td>Qunfidah City Feeder</td>
<td>61</td>
<td>250 - 300</td>
<td></td>
<td>4,000</td>
<td>Qunfidah City, Quaz, Hall</td>
</tr>
<tr>
<td>Eastern Province</td>
<td>258.03</td>
<td>500-1,100</td>
<td>1P/8B</td>
<td>604,250</td>
<td>Al-Khobar, Dammam, Dharan, Safra, Qatif, Rhimah</td>
</tr>
<tr>
<td>Eastern Province Phase 3</td>
<td>129.8</td>
<td>600-1,500</td>
<td>7B</td>
<td>45,000</td>
<td>Al-Khobar, Dammam, Dharan, Safra, Qatif, Rhimah, Rastanura, Shihat</td>
</tr>
<tr>
<td>Jubail-Royal Commission</td>
<td>81.8</td>
<td>250-1,500</td>
<td>1P 2B</td>
<td>358,950</td>
<td>Royal Commission Military Base</td>
</tr>
<tr>
<td>Jubail-Riyadh Line A</td>
<td>932</td>
<td>1,500</td>
<td>6P</td>
<td>2,982,500</td>
<td>Riyadh</td>
</tr>
<tr>
<td>Jubail-Riyadh Line C</td>
<td>375</td>
<td>1,500</td>
<td>4P</td>
<td>400,000</td>
<td>Riyadh</td>
</tr>
<tr>
<td>Riyadh City Feeder</td>
<td>132.5</td>
<td>1,600-2,000</td>
<td>4P</td>
<td>257,500</td>
<td>Riyadh</td>
</tr>
<tr>
<td>Khobar - Hofuf</td>
<td>141</td>
<td>400-1,400</td>
<td>1P</td>
<td>40,000</td>
<td>Hofuf</td>
</tr>
<tr>
<td>Riyadh / Sudair / Al Washem / Qassem</td>
<td>884.838</td>
<td>400-2,000</td>
<td>2P</td>
<td>520,000</td>
<td>Sudair, Al Washem, Qassem</td>
</tr>
<tr>
<td>Al Khafji</td>
<td>10</td>
<td>600</td>
<td>1P</td>
<td>113,650</td>
<td>Khafji</td>
</tr>
<tr>
<td>Buraidah City Feeder</td>
<td>14.5</td>
<td>1,100</td>
<td></td>
<td>Buraidah</td>
<td></td>
</tr>
<tr>
<td><strong>Source</strong>: SWCC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 41.12 WEC’s desalination plants

<table>
<thead>
<tr>
<th>Project</th>
<th>Water (m³/d)</th>
<th>Power (MW)</th>
<th>Fuel type</th>
<th>Status</th>
<th>Cost (million $)</th>
<th>Initial commercial operations date (ICOD)</th>
<th>Project commercial operations date (PCOD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoaibah (Phase 3) IWPP</td>
<td>880,000</td>
<td>900</td>
<td>Arabian Light Crude Oil</td>
<td>Under production - full capacity</td>
<td>2,460</td>
<td>05 Feb 2009</td>
<td>25 Jul 2009</td>
</tr>
<tr>
<td>Shuqaiq (Phase 2) IWPP</td>
<td>212,000</td>
<td>850</td>
<td>Arabian Heavy Crude Oil</td>
<td>Project completion is 96.1 % as end of Feb-2010</td>
<td>1,870</td>
<td>01 May 2010</td>
<td>01 Dec 2010</td>
</tr>
<tr>
<td>Shoaibah Expansion IWP</td>
<td>150,000</td>
<td>-</td>
<td>-</td>
<td>Under production - full capacity</td>
<td>234</td>
<td>-</td>
<td>28 Feb 2009</td>
</tr>
</tbody>
</table>

Source: WEC
In addition to SWCC, WEC and Marafiq, there are a number of private-sector water providers with significant facilities. **Kindasa Water Services** owns and operates two private desalination plants serving industrial customers in Jeddah. The first has a capacity of 14,000 m³/d. The second has a capacity of 25,500 m³/d. **Sawaco**, a subsidiary of **Saudi Brothers Commercial Company**, has a 12,000 m³/d facility based in North Obhor, serving commercial customers in the Makkah region.

The figure below outlines the number of online desalination plants in Saudi Arabia along with their design capacities.

**Figure 41.14 Summary of desalination in Saudi Arabia**

<table>
<thead>
<tr>
<th>Desalination plant statistics</th>
<th>Number</th>
<th>Capacity (m³/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large online plants (over 20,000 m³/d)</td>
<td>63</td>
<td>8,059,081</td>
</tr>
<tr>
<td>Smaller online plants (under 20,000 m³/d)</td>
<td>1,357</td>
<td>2,053,152</td>
</tr>
<tr>
<td><strong>Total capacity of all online plants</strong></td>
<td><strong>1,420</strong></td>
<td><strong>10,112,233</strong></td>
</tr>
</tbody>
</table>

Source: DesaData

In Jeddah, the unexpected growth of demand for desalinated water led to the commissioning of two barges to cover the shortfall in water supply during the construction of the **Shoaiba 3** project. These barges, which carry SWRO plants with a combined capacity of 52,000 m³/d, are being relocated to the **Shuqaiq 3 IWPP**.

### 41.6.4 Wastewater treatment plants

In addition to the principal wastewater treatment facilities for Riyadh and Jeddah, there are around two dozen wastewater treatment plants (WWTPs) serving the rest of the country, with a total average daily flow of around 1.6 million m³/d. The figure below indicates the design capacity and level of treatment at existing facilities in Riyadh, Jeddah, Madinah and Makkah.

**Figure 41.15 Wastewater treatment facilities in Saudi Arabia’s major cities**

<table>
<thead>
<tr>
<th>City</th>
<th>Facility</th>
<th>Plant</th>
<th>Design capacity (m³/d)</th>
<th>Level of treatment</th>
<th>Reuse type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riyadh</td>
<td>Manfouha</td>
<td>South C2</td>
<td>80,000</td>
<td>Tertiary</td>
<td>Restricted</td>
</tr>
<tr>
<td>Riyadh</td>
<td></td>
<td>South C3</td>
<td>120,000</td>
<td>Tertiary</td>
<td>Restricted</td>
</tr>
<tr>
<td>Riyadh</td>
<td></td>
<td>North</td>
<td>200,000</td>
<td>Tertiary</td>
<td>Unrestricted</td>
</tr>
<tr>
<td>Riyadh</td>
<td></td>
<td>East</td>
<td>200,000</td>
<td>Tertiary</td>
<td>Restricted</td>
</tr>
<tr>
<td>Riyadh</td>
<td></td>
<td>Al Kharj Road</td>
<td>Phase 1</td>
<td>100,000</td>
<td>Currently secondary (tertiary upgrade underway)</td>
</tr>
<tr>
<td>Jeddah</td>
<td>Al Khumrah</td>
<td>Phase 1</td>
<td>40,000</td>
<td>Secondary</td>
<td></td>
</tr>
<tr>
<td>Jeddah</td>
<td></td>
<td>Phase 2</td>
<td>60,000</td>
<td>Secondary</td>
<td></td>
</tr>
<tr>
<td>Jeddah</td>
<td></td>
<td>Phase 3</td>
<td>140,000</td>
<td>Secondary</td>
<td></td>
</tr>
<tr>
<td>Jeddah</td>
<td></td>
<td>Package plants</td>
<td>99,000</td>
<td>Secondary</td>
<td></td>
</tr>
<tr>
<td>Madinah</td>
<td></td>
<td></td>
<td>300,000</td>
<td>Tertiary</td>
<td></td>
</tr>
<tr>
<td>Makkah</td>
<td></td>
<td></td>
<td>100,000</td>
<td>Secondary</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>250,000</td>
<td>Tertiary</td>
<td></td>
</tr>
</tbody>
</table>

Source: NWC

### 41.6.5 Water reuse

According to MOWE estimates, Saudi Arabia’s advanced water reuse capacity is currently 260,000 m³/d, accounting for 1% of the country’s water supply. This is predicted to increase to 1.12 million m³/d by 2012 and 2.2 million m³/d by 2016, representing an
overall compound annual growth rate of 30.6%. All of the current water-reuse applications in Saudi Arabia are non-potable, and
this is not expected to change in the near future.

