TEMPLATE

CASE STUDY / SUCCESS STORIES*
ON THE USE OF NON-CONVENTIONAL WATER RESOURCES

(Desalination - Reuse of Treated Wastewater-
Agricultural Drainage Water - Brackish Groundwater -.Rainwater Harvesting – other types)

1	**Type of case study (choose one only)**	Study Type	pick only one
		1-Desalination	
		2-Reuse of Treated Wastewater	+
		3-Agricultural Drainage Water	
		4-Brackish Groundwater	
		5- Rainwater Harvesting	
		6- Other Types (have to be mentioned)	
2	**Title of Case Study**	Jebel Ali wastewater treatment plant and Dubai water reuse	
3	**Country of implemented the study**	United Arab Emirates	
4	**Location of the study**	Jebel Ali	
5	**Implementing Institution/ Organization**	• Dubai Municipality	
6	**Funded by**	• Dubai Municipality	
7	**Time period of the study**	2015-2025	
8	**Goals**	• Using treated wastewater for groundwater aquifer recharge & enhancing both groundwater quality and reserves. • meeting the growing demand for recycled water delivery • enhancing Dubai's sewer infrastructure to meet the requirements of sustainable development. • supplying and installation of bio trickling filters in the wastewater pumping stations • providing an environmentally friendly upgrade to the existing chemical scrubbers for the removal of odorous gas compounds in the recycled water.	
9	**Methodology (approach to implement)**	To collect and review all the required data on the Jebel Ali Wastewater Treatment Plant (Jebel Ali WWTP), a data collection form designed by Mohamed Dawoud was sent to the Dubai Municipality with an official request for completion as per protocol. In addition, two interviews were conducted: one with the Dubai Municipality Team and one with the Jebel Ali WWTP operation team. Other activities to collect and review data included the design of data and output forms regarding the status of Jebel Ali Wastewater Treatment Plant including	

		capacity, production, reused quantities and quality, in alignment with the Framework for the Development of Environment Statistics (UNSD 2013a, 2013b).
10	**Key findings**	In 2008, the Jebel Ali WWTP produced 137 MCM of recycled water through its waste treatment processes. Out of this, 91 MCM were used for irrigation while the remainder was discharged to the environment. In 2019, capacity was increased to 383 MCMwith 232 MCM used to irrigate 6,250 ha of land. Currently, the WWTPs in Dubai (Jebel Ali Phase 1 and 2 and Warsan) provide around 700,000 m3 /day of treated effluent, which is used as irrigation around the city for landscaped areas, urban greening projects and afforested areas. This water reuse has played a major role in transforming what was an arid region into a beautiful, green, thriving tourist haven for USD 100,000/day. If the same quantity of fresh water has been used for irrigation, it would have cost more than USD 2 million/day of public money. This amounts to a saving of USD 1.9 million/day, which over a year adds up to USD 690 million. Recently a plan was put forward to recharge the groundwater aquifer system with recycled water from Jebel Ali WWTP. The Dubai Municipality carried out a feasibility study in 2020 and is currently starting a pilot project to assess its technical and economic viability. Based on pilot project results, surplus irrigation water could be used to replenish the aquifer increasing the groundwater reserve and the quality of the groundwater quality. While water reuse for irrigation purposes relieves demand on costly desalinated water resources and brackish saline groundwater resources, there are concerns about impacts on human health as well as groundwater and soil pollution and salinity due to the presence of organic pollutants and heavy metals in the recycled water (Dawoud 2017). Collecting, treating and reusing wastewater for irrigation in landscaping, afforested areas and landscaping can bring socioeconomic, health and environmental impacts such as: Increasing green landscaped areas where there is a lack of access to other alternative water resources. Minimizing the use of desalinated water for irrigation, which reduces energy consumption and associated carbon emissions from the desalination process and reduces costs – desalinated water costs USD 3.2 (AED 10.2)/m3 compared to USD 0.51 (AED 1.9)/m3 . Reducing negative health and environmental impacts by reducing wastewater discharge. Reusing the treated wastewater from Jebel Ali WWTP will help to improve and enhance the deteriorated groundwater quality and reserves for future uses. The wastewater treatment plants are also designed in line with the Government of Dubai's Energy Conservation and Sustainability Strategy. Where possible they use rationalized energy-consuming processes and components such as gravity rather than pumping to convey water, adopting bio trickling filters to remove ammonia instead of aeration and using biological scrubbers to remove odors. Technological innovations such as variable speed drives for selected pumping needs and advanced process automation systems also help reduce energy use. Other benefits to the environment include contributions to the sanitation of Dubai Saltwater Creek and thereby to the Public Health and Environment of the Dubai City at large. Efficient management of the Jebel Ali WWTP together with the sustainable management of its produced wastewater is anticipated to become a cornerstone in terms of achieving progress toward Dubai's sustainability goals.

