Municipal

Innovative public-private partnership to improve water quality and availability

Udaipur, India

water scarcity impact

Reduced withdrawal	●
Reduced consumption	
Improved water quality	●
Increased productivity	
Net basin benefit	●

volumetric impact

7 300 000 m^3/yr

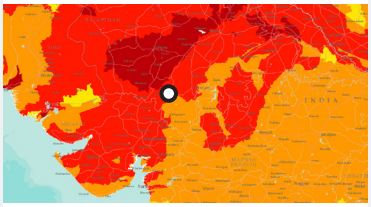
capital cost

$27 000 000

estimated unit cost of water

25 ¢/m^3

Water Stress
Udaipur, India



Arid & low water use
Low (<10%)
Low to med (10-20%)
Med to high (20-40%)
High (40-80%)
Extremely high (>80%)
No data available

Water Stress Map:
F. Gassert, P. Reig, T. Shiao, M. Luck and M. Landis, 2015. "Aqueduct Global Maps 2.1."

Confidence level
Low Medium High

Water Scarcity Impact Key
Main Minor

Credits
We would like to acknowledge Mr. V Jayaraman, Mr. Ashok Jain, Ms. Shama Jain, Mr. Dinesh Patidar and Mr. Bhanwar Rathore of Hindustan Zinc for their input in the preparation of this case study.

Project Overview

Udaipur is a popular tourist destination located in the economically active yet severely water scarce Indian state of Rajasthan. The city had failing wastewater infrastructure and was struggling to maintain the cleanliness of its lakes, which had been historically absorbing raw residential sewage. In September 2012, a court order was issued to hotels and the municipality to deal with the problem and improve sanitation, as well as tourists` enjoyment of the lakes.

At the same time, the major corporate zinc mining company Hindustan Zinc (a subsidiary of Vedanta Group Ltd) was increasing production and exploring options for additional water resources, which would reduce their dependence on fresh water withdrawal.

A forward-thinking public-private partnership (PPP) deal between the Hindustan Zinc and the local government (Udaipur Municipal Corporation and Rajasthan State-Owned Urban Improvement Trust) was formed in May 2012 to develop the city`s first Wastewater Treatment Plant (WWTP) which addressed both stakeholders objectives.

Commissioned in April 2014, the plant has a treatment capacity which equates to 30% of Udaipur's daily wastewater. The treated effluent is then reused in Hindustan Zinc`s Rajpura Dariba Mining & Smelting Complex, situated 80km outside of the city. The WWTP was funded by the Hindustan Zinc, and the plant will be transferred to the Government of Rajasthan in April 2039.

Key Elements

- Wastewater collection and reuse to deliver treated effluent to the Hindustan Zinc Industrial Complex.
- The plant is the first deployment of Moving Bed Bio-reactor (MBBR) technology in Rajasthan under a PPP model.
- Procured through a Design-Build-Own-Operate-Transfer (DBOOT) contract.
- Thermax India is the leading developer and Operations & Maintenance are carried out by Hindustan Zinc for the full length of the DBOOT contract.
- The WWTP cost $27 000 000 and was 100% financed by Hindustan Zinc.
- Production of treated manure that is sold by Udaipur Municipal Corporation to local farmers.

Key Outcomes

- Wastewater previously disposed into the lakes (30% of city's wastewater) is now collected and treated effluent is used for industrial production, released into the river during summer months and applied in horticulture.
- Fresh water abstraction at Rajpura Dariba Complex is reduced by 60% from 16 500 m^3 per day to 7 000 m^3 per day.
- Water quality improvement of the Ahar River, Pichola and Udai Sagar lakes due to reduced volume of wastewater discharges.

Udaipur, India

Intervention Features

- Wastewater reuse for agriculture
- Wastewater reuse as cooling water
- Wastewater recycling for industrial use
- PPP funding

Project Levers

(1) PPP funding

The project was primarily financed by Hindustan Zinc, this covered the land acquisition, the construction of the WWTP, and the 78 km pipeline linking the WWTP with the industrial complex. The Urban Improvement Trust and the Municipality of Udaipur City has contributed 70% of the costs for the 7 km pipeline connecting the city's sewerage system with the WWTP.

(2) Wastewater treatment for Industrial Zinc Complex

The WWTP supplies 3 500 000 m^3 per year to the Hindustan Zinc industrial complex where treated effluent is used at one of the three key mining and smelting operations:

- the beneficiation plant at the mining location.
- during the smelting process at roaster, leaching and purification phases.
- at the cooling towers of the captive power plant.

The majority of water is supplied during the dry period of February to July. As a result of this intervention, the complex has reduced its water withdrawal by 60% from 16 500 m^3 per day to 7 000 m^3 per day.

(3) Wastewater treatment for river-recharge and horticulture use

As the treatment capacity of the WWTP is 20 000 m^3 day and the industrial complex requires only 9 500 m^3 per day, a proportion of the treated effluent is released to the river for recharge (1 100 000 m^3 per year) and a considerable amount is also used in horticulture (730 000 m^3 per year).

Outcomes and Challenges

The project improved ecological stability of the local lakes (Udai Sagar and Pichola lake) and the Ahar river, reduces health-hazards from open sewage disposal and improves the tourist appeal of the area.

The plant's residual sludge is treated and sold by Udaipur Municipal Corporation to local farmers. The plants produce 120 tonnes of treated manure per year and its sale generates an annual revenue of $156 000.

Land acquisition was the greatest challenge for completing the project. Firstly, in terms of selecting a WWTP location close to the city that would be financially viable, and secondly negotiating with local stakeholders that were concerned about the potential visual and odour impacts. The neighbouring community was consulted on the technology selection and the operational and maintenance elements of the contract, which resulted in building trust and support for the project.

To meet the WWTP opening schedule, the developer worked closely with the Government to obtain the necessary approvals for laying down the pipe-network in busy urban and touristic areas.

There were operational difficulties at the beginning of the project at both WWTP and the Rajpura Dariba industial complex. The main issues at the WWTP were related to reliability and optimisation issues as well as inconsistent incoming wastewater quality. At the Rajpura Dariba industrial complex, there were challenges switching from freshwater to a treated effluent water quality that had higher total dissolved solids. The problem was resolved by marginally modifying the treatment process.

Above: Panoramic view of Wastewater Treatment Plant (© Hindustan Zinc)