Significant scope exists for the expansion of water reuse across Saudi Arabia. Constructing large-scale treated-effluent
distribution networks in the country’s major cities is a considerable logistical and financial challenge that is the subject of a
number of feasibility studies by NWC and its consultants.

A concurrent scheme is under development by NWC to market, trade and distribute treated effluent on a commercial basis
in Saudi Arabia’s major cities, through joint ventures with interested companies. These companies would off-take the treated effluent
at a price and invest in the infrastructure necessary to distribute and sell the effluent to the end user. The main customers for the
treated effluent are municipalities, district cooling companies and industrial water users.

In June 2009 NWC signed a memorandum of understanding (MOU) with Bariq Mining Ltd to provide up to 5,000 m³/d of
treated effluent from Madinah city’s 300,000 m³/d WWTP. The supply agreement will last for 20 years, and is slated to begin in
mid-2010. Metallurgical testwork using the effluent has confirmed the suitability of using it in copper mining operations at Jabal Sayid.
A scoping study is underway for the construction of a 200 km pipeline, which is expected to be a cost-effective method
of transporting the effluent from Madinah to Jabal Sayid. The MOU will be ratified as a commercial agreement upon the grant
of the Jabal Sayid Exploitation (mining) Licence. Currently, the vast majority of the treated effluent from the Madinah WWTP is
discharged to a nearby wadi (seasonal riverbed) for extraction by farmers for agricultural irrigation. Other companies which have
expressed an interest in signing a treated effluent supply agreement with an NWC/private partner project company include Saudi
Aramco (20,000 m³/d), Ma’aden (10,000 m³/d) and Knowledge Economic City near Madinah (65,000 m³/d).

The arrangement in Taif city is similar to that in Madinah. Treated effluent is used primarily for landscape irrigation and
firefighting systems, with the surplus discharged to a nearby wadi system. Treated effluent from Makkah’s various wastewater
treatment plants is reused in landscape irrigation. Direct reuse in agricultural irrigation is currently prohibited in the area. There
is currently no wide-scale reuse of treated effluent in Dammam or Khobar. Instead, treated effluent is disposed via sea outfalls
from the main WWTPs.

At the industrial cities of Jubail and Yanbu, Marafiq reuses treated effluent from its sanitary and industrial WWTPs. The
reuse applications are landscape irrigation and some industrial-process applications. The figure below indicates the wastewater
treatment and reuse capacities at the major facilities at Jubail and Yanbu in 2006, and also offers projections for 2011.

Figure 41.16 Wastewater treatment at Marafiq’s major facilities

<table>
<thead>
<tr>
<th>WWTP</th>
<th>Jubail</th>
<th>Yanbu</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Industrial</td>
<td>Sanitary</td>
</tr>
<tr>
<td>Wastewater treatment capacity (m³/d)</td>
<td>2006: 60,000</td>
<td>2006: 72,000</td>
</tr>
<tr>
<td></td>
<td>2011: 95,000</td>
<td>2011: 127,000</td>
</tr>
<tr>
<td>Treated effluent availability (m³/d)</td>
<td>2006: 47,000</td>
<td>2006: 60,000</td>
</tr>
<tr>
<td></td>
<td>2011: 72,000</td>
<td>2011: 90,000</td>
</tr>
<tr>
<td>Effluent distribution networks (km)</td>
<td>70</td>
<td>200</td>
</tr>
</tbody>
</table>

Source: Marafiq

41.7 Water in industry
Possessing around 20% of the world’s oil reserves, Saudi Arabia is ranked as the largest oil exporter in the world. According to
estimates from 2007 and 2008, the country produces 10.78 million bbl of oil per day and exports 8,728 million bbl/d. As part
of its efforts to develop and diversify the country’s economy, the Kingdom is also focusing on sectors such as power generation,
natural gas and petrochemicals. In 2007, the electricity production in Saudi Arabia was estimated to be 179.1 billion kWh, while a
2008 estimate places natural gas production at 80.44 billion m³. The main industries in Saudi Arabia are: crude oil production, petroleum refining, basic petrochemicals, ammonia, industrial gases, sodium hydroxide (caustic soda), cement, fertiliser, plastics, metals, commercial-ship repair, commercial-aircraft repair and
construction. The industrial water requirement in the country is around 710 million m³/yr.

41.8 Water finance
To date the most significantly financed water projects have been the independent water and power projects (IWPPs) at
Shoaiba, Shuqaiq, Jubail and Rabigh. The structure of the Shoaiba and Shuqaiq projects involved the Saudi government providing
40% of the equity for the project company, and a private developer consortium providing 60%. The debt equity split has been
in the region of 80:20. Tightening conditions in the international credit market have had an impact on Saudi project finance.
Specifically we can expect greater participation from bi-lateral lenders (particularly the Japan Bank for International Cooperation,
Korea Ex-Im Bank and China Ex-Im Bank) and from local banks (e.g. Riyadh Bank, NCB, Al Rajhi Bank and Alinma).
The sale of SWCC’s production assets is expected to interest a different type of investor to the traditional power and water developers who have dominated the IWPP programme to date. The risk profile is different: huge capital outlays on construction will not be there, which might attract infrastructure-fund investors. However, a key determinant of the value of the plants will be their condition, and it is likely that the successful consortia will include local partners with some insight into the operating history of the plants.

Besides desalination the next area of the Saudi water sector looking to attract private finance is the wastewater-treatment sector. The major plants are being packaged as a mixture of brownfield concessions and greenfield build-own-operate projects. It is likely that the winning consortia for these projects will include international EPC companies acting as developers, as well as local investors.

Progress has been delayed for some time on the first major WWTP package covering Riyadh, as a result of difficulties encountered by NWC in securing credit support for the project from the Saudi Ministry of Finance. Such support would guarantee payment to the contractor in the event of termination or default by NWC. It is looking increasingly likely that NWC will choose to proceed with the Riyadh scheme without credit support from the MOF. Once the issue of credit support has been resolved, the question of whether the greenfield elements of the project will be procured on a build-own-operate-transfer (BOOT) basis as planned, or an engineering, procurement and construction (EPC) basis will be more clear.

Once the wastewater projects are underway, the next step will be the distribution network for water reuse. At this stage the intention is to invite private developers to finance this. The most likely scenario would see NWC invite bids for the treated effluent from the factory gate, and the developer would be responsible for finding customers for the effluent and building the distribution system to deliver it to these customers.

In the longer term there will be opportunities to invest in the water distribution system. Indeed, once the existing management contracts for the major cities expire, they will be replaced by concessions. This might involve NWC contracting a private partner to run the utility for a period of perhaps 20 years, and to manage the investment programme, part of which may be financed by the concessionaire and part of which would be financed by the government. The other opportunity would be to invest in the NWC holding company itself in an initial public offering.

