BUSINESS MODEL PROFILES: WATER
SUMMARIZED FROM THE FORTHCOMING PUBLICATION
RESOURCE RECOVERY FROM WASTE
CGIAR RESEARCH PROGRAM ON Water, Land and Ecosystems
LED BY: IWMI International Water Management Institute

Managing Aquifer Recharge with Wastewater

Business characteristics

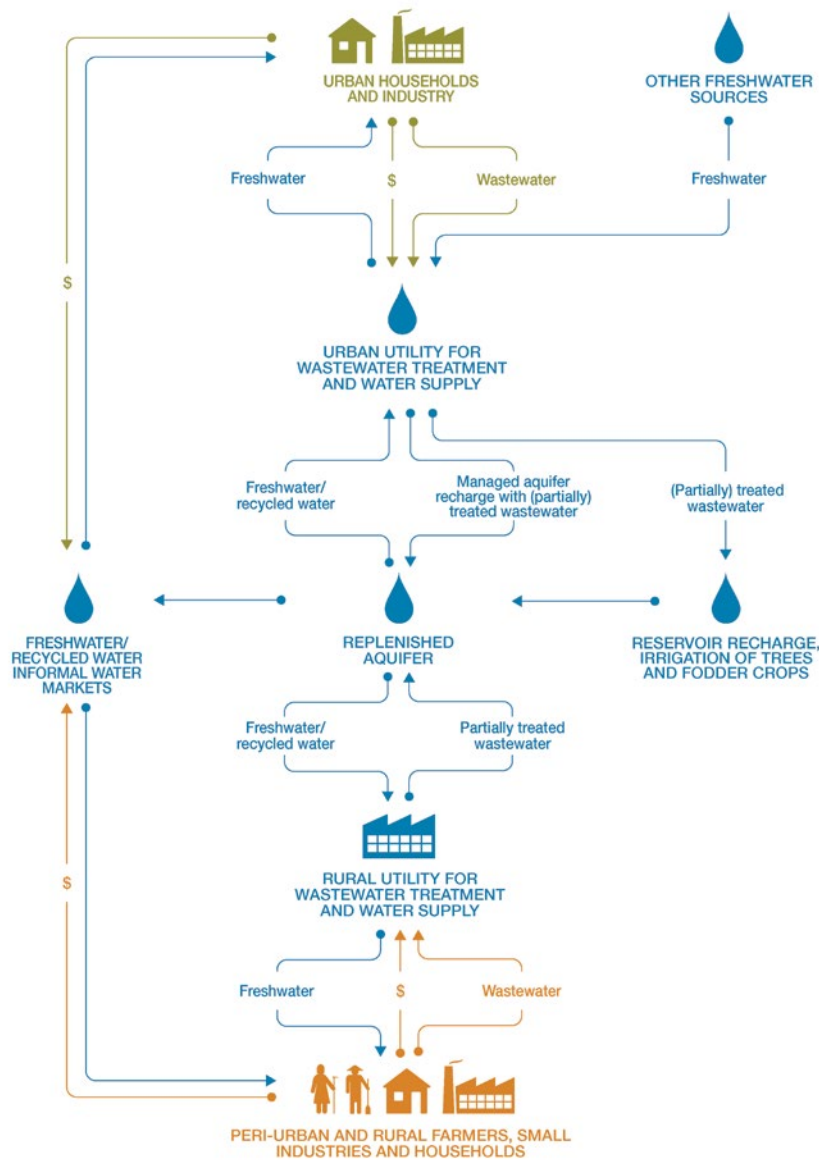
Geography	Water-stressed urban areas with suitable peri-urban conditions for aquifer recharge
Scale of production	Medium to very large scale (depending on aquifer characteristics and urban demand)
Type of organization	Public, public-private partnership (PPP), or mixed formal/informal sector arrangements
Investment cost range	Depending on wastewater volume and scale from USD 500,000 to USD 700 million for wastewater treatment and conveyance
Key costs	Wastewater treatment, water pumping for transfer and withdrawal, and water quality monitoring
Revenue stream	Sale of freshwater including reclaimed water from the aquifer, savings in potable water access from alternative sources, and savings in wastewater treatment

Business model

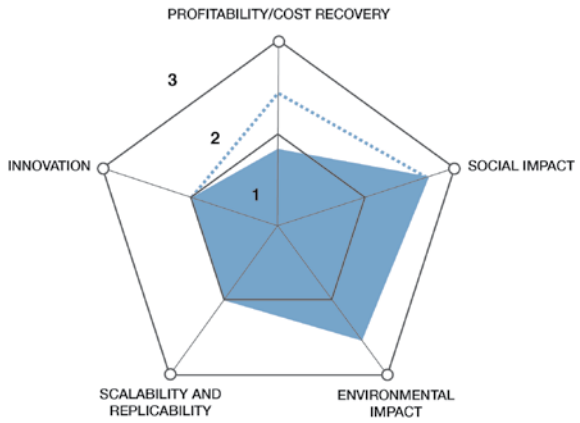
The business model takes advantage of natural water treatment processes to generate 'new' water in water-scarce environments. The model builds on the common fact that many cities tap into peri-urban and rural water resources, while at the same time releasing their wastewater into this periphery, eventually making cities their own downstream user. This water exchange happens in many locations without planning and sufficient monitoring, and requires better regulation.

