INDIA CASE STUDY:
Jambudiyapura Village, Gujarat

CSR FUNDING DELIVERS PUBLIC SANITATION PROJECT

PROJECT OVERVIEW

Location: Gujarat, India

Community: Rural tribal village

Population: Approx. 250 people

Challenges: Low water usage and low cost sustainability

Solution: Public outreach and Clearford One™ sanitation solution with household toilets and bathrooms, and a low maintenance treatment facility

A small agricultural community is the first open-defecation free (ODF) tribal village in Gujarat State thanks to corporate social responsibility (CSR) funding for an affordable wastewater technology and public sanitation outreach.

A new communal wastewater system with private toilets and bathrooms were successfully delivered along with public outreach programming to enable residents to achieve public health objectives and environmental stewardship in their community.

The public sanitation project was carefully planned and implemented within a strict budget through the CSR department of Infrastructure Leasing & Financial Services Limited (IL&FS), one of India's leading infrastructure development and finance companies. An output-based aid (OBA) model was selected that transfers the performance risk to the solution providers, thereby offering a new tool in the effort to sustainably end open defecation in India.

BACKGROUND

Gujarat Road & Infrastructure Co. Ltd (GRICL), a special purpose vehicle of IL&FS, has adopted a number of tribal villages along their toll road between Vadodara and Halol in Gujarat State as part of their CSR program. Under this initiative and with support from the Gujarat Government, the village of Jambudiyapura was designated as a model site for the creation of the first ODF village in Gujarat.

Jambudiyapura is an agricultural tribal village having a population of 250-300 people with 56 homes, a school and an Anganwadi (child healthcare centre).

The main sources of income in the village are agriculture and manual labour. While there is water supply to the homes from a communal water tower and distribution network, only ten family homes had toilets while the majority of residents practised open defecation in the fields around the village. Most homes had outdoor bathing areas with cloth screens for privacy.

The practice of open defecation poses a clear public health concern and, especially for women, a threat to personal safety and dignity. The ponding of greywater from bathing areas and household washing activities also presented a health risk to residents of waterborne disease and illness, a problem exacerbated by flooding during the monsoon season. Hence, there was a need for a low-cost sanitation solution with private toilets and bathrooms, as well as sustainable wastewater collection and treatment.

PROJECT OBJECTIVES

The goal of the CSR initiative was to use the principles of OBA to transform sanitation practices in the village away from open defecation towards a locally sustainable model that improves the long-term health of residents. The specific project objectives were to:

1 | Build private toilet, shower and washing facilities for individual homes;

2 | Collect all wastewater from homes using a communal sewerage system;

3 | Convey wastewater to a low-cost treatment facility with minimal power requirements;

4 | Treat wastewater to a quality that is safe for discharge and reusable for agricultural irrigation in accordance with all regulatory requirements; and

5 | Minimize operation and maintenance requirements such that activities can be performed by trained villagers.

CSR IN INDIA

In 2013, India's Parliament passed legislation requiring that companies doing business in India must spend 2% of their net profit on approved CSR activities, such as promoting health care, education, gender equality, and ensuring environmental sustainability.

Special mention is made of contributions to the Swachh Bharat 'Clean India' Mission towards improved hygiene, cleanliness and sanitation across India.

SOCIAL BARRIERS TOWARDS IMPROVED SANITATION IN INDIA

A study by Research Institute for Compassionate Economics found that "widespread open defecation in rural India is [attributable] to beliefs, values, and norms about purity, pollution, caste, and untouchability...." (Coffey et al. 2017)

For this project, an interesting observation that came out of interviews with the villagers was that two groups of people were most opposed to stopping open defecation—older men habituated to using the outdoors and, more unexpectedly, young girls aged 12-16 who valued going in groups as an opportunity to socialize and get out of the house.

These viewpoints were addressed by talking directly to individuals and explaining the benefits of moving away from open defecation practices in terms of social status, health and hygiene.

TARGETED PUBLIC OUTREACH

Targeted public outreach was used to promote acceptance of new sanitation practices and to communicate the value of the project to residents. Besides public health, the project would allow the recovery of treated reuse water for agriculture. Other outreach activities included community involvement in project planning and a public ceremony of personal commitment to improved sanitation.

CHALLENGES

The challenges of providing improved sanitation and sustainable wastewater servicing in rural India are complex and well documented. There is a critical need for solutions that provide a low life cycle cost of building and maintaining sanitary infrastructure, while also providing reliable performance under different operating conditions than are typically encountered in developed communities

LOW WATER USAGE

The community has limited water supply resulting in low water usage of only 70 litres/person/day (compared to 200-450 in North America). This poses a significant concern because conventional sewers rely on the flow of water to carry sewage solids through gravity pipes. When less water is being used, more solids accumulate in the pipe network leading to blockages that can cause sewer backups.

Other technical challenges for the project included:

- Black cotton soils and saturated ground,
- Sewer alignment constraints from existing development,
- Limited power supply for pumping and mechanical treatment operations.

LOW COST SUSTAINABILITY

There are two linked aspects of sustainability—social and financial—that had to be addressed. Social barriers, such as traditional attitudes around personal hygiene, on page 3. The Client and Government worked with village leaders to leverage financial considerations along with public outreach for social acceptance of the project.

Since capital costs were paid under the CSR budget, government subsidies were directed towards a communal fund for long-term operation of the new system. Households contributed an affordable but non-negligible amount to the communal fund as a commitment to the project objectives. This financial consideration was paired with a commitment by the village leaders to manage and maintain the system into the future. The design for system performance was developed to support the village in their commitments.

TECHNOLOGY SELECTION

The Client's project team evaluated different wastewater technology options for sustainable low-cost servicing.