41.8.1 Tariffs
The tariff structure applied by MOWE and maintained by NWC is detailed in the figure below.

**Figure 41.17 Water tariff structure**

<table>
<thead>
<tr>
<th>Consumption (m³/month)</th>
<th>Tariff (SAR/m³)</th>
<th>Tariff ($/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-50</td>
<td>0.10</td>
<td>0.027</td>
</tr>
<tr>
<td>50-100</td>
<td>0.15</td>
<td>0.040</td>
</tr>
<tr>
<td>100-200</td>
<td>2.00</td>
<td>0.533</td>
</tr>
<tr>
<td>200-300</td>
<td>4.00</td>
<td>1.067</td>
</tr>
<tr>
<td>&gt;300</td>
<td>6.00</td>
<td>1.600</td>
</tr>
</tbody>
</table>

Source: Water Market Middle East 2010, GWI 2009

The average amount billed is currently SAR 1.07/m³. MOWE estimates the true cost of supplying water at SAR 18/m³ including capital costs, but excluding the cost of subsidised feedstock for SWCC’s desalination plants.
41.8.2 Operating and capital expenditure

The extent of private sector participation in the Saudi water sector is discussed in section 41.10. An example of this is the financial structure of the Shuqaiq IWPP, which is shown in the figure below.

**Figure 41.18 Financial structure of the Shuqaiq IWPP**

Source: GWI

41.9 Government’s water strategy

41.9.1 SWCC privatisation

The next stage of the privatisation of the SWCC will be to package the main production centres as brown-field (i.e. existing capacity) IWPPs and to auction them to investors. This would involve separating the production assets from the rest of the company, and setting up an offtaker (which may or may not be WEC), which would sign a water and power purchase agreement with the buyer of the assets. There is scope for the buyers of the plants to rehabilitate the older plants to expand capacity and improve efficiency. The extent to which this is possible will need to be recognised in the duration of the power and water purchase agreements. A new agreement for the supply of feedstock will also need to be put in place.

Production centres that are earmarked for privatisation are Al Khobar, Shoaiba, Jubail and Shuqaiq. Older production centres (such as Jeddah) and smaller plants (such as the Red Sea satellite plants) are not expected to be sold in the first wave of privatisation.
41.9.2 National Water Company strategy

41.9.2.1 Water supply and wastewater collection

The strategy for water supply and wastewater collection is to incorporate performance-based management contracts of 5-7 year duration in the country’s five main urban areas. These contracts encompass water production, water supply, wastewater collection and treatment and treated effluent management. The aim is to improve the performance of the utilities. Two contracts have already been let to Veolia Water in Riyadh and Suez Environnement in Jeddah. Over the next year, NWC is planning to award similar contracts covering Saudi Arabia’s three other urban areas: Greater Dammam, Madinah and Makkah/Taif. After the management contracts have reached their term, the intention is to let longer-term concession contracts for the cities. This will require some form of cost-recovery tariffs in order to be attractive to private-sector bidders.

41.9.2.2 Wastewater treatment and reuse

The NWC plans to expand and modernise capacity through a privatisation programme encompassing existing and future wastewater-treatment facilities in Saudi Arabia’s major cities. As well as the greenfield construction elements, the duration of the operation and maintenance elements of the contracts is expected to be 25 years. The Riyadh wastewater scheme will be the first under the privatisation. Here WWTWs will be offered as two separate packages based on catchment areas. Jeddah will follow Riyadh, and then Dammam, Makkah and Madinah.

Currently, treated wastewater is not widely reused. There are some small commercial reuse operations in Jeddah, but the Manfouha wastewater treatment plant in Riyadh simply returns its effluent to nature: it is the source of the “Riyadh River”. The objective is to upgrade the standard of wastewater treatment in the treatment plants to reuse standard, then to invite private companies to construct a distribution network for the reclaimed water to take it to commercial customers with non-potable water needs. Developing commercially viable water-reuse schemes in Saudi Arabia’s main urban areas is an important strand of the government’s wastewater strategy. Selling the treated effluent to end users will be essential in order to cover the cost of the distribution network.

41.9.3 The Economic Cities Programme

Six new cities are planned across Saudi Arabia, of which four have made significant progress:

- **King Abdullah Economic City** (KAEC) is being developed by Emaar, a publicly-quoted Emirati property developer, between Makkah, Madinah and Jeddah. HSBC has been appointed as financial advisor for the utility work. Negotiations over a contract for a 70,000 m³/d desalination plant have been ongoing for some time. This will be financed separately from the rest of the KAEC development. In the longer term the desalination component could grow to 1.58 million m³/d.

- **Knowledge Economic City** (KEC), situated in Madinah, brings together an Islamic-studies centre with an IT-based economic city at an estimated cost of SAR 30 billion. The total population will be 150,000. It is being developed by a consortium of local investors.

- **Prince Abdulaziz bin Moussaed Economic City** (PABMEC) is in Hail, 720 km north of Riyadh. It is being developed by Rakisa Holding Company, a Saudi-based telecoms and infrastructure-investment group. The total cost of the new city will be SAR 30 billion by its completion date in 2016. No details of its power and water requirement have been released. It will have a population of up to 2 million people.

- **Jizan Economic City** (JEC) will be 725 km south of Jeddah. It has similar broad-reaching objectives to KAEC. It is being developed by Malaysia’s MMC and Saudi Binladen Group, and has a projected population of 300,000.

At this stage it is unknown what the utility provision for the cities will be. As the cities are being developed privately, it is assumed that the utilities will be privately financed and owned. This would imply some need for regulation, which has yet to be discussed. However, given the prominence attached by recent royal and ministerial decrees to water reuse, the economic-city programme is expected to offer a wealth of opportunities to the wastewater-treatment and reuse sector.

41.10 Private sector participation

The Supreme Economic Council takes responsibility for the privatisation programme in the Kingdom, and approved a national strategy in a resolution in June 2002. The Council of Ministers subsequently identified the sectors, including water, which would be included in the privatisation programme. The privatisation strategy for the water sector, which was launched in 2006, is illustrated in the following figure.
Saudi Arabia // Private sector participation

Figure 41.19 Privatisation strategy for Saudi Arabia

Source: GWI

A timeline of the privatisation process is shown below.

Figure 41.20 Timeline of the privatisation programme

Source: GWI

The figure below outlines the extent of private-sector participation in capital and operating expenditure in the Saudi water sector.

Figure 41.21 Private sector participation in the Saudi water sector

<table>
<thead>
<tr>
<th>Area of sector</th>
<th>2009 Capex</th>
<th>2009 Opex</th>
<th>2020 Capex</th>
<th>2020 Opex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desalination plants</td>
<td>New plants</td>
<td>New plants</td>
<td>All plants</td>
<td>All plants</td>
</tr>
<tr>
<td>Long-distance transmission</td>
<td>No</td>
<td>No</td>
<td>Maybe</td>
<td>Maybe</td>
</tr>
<tr>
<td>Drinking-water distribution</td>
<td>No</td>
<td>Some</td>
<td>Some</td>
<td>Yes</td>
</tr>
<tr>
<td>Sewerage</td>
<td>No</td>
<td>Some</td>
<td>Some</td>
<td>Yes</td>
</tr>
<tr>
<td>Wastewater treatment plants</td>
<td>New plants</td>
<td>New plants</td>
<td>All plants</td>
<td>All plants</td>
</tr>
<tr>
<td>Groundwater resources</td>
<td>No</td>
<td>No</td>
<td>Maybe</td>
<td>Maybe</td>
</tr>
</tbody>
</table>

Source: GWI
4.1.1 Current and future projects

4.1.1.1 Water production facilities

The following figure outlines the current and future water production facilities in Saudi Arabia.