		The Dubai experience is scalable in the region and elsewhere in terms of: Technology and Service Solutions: The wastewater system in Dubai has long sewage network lines of different diameters which are 3,000 km long, with 56 sub-pumping stations, corresponding to 10 main pumping stations and two sewage treatment plants in Jebel Ali and Warsan. To control and manage this huge infrastructure and the assets it contains, the Dubai Municipality inaugurated a remote-control system at the Jebel Ali WWTP. This remote monitoring and control system means a comprehensive database can be maintained that enables supervisors to analyze data and submit reports and supports them to make informed decisions. Data from the system also helps develop and plan maintenance programs. Reuse and Achieving Zero Discharge to Environment: The Dubai Municipality is the first in the region to reach zero discharge of wastewater to the environment. All produced waste is fully utilized for irrigation and future production increases will be used for groundwater aquifer recharge to enhance the groundwater quality and reserve.
11	**Conclusions**	• ….
12	**Recommendations**	It highly recommended to multiply the adaption of this project in different areas as it's proven its viability since its construction.
13	**Lessons learned**	• **STRENGTHS:** Enabling legislative framework and reuse tariffs Training on operation and management Automated operation and monitoring Jebel Ali WWTP allows Dubai City to reduce the use of costly desalinated seawater by 700,000,000 L/day through reuse applications such as irrigation Increased efficiency achieved in drying biosolids for reuse through using three paddle dryer lines • **WEAKNESSES:** Seepage of seawater into the collection network which increases the salinity of raw wastewater to 3,000–4,000 ppm Discharge of biosolids • **OPPORTUNITIES:** Raising awareness of the environmental aspects of wastewater treatment plants Empowering women through increased employment at the WWTP Development of legislation related to recycled water reuse in farming Establishing agricultural measures to monitor agricultural land that uses recycled water for irrigational purposes Stakeholder involvement and engagement in recycled water use for irrigation Enhanced cost recovery for recycled water uses in farming • **THREATS:** CAPEX is needed to implement and maintain proper treatment or mitigation measures to solve the salinity level of treated wastewater
14	**References (resources) Found is the case study**	• Abdel-Dayem, S.; Taha, F.; Choukr-Allah, R.; Kfouri, C.; Chung, C.; Al Saiid, A. 2011. Water reuse in the Arab World – From principle to practice. Proceedings of the Expert Consultation Wastewater Management in the Arab World, May 22-24, 2011, Dubai, United Arab Emirates (UAE). World Bank. 40p. https://documents1.worldbank.org/curated/en/405461468136207446/pdf/717450WP0Box3700Principle00Practice.pdf • Al Awadhi, M. 2014. Beneficial re-use of treated sewage effluent. Presentation by Director of Sewage Treatment Plant Department, Dubai Municipality.

		• FCSC (Federal Competitiveness and Statistics Center). 2021. Annual statistics report. Abu Dhabi, United Arab Emirates (UAE). United Arab Emirates Ministry of Cabinet Affairs. • Dawoud, M.A. 2017. Feasibility of using treated wastewater in groundwater aquifer recharge in Abu Dhabi. Paper presented at the WSTA 12 Gulf Water Conference, Bahrain. Available at https://www. researchgate.net/publication/323476712_Feasibility_of_Using_Treated_ Wastewater_in_Groundwater_Aquifer_Recharge_in_Abu_Dhabi • UNSD (United Nations Statistics Division). 2013a. Demographic yearbook. USA: United Nations. https:// unstats.un.org/unsd/demographic/products/dyb/dyb2013.htm • UNSD. 2013b. Framework for the development of environment statistics. USA: United Nations. https:// unstats.un.org/unsd/envstats/fdes.cshtml
15	**Publications from the study**	Source book
16	**study adapted/developed by**	AWC

Acronyms

EPSS: Environment Protection and Safety Section

UAE: United Arab Emirates

WWTP: Wastewater Treatment Plant

Images:

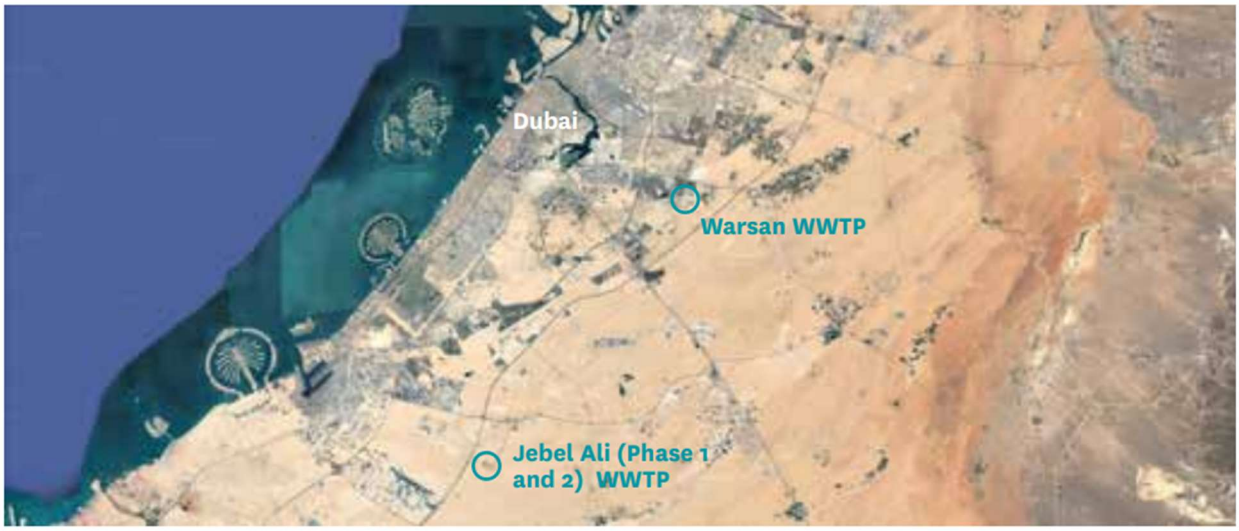

FIGURE 9.1 Jebel Ali WWTP: Location map. *SOURCE*: Google Earth

FIGURE 9.2 Jebel Ali WWTP: Layout map. *SOURCE*: Google Earth