The business can be implemented by public water/wastewater utilities or a PPP. It acknowledges that conventional wastewater treatment in most low-income countries will not be able to treat all urban wastewater to the standards needed for irrigation, domestic use and/or the environment in the short and medium term. Therefore, it builds on the cost-saving, additional cleaning capacity of natural processes taking place during wastewater conveyance in open channels and infiltration in the soil for (deep) aquifer recharge. In the model, wastewater from urban households replenishes peri-urban/rural aquifers, and the freshwater from these aquifers is then sold to urban and rural users. The revenue generated from this can then be used for financing further water treatment operations.

BUSINESS MODEL VALUE CHAIN



Business performance



While the model can be profitable compared to alternative water supply options in water-scarce regions, its larger benefits are the prevention of drought-related costs for society, which can exceed the investment costs multiple times. The reuse of wastewater for rural and urban needs offers significant benefits to urban consumers and agricultural communities as long as safety requirements are met.

Main risks

Market risks: Use of unsafe water could lead to customers losing trust in the replenished groundwater.

Political and regulatory risks: The business requires: (i) well-defined groundwater and wastewater-related water rights or entitlements, (ii) reuse guidelines based on water quality, and (iii) monitoring mechanisms related to both requirements. In many locations, groundwater abstraction and reuse are, however, informal.

Social equity-related risks: The model links different interest groups in need of water, across administrative boundaries and sectors, and thus needs an inclusive process of planning and implementation. This can be hindered depending on the political power of each actor.

Safety, environmental and health risks: The health risks connected to this business model depend strongly on the treatment capacity in place, before and during aquifer recharge. To address possible health and safety risks, standard safety precautions should be applied to water withdrawn from the recharged aquifer.

Case study: Bangalore, India

In Bangalore, India, a system has been put in place whereby excess water from the city's highly polluted Yelemallappa Shetty tank (YMST) (man-made reservoir) is redirected over about 6.2 km to the Amani Doddakere tank (ADT) at Hoskote, where the water is replenishing the groundwater level. This system reduces pressure on the sewage-fed YMST while partially restoring the ADT, a tank that was dried up for over 18 years.

Through this aquifer recharge, groundwater tables which had dropped below 300 meters in the ADT's vicinity can now be accessed again, providing farmers and households with quality water, either directly from wells or through water vendors with well access. Also, the Hoskote Municipality has started almost a 24/7 water supply after mandatory water treatment (chlorination), compared to before when piped water was only available for short periods every few days. In theory, revenues could be generated from charging farmers per hectare and households connected to meters. Field surveys showed that farmers between the YMST and ADT would be willing to pay significantly above current water rates, if they could rely on the wastewater flow. The amounts would allow to cover about 25% of the operation and maintenance cost of the lift scheme.

Key performance indicators (2015/16)

Capital investment:	USD 613,000 for water lifting and transfer
Labor:	Low in public sector, but high among benefiting farmers and private sector
Operation and maintenance cost:	USD 3,000 per month (mostly for pumping)
Output:	5-6 million cubic meters (Mm^3) per year for up to 171 hectares under irrigation
Potential social and environmental impact:	Water supply for 200-500 farmers between the YMST and ADT, direct and indirect supply for several thousand households via piped and tanker water supply, and improved ecosystem services through biodiversity increase after lake restoration.

For more information on the business model and related cases, see Chapter 17 of **Otoo, M.; Drechsel, P. (Eds.). 2017.** ***Resource recovery from waste: Business models for energy, nutrient and water reuse in low- and middle-income countries.*** **London: Earthscan/ Routledge. In press.** The book has been produced by the Resource Recovery and Reuse subprogram of the International Water Management Institute (IWMI), under the CGIAR Research Program on Water, Land and Ecosystems (WLE) and its Rural-Urban Linkages Research Theme. The support of the Swiss Agency for Development and Cooperation (SDC), the International Fund for Agricultural Development (IFAD), and CGIAR Fund Donors (www.cgiar.org/about-us/our-funders/) is gratefully acknowledged.