**Figure 41.22  Water production projects**

<table>
<thead>
<tr>
<th>Project</th>
<th>Capacity (m³/d)</th>
<th>Cost ($million)</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al-Waji 4</td>
<td>11,000-13,500 m³/d MED</td>
<td></td>
<td>Expected to be retendered by SWCC.</td>
</tr>
<tr>
<td>Duba phase 4</td>
<td>9,000 m³/d MED</td>
<td></td>
<td>Expected to be retendered by SWCC.</td>
</tr>
<tr>
<td>Haql phase 3</td>
<td>9,000 m³/d MED</td>
<td></td>
<td>Expected to be retendered by SWCC.</td>
</tr>
<tr>
<td>Jeddah phase 3</td>
<td>240,000 m³/d SWRO</td>
<td>Approx. $300 million</td>
<td>Contract signed.</td>
</tr>
<tr>
<td>Jizan Economic City</td>
<td>Development of a 12,000 m³/d SWRO and a 3,000 m³/d municipal WWTP. Depending on growth at JEC, the SWRO island will be expanded to 70,000 m³/d at a later date.</td>
<td>Contract tendered on 9 February 2010. Bid submission scheduled for April 2010, with an award to follow in May. The projected commercial operation date is August 2011.</td>
<td></td>
</tr>
<tr>
<td>Jubail RO</td>
<td>75,000 m³/d SWRO</td>
<td>Total cost of the desalination equipment is around $70 million. The 16-month contract is valued at around $52 million.</td>
<td>Under operation</td>
</tr>
<tr>
<td>Jubail RO second pass</td>
<td>Addition of a second pass to SWCC’s 78,182 m³/d RO plant at Jubail</td>
<td></td>
<td>SWCC has issued a tender, with the bid submission deadline extended to 12 April 2010.</td>
</tr>
<tr>
<td>King Abdullah Economic City</td>
<td>10,000 m³/d SWRO, with the option for the client to double the size of the plant after two years.</td>
<td>$52 million</td>
<td>Decision on project’s future due in 2010</td>
</tr>
<tr>
<td>Khobar 4 IWPP</td>
<td>250,000 m³/d &amp; 250MW</td>
<td></td>
<td>Future plant planned over the next 5-7 years</td>
</tr>
<tr>
<td>Ras Azzour</td>
<td>1,025,000 m³/d (220MiGD) &amp; 2,400 MW. Likely combination of RO (25-30%) and thermal desalination technologies. The power plant will employ a gas-fired combined cycle.</td>
<td>Region of $4 billion</td>
<td>Being tendered on an EPC basis. Bid deadline set for 19 April 2010. First power scheduled to be produced by end of 2012.</td>
</tr>
<tr>
<td>Ras Azzour Ma’aden aluminium</td>
<td>Approximately 30,000 m³/d and 2,000 MW</td>
<td></td>
<td>This has been shelved in favour of a joint power and water project with SWCC at Ras Azzour. As well as offtaking water from the joint project, Ma’aden will offtake 1,350 MW of the project’s 2,400 MW power output</td>
</tr>
<tr>
<td>Ras Tanura</td>
<td>Approximately 150,000 m³/d, 1000 MW and 2,300 t/hour of steam</td>
<td></td>
<td>Front end engineering will be completed before an RFP for the project is issued</td>
</tr>
<tr>
<td>Shoaiba 4 IWPP</td>
<td>650,000 m³/d &amp; 665 MW</td>
<td></td>
<td>Future plant planned over the next 5-7 years</td>
</tr>
<tr>
<td>Shuqaiq 3 IWPP</td>
<td>175,000 m³/d &amp; 175 MW</td>
<td></td>
<td>RFP planned for 2010</td>
</tr>
<tr>
<td>Yanbu</td>
<td>6,000 m³/d</td>
<td>EPC bids under review</td>
<td></td>
</tr>
<tr>
<td>Yanbu 3</td>
<td>400,000 m³/d &amp; 1,500 MW</td>
<td></td>
<td>Combined with Yanbu (Marafiq) as EPC. Unlikely to proceed before the conclusion of the tender process for the Ras Azzour power and desalination plant.</td>
</tr>
<tr>
<td>Yanbu for Marafiq</td>
<td>150,000 m³/d and 1,700 MW</td>
<td></td>
<td>Combined with Yanbu 3 as EPC</td>
</tr>
</tbody>
</table>

Source: Global Water Desal Tracker, GWI

The Al Khafji Phase 3 project, a 30,000 m³/d MED plant, has been cancelled by the SWCC. The region in the far north-east corner of the Kingdom will instead be supplied by the Ras Azzour power and desalination plant. Previously, the total budget for the Haql, Duba, Al-Waji and Al-Khafi projects was SAR 750 million. However, the cancellation of Al Khafji and the uncertain timetable for the remaining three projects indicate a reduction in the expected cost.

The package of three satellite MED desalination plants (Al-Waji, Duba and Haql) is now not expected to be retendered by the SWCC before the conclusion of the tender process for the Ras Azzour power and desalination plant. A possible retender has
previously been expected before the end of 2009. Wabag/El-Seif Engineering and ACWA Power Sasakura were involved with previous tender processes for the package of plants.

The figure below shows SWCC water transmission pipelines that are currently under construction.

**Figure 4.23 Water transmission pipelines**

<table>
<thead>
<tr>
<th>Project</th>
<th>Pipeline length (km)</th>
<th>Pipeline diameter (mm)</th>
<th>No. of pumping &amp; blending stations</th>
<th>Storage tanks</th>
<th>Total storage capacity (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makkah-Taif-Jeddah Transmission System III</td>
<td>344</td>
<td>1,100-2,000</td>
<td>5</td>
<td>7</td>
<td>790,000</td>
</tr>
<tr>
<td>Shuqaiq Transmission System II</td>
<td>913</td>
<td>15-1,600</td>
<td>10</td>
<td>58</td>
<td>565,000</td>
</tr>
<tr>
<td>Al-Leath Transmission System</td>
<td>6</td>
<td>300</td>
<td></td>
<td>2</td>
<td>9,000</td>
</tr>
<tr>
<td>Farasan Transmission System</td>
<td>2</td>
<td>450</td>
<td></td>
<td>2</td>
<td>9,000</td>
</tr>
<tr>
<td>Ras Azzour - Riyadh Transmission System</td>
<td>913.8</td>
<td>1,200-1,829</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: SWCC

**4.1.1.2 Wastewater treatment and water reuse**

The figure below indicates the existing wastewater treatment plants in Saudi Arabia’s major cities, as well as the plants which are proposed to be built as part of the country’s wastewater privatisation.

**Figure 4.24 WWTPs to be constructed or transferred to the private sector in major cities**

<table>
<thead>
<tr>
<th>City</th>
<th>Facility</th>
<th>Plant</th>
<th>Design capacity (m³/d)</th>
<th>Status</th>
<th>Plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riyadh</td>
<td>Al-Kharj Road (package 1)</td>
<td>Phase 1</td>
<td>100,000</td>
<td>Online (2007)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 2</td>
<td>100,000</td>
<td>Under construction (2009)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 3</td>
<td>100,000</td>
<td>Planned EPC contract</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td>Manfouha (package 2)</td>
<td>South C2</td>
<td>80,000</td>
<td>Online (1975)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>South C3</td>
<td>120,000</td>
<td>Online (1981)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>North</td>
<td>200,000</td>
<td>Online (1994)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>East</td>
<td>200,000</td>
<td>Online (2005)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td>Al Hayer (package 2)</td>
<td>Phase 1</td>
<td>400,000</td>
<td>Under construction (2011/12)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 2</td>
<td>400,000</td>
<td>Planned Likely EPC</td>
<td></td>
</tr>
<tr>
<td>Jeddah</td>
<td>Al Khumrah</td>
<td>Phase 1</td>
<td>40,000</td>
<td>Online (1977)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 2</td>
<td>60,000</td>
<td>Online (1977)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 3</td>
<td>140,000</td>
<td>Online (2005)</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 4</td>
<td>250,000</td>
<td>Under construction</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 5</td>
<td>250,000</td>
<td>Planned (under study) BOT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grouped small plants</td>
<td></td>
<td>99,000</td>
<td>Online</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td>Airport</td>
<td>Phase 1</td>
<td>250,000</td>
<td>Under construction</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 2</td>
<td>250,000</td>
<td>Planned (under study) BOT</td>
<td></td>
</tr>
<tr>
<td>Madinah</td>
<td></td>
<td></td>
<td>300,000</td>
<td>Online</td>
<td>TOT</td>
</tr>
<tr>
<td>Makkah</td>
<td>Akashiya</td>
<td>Phase 1</td>
<td>40,000</td>
<td>Online</td>
<td>TOT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase 2</td>
<td>60,000</td>
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<tr>
<td></td>
<td>Hadda</td>
<td></td>
<td>125,000</td>
<td>Under construction</td>
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<td></td>
<td>Arana</td>
<td></td>
<td>250,000</td>
<td>Operational</td>
<td>TOT</td>
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<tr>
<td>Greater</td>
<td>Dammam</td>
<td></td>
<td>193,000</td>
<td>Online</td>
<td>TOT</td>
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<tr>
<td>Dammam</td>
<td>Al-Khobar</td>
<td></td>
<td>290,000</td>
<td>Online</td>
<td>TOT</td>
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</tbody>
</table>