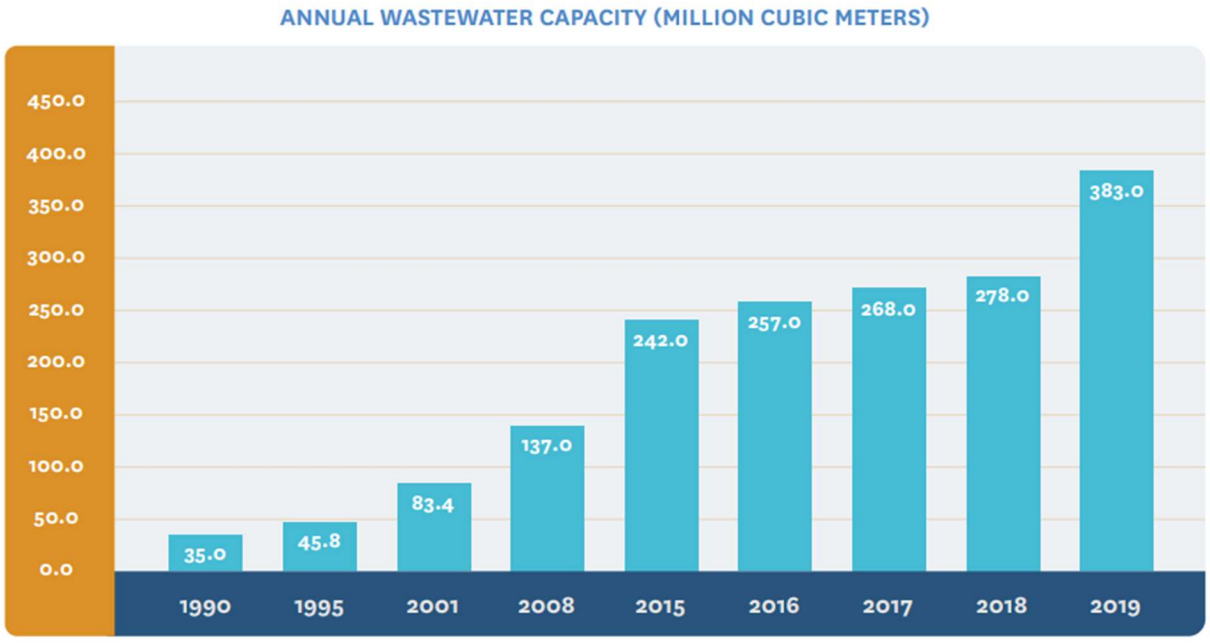

FIGURE 9.3 Jebel Ali WWTP: Annual capacity 1990–2019.

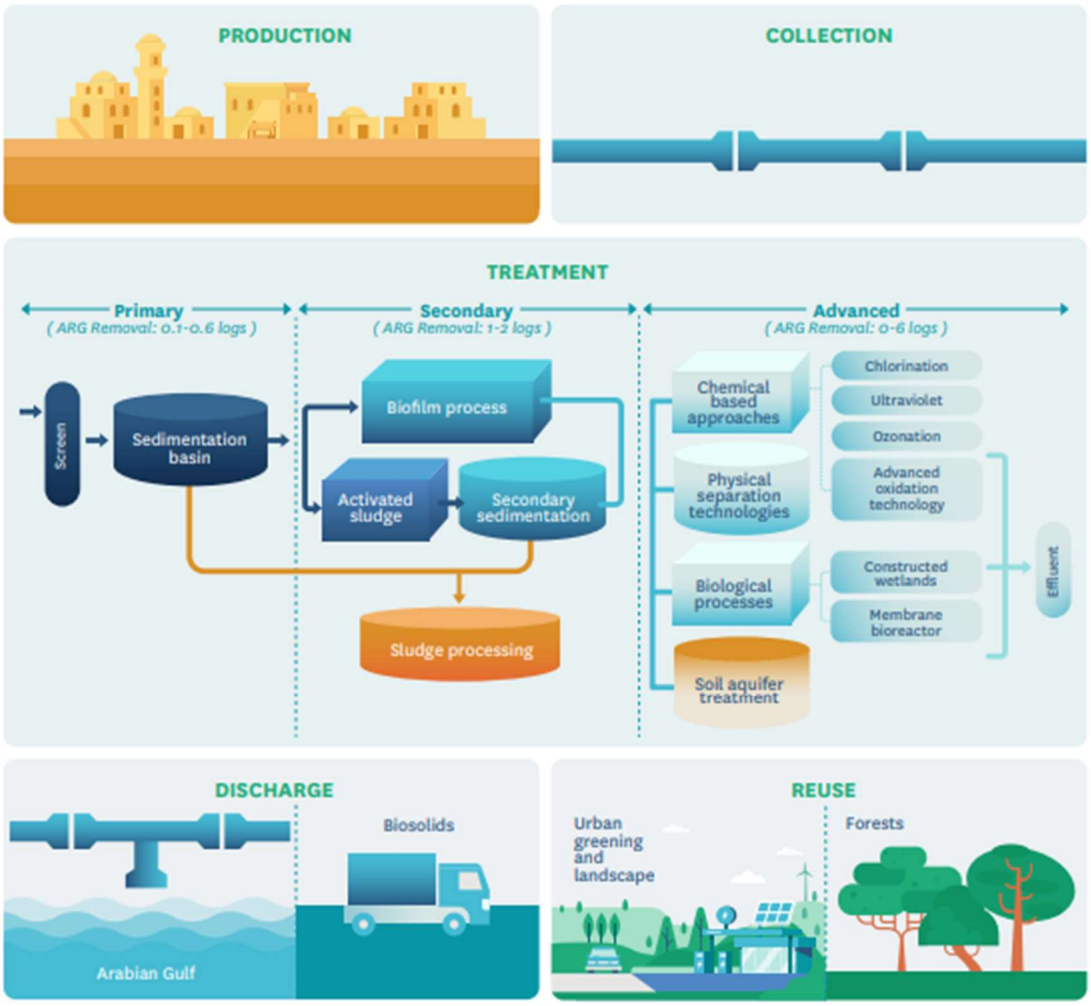

FIGURE 9.4 Jebel Ali WWTP and water reuse: Schematic diagram.