In order to accommodate the low water supply of 70 litres/person/day, a Clearford One™ system was selected for solids-free wastewater conveyance.

A low-cost vertical soil biotechnology treatment facility was chosen for final treatment because of its simplicity for operation and maintenance.

Clearford One™

SOLUTION

A Clearford One™ system was designed with four components to meet the project objectives while overcoming the technical and social challenges related to implementation of the new system.

1 | PRIVATE BATHROOMS

Bathroom facilities were constructed in the backyard of each home to provide safe, private access to a toilet, shower and washing area. Each bathroom was constructed of durable materials and equipped with lighting and plumbing, including a rooftop water tank to store clean water for daily use. The challenges associated with bathroom design and their acceptance by residents are described in the sidebar below.

IN FOCUS: THOUGHTFUL DESIGN FOR PRIVATE BATHROOMS

Bathrooms were identified early on as a key component for success of the project. However, the design details for the bathroom facilities became an important issue for residents, and required thoughtful consideration by the project team to ensure these facilities would be used and cared for by residents for years to come.

Common refrains heard from sanitation experts on this project included:
- Do not build bathrooms near the toilets;
- Do not build high quality bathrooms as they will be converted to living and storage spaces; and
- Use cheaper twin pit toilets rather than communal servicing.

After community meetings and a series of interviews with residents, all of these presumptions were overturned. In fact, residents were strongly against twin pit toilets because they would flood during the monsoon exactly when they are most needed as the surrounding fields are waterlogged. The community decided that each household should have a toilet and bathroom, as well as a washing area (called mori) where clothes and utensils can be cleaned.

The residents were principally concerned about the quality of work for new bathrooms. As a result, the collection rate for household contributions was initially just 3 of 56 homes. When the quality of workmanship was displayed during construction of the first bathroom, the remaining households paid their contribution within a week. This suggests that if a thoughtful design and suitable quality of construction are specified, much of the reluctance to participate in sanitation projects may be resolved.

2 | INTERCEPTOR TANKS

ClearDigest™ tanks were built next to each bathroom to capture sewage solids before releasing the liquid effluent to the sewer network. The tanks were constructed in place from bricks and cement with a working volume of 2000 litres each. Wastewater is pretreated by digesting the organic pollutants and trapping the inorganic solids.

3 | SMALL BORE SEWERS

ClearConvey™ small diameter gravity sewers were installed to collect effluent wastewater from the interceptor tanks. Flexible high density polyethylene (HDPE) pipe was installed in shallow cut-and-cover trenches to accommodate the irregular sewer alignment through the backyards. Small cleanouts were provided throughout the sewer network instead of large manhole structures. Thermal fusion of pipe and fitting joints ensures zero infiltration of groundwater and no contamination of soils through leaky joints in the sewer network.

4 | TREATMENT FACILITY

ClearRecover™ treatment is provided at a treatment facility supplied by Vision Earthcare Pvt. Ltd using the CAMUS-SBT soil biotechnology that was developed by the Indian Institute of Technology Mumbai. A small pumping station is required to lift wastewater from the buried sewer network to an aboveground vertical structure. The facility was built in place and filled with selected soil media and plantings that achieve the treated effluent standards set by the Ministry of Environment and Forest and Central Public Health and Environmental Engineering Organisation (CPHEEO). Recovered water is safely returned to the environment for reuse for agricultural irrigation, particularly in the dry summer months.

OPERATION & MAINTENANCE

The following efforts were made to ensure affordable life-cycle operation and maintenance of the system for long-term improved sanitation in the village.

CLEARFORD ONE SYSTEM FEATURES

The new sanitary infrastructure is designed for minimal maintenance. The interceptor tanks do not require electricity or additives. The removal of solids, oils and grease in the tanks protects the small bore sewers from blockages, so that practically no maintenance is required. Meanwhile, anaerobic digestion in the tanks minimizes sludge production, thereby requiring only infrequent pump-out compared to alternative systems such as septic tanks.

LOW COST TREATMENT

The treatment facility uses just 15 kWh/day of electricity costing around Rs. 2250 per month. Most maintenance work requires no more skill than that possessed by a trained handyman or gardener.

LONG-TERM FUNDING FOR OPERATION

A communal fund made up of government and household contributions was set up to sustain the operation of the system for at least 15 years, removing the common risk in India of systems failing shortly after installation. A new sanitation committee of residents will manage funds and lead the village in responsible use and maintenance of the system. Furthermore, the village will assume responsibility for operating the system after training from the technology supplier.

REMARKS

Since construction was completed in May 2016, the village has established sanitary management zones to encourage proper use of the new facilities. Households have dismantled their old outdoor washing areas and improved their home plumbing in order to benefit from delivering clean water to their new toilets and bathrooms.

A plan for treated water reuse is being developed for farmers to receive water for irrigation of their fields, which is expected to lead to greater drinking water conservation and improved agricultural productivity.

TOWARDS SUSTAINABLE SANITATION

Although long-term success of the project remains to be confirmed, the positive response and involvement of the community are clear steps towards achieving sustainable sanitation and public health in the village. The experience in Jambudiyapura offers an appealing model for output-based CSR funding of projects in rural India through community engagement, careful selection of technologies, and thoughtful project planning and implementation.

REFERENCES

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ABOUT CLEARFORD WATER SYSTEMS INC.

Clearford Water Systems Inc. is a provider of unified water management and sanitation systems centred on its proprietary technology, Clearford One, comprised of ClearDigest interceptor tanks, ClearConvey small bore sewers, and ClearRecover final treatment facility. For more information on Clearford Water Systems, please visit www.clearford.com.

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