Source: NWC

Performance-based management contracts to provide water and wastewater services to Riyadh and Jeddah were awarded in 2007 and 2008 respectively. The 6-year contract for Riyadh was awarded to Veolia Water, and the 7-year Jeddah contract to Suez.
Environnement. NWC is in the process of rolling out three further water & wastewater management contracts in the Kingdom’s so-called ‘second-tier cities’: Greater Dammam, Madinah and Makkah/Taif. The tentative schedule is outlined in the table below.

In Riyadh and Jeddah, NWC established City Business Units (CBUs), which are being managed and operated by the private operators. The intention is to replicate this arrangement in the upcoming round of new management contracts. Reuse of treated effluent is within the mandate of the CBUs, where facilities exist.

Figure 41.25 Tentative schedule for tendering of management contracts by NWC in second tier cities

<table>
<thead>
<tr>
<th>Stage</th>
<th>Dammam/Al-Khobar</th>
<th>Madinah</th>
<th>Makkah/Taif</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issuance of RFQ</td>
<td>6 July 2009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prequalification of bidders</td>
<td>August 2009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFP issuance</td>
<td>Second half 2010</td>
<td>Second half 2010</td>
<td>December 2009</td>
</tr>
<tr>
<td>Bid deadline</td>
<td>March 2010</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: NWC

Other smaller cities targeted for future privatisation of water and wastewater services include Jubail, Hofuf, Mubarraz and Buraidah.

4.11.3 Tracked projects

Figure 41.26 Tracked desalination projects in Saudi Arabia

<table>
<thead>
<tr>
<th>Project name</th>
<th>Capacity (m³/d)</th>
<th>Expected cost</th>
<th>Description</th>
</tr>
</thead>
</table>
| Al Khafji      | 5,680           |               | 5,680 m³/d (1.5MGD) seawater MED, consisting of two 0.75MGD trains, each upgradable at a later date to 0.9MGD.  
**Client:** Al-Khafji Joint Operations  
**Current status:** The client is close to completing the design basis scoping paper for the project. Once the paper has been completed, the front-end engineering design (FEED) will go ahead. The FEED is now scheduled to be completed before the end of 2010. An EPC tender will be issued after this. |
| Al-Khafji Phase 3 | 30,000          | $200 million  | 30,000 m³/d MED  
**Client:** SWCC  
**Current status:** The project at Al-Khafji has been cancelled by SWCC. The region in the far north-east corner of the Kingdom will instead be supplied by the Ras Azzour power and desalination plant which is currently being tendered by SWCC. |
| Al-Waji 4       | 11,000          | $200 million  | 11,000-13,500 m³/d MED  
**Client:** SWCC  
**Current status:** The package of three satellite MED desalination plants (Al-Waji, Duba and Haql) is now not expected to be retendered by SWCC before the conclusion of the tender process for the Ras Azzour power and desalination plant. Project sources had previously expected a possible retender before the end of 2009. Wabag/El-Seif Engineering and ACWA Power Sasakura were involved with previous tender processes for the package of plants. |
| Duba phase 4    | 9,000           | $200 million  | 9,000 m³/d MED  
**Client:** SWCC  
**Current status:** The package of three satellite MED desalination plants (Al-Waji, Duba and Haql) is now not expected to be retendered by SWCC before the conclusion of the tender process for the Ras Azzour power and desalination plant. Project sources had previously expected a possible retender before the end of 2009. Wabag/El-Seif Engineering and ACWA Power Sasakura were involved with previous tender processes for the package of plants. |
| Haql phase 3    | 9,000           | $200 million  | 9,000 m³/d MED  
**Client:** SWCC  
**Current status:** The package of three satellite MED desalination plants (Al-Waji, Duba and Haql) is now not expected to be retendered by SWCC before the conclusion of the tender process for the Ras Azzour power and desalination plant. Project sources had previously expected a possible retender before the end of 2009. Wabag/El-Seif Engineering and ACWA Power Sasakura were involved with previous tender processes for the package of plants. |
<table>
<thead>
<tr>
<th>Project name</th>
<th>Capacity (m³/d)</th>
<th>Expected cost</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jizan Economic City</td>
<td>12,000</td>
<td></td>
<td>Development of the 12,000 m³/d first phase of a new SWRO plant, as well as a 3,000 m³/d municipal WWTP. The WWTP technology is at the discretion of the developer. Depending on the growth at JEC, the SWRO island will be expanded at a later date to 70,000 m³/d. The developer will also be responsible for the trucking of potable water to offtakers; the transportation of wastewater to the WWTP by vacuum truck; and the O&amp;M of water transmission lines connected to the SWRO plant as they are installed. <strong>Client</strong>: Joint venture between Malaysia’s MMC Corporation and Saudi Binladin Group (SBG). The consumers will be multiple private industries located in JEC, including a steel plant, factory marketing complex, and residential and commercial properties. <strong>Current status</strong>: The contract was tendered by the client on 9th February. Bid submission is understood to be scheduled for April 2010, with an award to follow in May. The projected commercial operation date is August 2011.</td>
</tr>
<tr>
<td>Jubail RO upgrade</td>
<td>78,182</td>
<td></td>
<td>The addition of a second pass to SWCC’s 78,182 m³/d reverse osmosis plant at Jubail, which was commissioned in 2002. <strong>Client</strong>: Saline Water Conversion Corporation (SWCC) <strong>Current status</strong>: SWCC has extended the bid submission deadline from 25 January to 12 April 2010.</td>
</tr>
<tr>
<td>Khobar 4 IWPP</td>
<td>250,000 &amp; 250MW</td>
<td></td>
<td>250,000 m³/d &amp; 250MW <strong>Client</strong>: SWCC <strong>Current status</strong>: One of three independent power and water projects (IWPP) to follow Yanbu 3 and to be developed over the next five to seven years. The projects are expected to be developed in the following sequence: Shoaiba 4, Shuqaiq 3, and Khobar 4.</td>
</tr>
<tr>
<td>King Abdullah Economic City</td>
<td>70,000</td>
<td></td>
<td>70,000 m³/d SWRO <strong>Client</strong>: Emaar, the Economic City <strong>Current status</strong>: The client has indicated that a decision regarding the future of the large desalination plant slated to serve KAEC has been postponed until next year. A number of proposals had been received. A 10,000 m³/d stop-gap plant is currently being constructed at the greenfield site, the centrepiece of Saudi Arabia’s economic city programme, by Huta Marine.</td>
</tr>
<tr>
<td>Ras Azzour</td>
<td>1,025,000 &amp; 2,400MW, $4,000 million</td>
<td></td>
<td>1,025,000 m³/d (220MIGD) &amp; 2,400MW. Combination of RO (25-30%) and thermal desalination technologies. The power plant will employ a gas-fired combined cycle. First power is scheduled to be produced at Ras Azzour by 1st December 2012. <strong>Client</strong>: Saline Water Conversion Corporation (SWCC) <strong>Current status</strong>: SWCC has extended the bid submission deadline on the separate power and water contracts from 20 March to 19 April. Five contractors have so far prequalified for the desalination element: ACWA Power Sasakura; Arabian Bemco; Doosan Heavy Industries &amp; Construction; Hitachi Zosen; and Sidem. At least nine companies have prequalified for the power element, including Alstom; Arabian Bemco; Daelim Industrial Co.; Daewoo E&amp;C; Doosan Heavy Industries &amp; Construction; Hyundai E&amp;C; Iberdrola E&amp;C; National Contracting Co.; and Siemens. SWCC originally issued a request for proposals for the project on 5th December 2009.</td>
</tr>
<tr>
<td>Ras Tanura</td>
<td>150,000</td>
<td></td>
<td>Approx 150,000 m³/d, 1000MW and 2,300t/hour of steam <strong>Client</strong>: Saudi Aramco and Dow Chemical <strong>Current status</strong>: Potential bidders have submitted prequalification documents and been invited by the client to make presentations. The client is completing the front end engineering before an RFP for the project is issued. This is estimated to happen towards the end of 2010 at the earliest.</td>
</tr>
<tr>
<td>Shoaiba 4 IWPP</td>
<td>650,000</td>
<td></td>
<td>650,000 m³/d &amp; 665MW <strong>Client</strong>: SWCC <strong>Current status</strong>: One of three independent power and water projects (IWPP) to follow Yanbu 3 and to be developed over the next five to seven years. The projects are expected to be developed in the following sequence: Shoaiba 4, Shuqaiq 3, and Khobar 4.</td>
</tr>
</tbody>
</table>
### Project name: Shuqaiq 3 IWPP
- **Capacity (m³/d):** 83,432 m³/d MSF to be expanded to 175,000 m³/d
- **Expected cost:**
- **Description:** The existing Shuqaiq 1 plant has a capacity of 83,432 m³/d MSF and 62MW. The new capacity that will be build under this project is 175,000 m³/d & 175MW
  - **Client:** Saline Water Conversion Corporation (SWCC)
  - **Current status:** This project is now slated as the first asset sale to take place as part of the SWCC privatisation. An RFP is planned for the first half of 2010. The developer would be offered the opportunity to buy and rehabilitate the existing Shuqaiq 1 plant, and also build additional capacity. The full details of the proposed privatisation of SWCC are now scheduled to be announced in the first quarter of next year. This project was one of three IWPPs (also including Shoaiba 4 and Khobar 4) that had originally been scheduled to follow the Yanbu 3 project.

### Project name: Yanbu
- **Capacity (m³/d):** 6,000 m³/d
- **Expected cost:** 6,000 m³/d
- **Current status:** Al-Alamiyah Water Works & Services, a joint venture between AmiWater, a subsidiary of Amiantit Group, and Bushnak Group, is currently reviewing EPC bids for the 6,000 m³/d RO plant. However, the project has been held up due to a delay in the release of funds. The successful bidder is not expected to be announced for another two months. The project will be developed under a BOO contract, with AWWS acting as developer. The plant is expected to be expanded at a later date.

### Project name: Yanbu (Marafiq)
- **Capacity (m³/d):** 150,000 m³/d
- **Expected cost:** Previously 150,000 m³/d and 1700 MW
- **Current status:** This plant will be merged with the greenfield elements of SWCC’s Yanbu 3 IWPP and tendered on an EPC basis (see story p18). The combined facility will have a capacity of approximately 1700MW and 550,000 m³/d (121 MIGD). The project is understood to be the highest priority in SWCC’s large-scale procurement programme, although no firm date has been given as to when the new tender process will move forward. SWCC has also yet to indicate what will happen to the twelve bidding groups that prequalified for the Yanbu (Marafiq) IWPP in 2008.

### Project name: Yanbu (Marafiq) 2
- **Capacity (m³/d):** 60,000 m³/d
- **Expected cost:** Approximately 60,000 m³/d of desalination capacity and between 600MW and 700MW of oil-fired power capacity. Marafiq is considering whether to include the option of future expansion. This option would be exercised in the case of extra demand from Marafiq’s customers in Yanbu. This project is an interim measure to meet demand until the joint EPC project with SWCC is successfully delivered. The current expectation is that it will provide sufficient capacity to meet demand up to 2014.
- **Client:** Marafiq
- **Current status:** Marafiq is anticipating that it will launch the tender process for this project in March or April 2010.

Source: Global desalination tracker, GWI
Saudi Arabia // Current and future projects

Tracked reuse projects in Saudi Arabia

<table>
<thead>
<tr>
<th>Project name</th>
<th>Capacity (m³/d)</th>
<th>Expected cost</th>
<th>Description</th>
</tr>
</thead>
</table>
| Jeddah WWTPs               | 750,000         |               | To manage, operate, maintain and develop Jeddah’s existing and future wastewater treatment plants. The new capacity that is expected to be included in the contract encompasses three new plants: Jeddah Airport 3, Jeddah City North and Jeddah City South. The contract also includes the rehabilitation of eight operational plants, project management and the subsequent operation and maintenance of two new 250,000 m³/d facilities at Jeddah Airport and Al Khumrah (Phase 4), and the design and construction of the second, NWC-financed 250,000 m³/d phase of the Jeddah Airport plant.  
**Client:** National Water Company. CRA International (Charles River Associate International) is lead consultant on the project; Hyder Cons  
**Current status:** An RFQ for the Jeddah project will not be issued until the tender process for the Riyadh wastewater PPP is finished. The reasoning behind this is to learn from the Riyadh tender process, which itself has been delayed. |
| King Abdullah Economic City WWTP | 30,000         |               | To build, own and operate a new wastewater treatment plant to serve the largest of the six economic cities planned across the Kingdom. KAEC will be located 120km north of Jeddah. Capacity: 30000 m³/d. Technology: MBR  
**Client:** Emaar. HSBC is the financial adviser.  
**Current status:** Although the Client received four proposals for the WWTP, it has now decided to halt progress on the project until 2010. The expectation is that if the bids are no longer valid when the client chooses to restart the project, then it will be retendered. |
| Mecca, Medina & Greater Dammam WWTPs | 1,228,000     |               | A mixture of existing and future wastewater treatment plants to serve the cities of Mecca, Medina & Greater Dammam, which includes Al Khobar city. Capacity: Medina: 300,000. Mecca: 195,000. Dammam: 483,000.  
**Client:** National Water Company  
**Current status:** Expected to follow the completion of the tender process for the Riyadh and Jeddah wastewater PPPs. |
| Riyadh WWTPs               | 1,100,000       |               | The original long-term objective of NWC’s wastewater strategy in Riyadh was to package the treatment assets and sequentially transfer operation and maintenance of those assets to the private sector through brownfield build-operate-transfer contracts of around 25 years in duration. The total capacity of the WWTPs in question (some of which have yet to be constructed) is 1.1 million m³/d. The first package of WWTPs is three 100,000 m³/d phases at Al Kharj. A second package concerns the continued operation of the four existing plants at Manfouha until 2015, as well as the operation of the 400,000 m³/d Al Hayer Phase 1, which is currently under construction through a local EPC contractor. The contract will also cover the construction of the 400,000 m³/d Al Hayer Phase 2 plant, which is likely to be tendered on an EPC basis.  
**Client:** National Water Company (NWC). Advisors are HSBC, Fichtner, Clifford Chance, The Law Firm of Yousef and Mohammed Al-Jadaan, Halcrow, PricewaterhouseCoopers and Ernst & Young.  
**Current status:** NWC has indicated that it now intends to issue a full tender for a third 100,000 m³/d tertiary wastewater treatment plant at Al-Kharj Road in the second quarter of 2010. NWC is understood to have prequalified bidders for the project in late 2009. |

Source: Global water reuse tracker, GWI
Tracked PPP projects in Saudi Arabia

<table>
<thead>
<tr>
<th>Project name</th>
<th>Capacity (m³/d)</th>
<th>Expected cost</th>
<th>Description</th>
</tr>
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</table>
| Greater Dammam, Medina and Mecca |                 |               | Water and wastewater management contracts for the following cities: 1) Greater Dammam (Dammam & Al Khobar, total population 1.2 million), 2) Mecca & Taif (total population 2.2 million) and 3) Medina (population 994,000).  
**Client:** National Water Company (NWC) is the client. Advisory team of Hyder Consulting, Al Dakhil Capital Group and Prima Law & Consultation Office in association with Simmons & Simmons.  
**Current status:** NWC issued a request for proposals for the contract serving Mecca and Taif on 21 December, with the bid deadline set for 1 March 2010. Some of the international consortia are likely to abstain from bidding, given the restrictions on Muslim workers in the holy city. RFPs for Dammam/Al Khobar and Medina will be staggered at a later date, most probably in the second half of 2010. The following groups have qualified for all three contracts: Acciona with YTL Power International and Wessex Water; Agbar with WESCO (Bushnak Group); aqualia; Gelsenwasser with Saudi Services Company Ltd.; Metito Berlinwasser with Saudi Masader; Ranhill with Jusco and Arab Economic and Business Group (A’Amal); Saur with Zamil Operations & Maintenance Co.; United Utilities with Saudi Pan Kingdom; and Veolia. A consortium of Severn Trent Services International (STSI) and Miahona has prequalified for the Dammam/Al Khobar project, though not for Mecca/Taif or Medina. A consortium of Puncak Niaga, STSI and Miahona has prequalified for the Mecca/Taif contract. |
| Smaller cities                |                 |               | As part of the next stage of the privatisation process, the Saudi National Water Company intends to tender between three and five contracts for full water and wastewater audit services in a number of smaller cities. The contracts are expected to be split up on a geographical basis as follows: Buraidah and Onaizah in Al-Qassim Province; Abha and Khamis Mushait in Asir Province; Jubail and Al Hofuf; Tabuk; and Yanbu.  
**Client:** NWC  
**Current status:** Although NWC has not yet indicated a firm timetable for tendering audit contracts for the smaller cities, it has provided an indicative schedule for the award of advisory contracts and then management contracts within the cities. The schedule is as follows: |

Source: Global PPP project tracker, GWI
4I.12 Market forecast

The population of Saudi Arabia is expected to reach 50 million by the year 2050, and this expansion remains the fundamental driver of growing demand in the Kingdom’s water sector. The fact that groundwater resources and other sources of fresh water are declining faster than the population is rising presents a huge challenge to the government, and conversely a significant investment opportunity for the water industry. Other factors driving increased demand are the moves to further industrialise and diversify the economy away from oil and gas, and the new cities programme, which will entail significant investment in water infrastructure.

Efforts are being made to harness desalination and water reuse, to increase private sector participation in the water sector and to encourage increased conservation to secure water supplies. There is significant scope for expansion of water reuse across Saudi Arabia. Constructing large-scale treated effluent distribution networks in the major cities is a considerable logistical and financial challenge that is the subject of a number of feasibility studies by NWC and its consultants. Desalination provides attractive opportunities since it is much more established than reuse. Desalination projects totalling approximately 2.5 million m³/d are currently being tracked by Global Water Intelligence. Of these, the highest-profile project is the 1.025 million m³/d Ras Azzour project. This recently suffered a setback when private-sector ownership of the project was abandoned in the second quarter of 2009 after the preferred-bidder consortium split up. However, appetite for private sector involvement in the desalination sector in general remains strong.

The situation is a little different when it comes to utilities. The water utilities for the major cities historically had a very poor record of efficiency with high distribution losses and irregular supply. Support from the very highest levels of government for privatisation has begun to have an effect, but there remain significant challenges to overcome. These include the fact that tariffs are far below cost recovery levels, and there is as yet little political support to increase them - the water sector is heavily dependent on public subsidies. Another restraint is that unemployment is a serious issue in the Kingdom; it has yet to be seen how strong the commitment to privatisation will be in the face of the kind of downsizing of personnel that the private sector might want to implement.
Figure 41.29 Market forecast, 2007-2016

Drinking water capital expenditure

Industrial and municipal capital expenditure

Water and wastewater operating expenditure

Industrial expenditure

Desalination and water reuse

Source: GWI Global Water Market 2011
Figure 41.30 Market forecast breakdown, 2010

Total water market (2010) $8,538m

- Industrial water 3.5%
- Bottled water 5.6%
- Point of use equipment 1.3%
- Irrigation equipment 21.1%
- Utilities 68.5%

Industrial market (2010) $303m

- Services 7.3%
- Chemicals 38.7%
- Industrial equipment 54.0%

Utility market (2010) $5,847m

- Water opex 36.5%
- Wastewater opex 5.0%
- Drinking water capex 44.6%
- Wastewater capex 13.9%

Combined capex (2010) $3,584m

- Equipment 24.7%
- Site work 20.8%
- Pipes 19.1%
- Pumps & valves 18.5%
- Pipe rehab services 4.8%
- Professional/other 12.1%

Utility capex (2010) $3,420m

- WTPs 0.1%
- Water resources/other 63.2%
- Water network rehab 5.5%
- New water networks 7.3%
- WWTPs 12.7%
- New wastewater networks 6.4%
- Wastewater network rehab 4.3%
- Other wastewater 0.4%

Equipment market (2010) $871m

- Other equipment 51.5%
- Standard process equipment 12.3%
- Headworks/screens 9.4%
- Filtration systems/media 8.4%

Source: GWI Global Water Market 2011
Figure 41.31 Market forecast data, 2007-2016 ($ million)

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<tbody>
<tr>
<td>Utility water capital expenditure</td>
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<tr>
<td>Water network rehabilitation</td>
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<td>737.0</td>
<td>163.1</td>
<td>189.2</td>
<td>218.0</td>
<td>249.5</td>
<td>283.4</td>
<td>319.7</td>
<td>358.1</td>
<td>398.2</td>
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<td>New water networks</td>
<td>406.5</td>
<td>977.0</td>
<td>216.2</td>
<td>250.8</td>
<td>289.0</td>
<td>330.7</td>
<td>375.7</td>
<td>423.8</td>
<td>474.6</td>
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<td>8.4</td>
<td>18.9</td>
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<td>6.8</td>
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<td>Water resources excluding desalination</td>
<td>137.4</td>
<td>314.0</td>
<td>87.9</td>
<td>94.9</td>
<td>102.5</td>
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<td>119.6</td>
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<td>585.8</td>
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<td>Wastewater network rehabilitation</td>
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<td>110.0</td>
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<td>193.5</td>
<td>316.3</td>
<td>409.5</td>
<td>524.9</td>
<td>533.1</td>
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<td>New Wastewater networks</td>
<td>103.8</td>
<td>139.4</td>
<td>165.0</td>
<td>219.9</td>
<td>290.3</td>
<td>474.4</td>
<td>614.2</td>
<td>787.4</td>
<td>799.6</td>
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<td>192.9</td>
<td>321.7</td>
<td>433.5</td>
<td>578.3</td>
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<td>861.9</td>
<td>1,104.6</td>
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<td>Other wastewater</td>
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<td>20.6</td>
<td>26.7</td>
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<td>Total utility opex</td>
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Source: GWI Global Water Market 2011
This report is a excerpt from *Global Water Market 2011*. For ease of comparison, all measurements in *Global Water Market 2011* have been converted into metric units, and key monetary amounts have been converted into US dollars. Amounts preceded by a single dollar sign ($) are in US dollars, unless otherwise specified. Local currencies are specified using their ISO three-letter code, and conversion factors for units and currencies are given at the end of this section.

A consolidated list of references consulted by the authors during the course of writing *Global Water Market 2011* is provided at the end of the report.

*Global Water Market 2011* was written and researched by Lola Adesanya (France, Nigeria), Fabiola Alvarado-Revilla (Austria, Colombia, Israel, Peru, UAE), Carla Bissett (Australia), Max Borchardt (data for several countries), Lorenzo Bosi (Italy), Christopher Gasson (Introduction, Private Water, Scarcity, EU Regulation), Alexander Danilenko (data for several countries), Victoria David (Belarus, Canada, Czech Republic, Egypt, Indonesia), Rebeca de Buen (Colombia), Emma Dou (China, Taiwan), Amina Egal (France), Ian Elkins (Introduction), Emilie Filou (Algeria, Morocco, Tunisia), Gabriela Gadêlha (Brazil), Clara Gonzalez (Austria, Germany, Malaysia), Adam Heffill (Kuwait, Saudi Arabia, Scarcity), Hiroko Kasama (Japan, UAE), Sara Knight (Austria, Switzerland), Dennis Konadu (Kazakhstan, Poland, Russia), Valentina Lazarova (Reuse in France), Heather Lang (Qatar), Kathy Liu (China, Taiwan), Roya Mansouri (Iran), Charlotte Massey (Saudi Arabia, Singapore), Lawrence Molloy (Japan), Neha Rai (Netherlands), Rama Singh Rastogi (India), Sungwook Seo (Republic of Korea), Daniel Shemie (Belgium), Kelly Ser (Singapore), Sivan Tal (Israel), Jablanka Uzelac (Croatia), Swathi Veeravalli (New Zealand), Shilp Verma (Indonesia, Malaysia), Nadia Weekes (EU Regulation), Richard Weyndling (Spain), Mark Walsh (Mexico) and Mark Worth (Nigeria, South Africa).

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The Project Manager was Jablanka Uzelac, the Production Manager was Heather Lang and the Data Manager was Ankit Patel.
The Research and Publications Programme Director was Matthew Stiff.

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Requests for more in-depth research and analysis should be addressed to our Head of Research Jablanka Uzelac (ju@globalwaterintel.com) who will be happy to discuss bespoke reports to meet particular needs. Additionally, we can provide consultancy services stretching from due diligence to market analysis and strategy reviews.
Forecast methodology

The market data and forecasts presented in this report are based on four original datasets:

The first dataset contains information about capital and operating expenditure by water utilities. We have collected detailed information where possible for the profiled country. Where consolidated information is not available, we have estimated it on the basis of grossing up individual utility data (typically from the World Bank’s IBNet database of water utility performance indicators). Where utility data is not available we have taken service-level information, then modelled the likely costs on the basis of comparators taken from IBNet, and added in information on overseas development assistance from the OECD database. Having established a basis for recent historical capital and operating expenditure, we have then moved forward to project future capital expenditure, and the impact this additional capital expenditure will have on operating expenditure. We have been able to do this on the basis of proposed capital programmes and information about the challenges that the profiled country faces. We have taken into account historic patterns, and a model based on our analysis of the drivers of expenditure in water. We have then divided up the capital expenditure by category (e.g. new networks, rehabilitation, treatment plants and so on) according to what information we have about the destination of capital expenditure.

The second dataset concerns the industrial water equipment market. Here we have collected information about the estimated size of the various equipment and end-user markets from market participants, and used this to create a matrix giving the proportion of each end-user market which goes towards each equipment supply category. We have then taken a set of industry indicators (such as power production, paper production, oil and gas production, and so on) in order to divide the total market geographically by country, weighted according to both recent growth and established capacity (to take account of both new sales and upgrades). The next step is to project the growth of each industry forward, which we have done with reference to current industry literature and analysis. We have then applied the market growth percentages of the equipment categories in a matrix multiplication to reach an industrial market forecast by end-user and by equipment type.

The third dataset is the water treatment chemicals market, which is based on data on chemical market size and share supplied by the major players in the business. This data is then divided amongst end-user markets, with future growth forecasts being created from a function of future capex and existing capacity. A matrix multiplication delivers the chemical market by end-user and by chemical type. We have also estimated the size of the industrial water services business, using some information on market size provided by participants, and projecting this forward on the basis of current trends.

The fourth dataset is our desalination dataset drawn from DesalData, which provides information on planned plants, a cost calculator, as well as future forecast capacity. It has been brought together with the industrial and municipal datasets to create a combined water industry equipment forecast.

The essential point to make is that the data presented in this report is not the result of primary research. It is based on secondary research, and mathematical modelling. It is not infallible. Even though it is sometimes presented with decimal places of accuracy, this is more the nature of the spreadsheets that were used to create the data than a reflection of its dependability. We justify the inclusion of the data in this report because it represents a quantitative summary of all the qualitative information carried in the report. It represents our opinion on what the market is, based on the research we have undertaken.

There are some contradictions with data we produced for the Global Water Market 2008 report. In the most extreme cases, this is because of improved access to information or improved methodology. Other differences can be explained in terms of currency changes. We have generally used the dollar exchange rate on 1st March 2010. The previous report used the dollar exchange rate on 1st August 2007. The global financial crisis has had a significant effect on the forecasts, and ensured that our expectations for 2009 were significantly out of line. This is the nature of forecasting. It can only aspire to be the most informed current view of the future. It cannot anticipate the unexpected.
Unit conversion factors used in *Global Water Market 2011*

1 US gallon = 0.003785 m³
1 MGD = 3,785 m³/d
1 MIGD = 4,546 m³/d
1 Acre-foot = 1,233 m³/d

Totals may not add up to 100% due to independent rounding of figures.

Exchange rates used in *Global Water Market 2011*

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<td>NIS New Israeli Shekels</td>
</tr>
<tr>
<td>1.40</td>
<td>NZD New Zealand, $</td>
</tr>
<tr>
<td>2.84</td>
<td>PEN Peru, Nuevos Soles</td>
</tr>
<tr>
<td>2.84</td>
<td>PLN Poland, Zlotych</td>
</tr>
<tr>
<td>4.00</td>
<td>QAR Qatar, Rials</td>
</tr>
<tr>
<td>3.03</td>
<td>RON Romania, New Lei</td>
</tr>
<tr>
<td>29.89</td>
<td>RUB Russia, Rubles</td>
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<tr>
<td>4.00</td>
<td>SAR Saudi Arabia, Riyals</td>
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<td>7.11</td>
<td>SEK Sweden, Kronor</td>
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<td>SEK Swedish Krona</td>
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<td>SGD Singapore, $</td>
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<td>1.05</td>
<td>Swiss Franc (CHF)</td>
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<td>32.75</td>
<td>THB Thailand, Baht</td>
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<td>1.38</td>
<td>TND Tunisia, Dinars</td>
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<td>1.48</td>
<td>TRY Turkey, New Lira</td>
</tr>
<tr>
<td>32.15</td>
<td>TWD Taiwan, New $</td>
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<tr>
<td>7.45</td>
<td>ZAR South Africa, Rand</td>
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