Challenges Expected

Sanitation services in Leh face many challenges which create technical and operational risks for Blue Water Company.

1. Long and cold winters: De-sludging septic tanks in winter is challenging as the sludge freezes and hardens. Bacteria cultures may help to soften the sludge but this has not been tested yet and can be expensive.

2. Tourist season during summers: Septic tanks can be cleaned only at night due to high traffic of tourists at hotels and on the streets. However, nights during the summer can also be quite cold, which thickens the sludge. Productivity is affected which makes it difficult to schedule cleanings effectively.

3. Low pump power: Suction pumps loose power at high altitudes and are not as effecting at pulling sludge from over 30-40 feet. Fuel consumption goes up which affects business economics, and many septic tanks cannot be cleaned. The Company is experimenting with add-on pumps in such cases.

4. Narrow streets and gradients: Many roads in Leh are too small for trucks, and gradients make it difficult for the truck to suck the sludge uphill. New products are being developed for such locations (see below).

5. Resistance to scheduled cleaning and political risks: Any change in the Municipality's determination to have septic tanks cleaned regularly, can dramatically impact revenues. While this is not a risk in the near-term, there can be pressures in the future.

6. Performance of the treatment plant: While the plant is designed keeping high altitude and cold temperatures, careful monitoring is still required, especially in year 1, to understand the performance and ensure compliance with regulations and standards.

Potential and Flexibility to Improve

The system allows for incremental improvements, if needed, to further improve performance.

1. Greenhouses to improve treatment quality: The PDBs can be converted into greenhouses to improve treatment quality, especially during cold winters.

2. Capacity increase: Building more PDB will double the capacity of the treatment easily—within 4 weeks. Extra space has been retained for such expansion in the future.

3. Mobile Gulper: BORDA is developing a small, mobile device that can reach and clean septic tanks that are far from the road, or on a street too small for trucks to access. This is a problem in every Indian city and this device can help truly eradicate manual scavenging which remains prevalent even in big cities as only people can go in and clean such tanks.

IMPLEMENTING PARTNERS AND SUPPORTERS

Goverment of Jammu & Kashmir

BORDA e.V: Am Deich 45, 28199 Bremen, Germany. +49.421.4089 520. office@borda.de
BORDA South Asia: Eco House, #284 Annapoorneshwari Nagar, Bangalore 560091, India. tsephel@borda-sa.org

FSM for Leh

co-funded by
HANSA FLEX
experts in fluid management

At an altitude of 12,000 feet, Leh town in Ladakh, North India, with a population of about 45,000 is one of the highest cities in the world and has amongst the harshest climates—minimum temperature of -30°C, low air pressure and very little rain or snow.

Roads to Ladakh remain closed for 6 months of the year, making access difficult. Increasingly erratic weather patterns caused by global warming are affecting water supply (causing floods) and agricultural production, thereby disturbing the safety and self-sufficiency of the region.

Due to its geographic isolation, Ladakh's traditional way of life is incredibly sustainable and self-sufficient. But modern habits and an influx of tourists over the past 10 years (270,000 expected in 2017) are wreaking havoc on the ecology. Plastic waste, traffic jams, flush toilets, massive amounts of construction—all are threatening the fragile ecosystem and polluting natural resources.

About 60% of water is drawn from the pure underground water table and even consumed without filtering. But as flush toilets become increasingly popular, they discharge sewage into underground septic tanks and pits, which release toxic overflow into the soil which is contaminating the underground water. Cases of yellowish and smelly water being drawn through bore wells have been reported.

A sewer system is under construction and in 2-3 years, may cover only 40% of the city. This could be too little, too late as ground water contamination would have disastrous effects on public health and tourism. Many Indian cities, including Shimla, have seen cholera or jaundice outbreaks due to similar pollution of water sources. Besides, over 50% of the population will continue to use septic tanks and soak pits.

Due to this situation, the Ladakh Autonomous Hill Development Council (LAHDC) visited Devanahalli (near Bangalore) in February 2017 to understand Faecal Sludge Management (FSM) and realized that it was critical to protect the environment and water supply in Leh. In May 2017, BORDA visited Leh to conceptualize a FSM system for the city that can complement the sewerage system that is under development. Three months later, in August, the FSM system was commissioned and operations started.

BORDA

A Familiar Problem

Officials from LAHDC and the Municipal Committee of Leh (MCL) had two concerns:

1. How will the municipality manage the FSM project?
FSM involves multiple operations including planning and scheduling the cleaning of septic tanks in an efficient manner, safely transporting the faecal sludge to a treatment plant, running the Faecal Sludge Treatment Plant to meet effluent standards, and high quality operations management.

Given the shortage of staff and lack of technical expertise amongst the local authorities, who can design, implement and operate the system such that the end goals are met?

2. How will the municipality pay for it?
While public funds can be identified, it takes time to allocate budgets and government tendering processes delay implementation with no guarantee of finding the right contractor who will implement the system properly. This will work against the urgency of the situation.

These are common problems facing urban local bodies interested in implementing good quality FSM services. Many cities divide the process into separate components undertaken by separate parties, but this reduces accountability and increases chances of conflict, errors and failure.

Therefore, BORDA decided to invite the Blue Water Company (BWC) to set up India's first Public Private Partnership (PPP) in FSM to finance and design, build, operate and transfer (DBOT) the entire system, thereby solving both problems facing MCL.

A Solution— India's first PPP for FSM

A five-year partnership contract between the Municipal Committee of Leh (MCL) and Blue Water Company (BWC) outlines operating responsibilities, payment terms and revenue models:

Municipal Committee of Leh (MCL)	Blue Water Company (BWC)
Will provide the land for the FSTP Will provide 2 suction trucks it already owns for cleaning services	Will invest capital to construct the FSTP Will create a monthly schedule and clean septic tanks—large ones each year, smaller ones every two years
Will charge and collect a fee from every household, hotel and guesthouse for compulsory FSM services	Will be paid a part of the fees collected from customers, after the septic tank is cleaned
Will send customers a notice of cleaning 20 days in advance, based on schedule created by BWC	Will train all employees, ensure use of proper safety gear and provide periodic health checks to operators

This structure aligns the interests of MCL and BWC perfectly. As BWC has invested in the project, it is committed to providing high quality service for the duration of the contract.

BWC has an incentive to build the FSTP quickly and start services so as to start earning a return on its capital as quickly as possible, so risks of work stoppage and delays are minimized.

As the MCL will pay BWC a fee based on collections from customers, FSM will always be a financially profitable service which can be sustained in the long-term.

Notable Features

1. Speed—Implementation in 3 months: In May 2017, BORDA visited Ladakh and submitted a preliminary proposal. In June, an agreement was signed, land allocated for the FSTP, design completed and construction started. In August the FSM system will become operational—3 months from first discussion. This clearly shows that political will along with a turn-key PPP approach can be implemented very quickly, particularly if land can be quickly identified and cleared.

2. No Cost to Government: The ULB has invested zero money and will pay only when services are successfully delivered. This prevents investment of funds into projects that never achieve their goals, as is common in India.

3. Accountability and Simplicity: As BWC is responsible for designing, building and operating the entire system for 5 years, it is fully accountable for any problems or failures. Accountability fails when multiple players are involved in complicated structures and arrangements.

4. New Technology: Given the unpredictable weather which can disrupt scheduled cleaning services and thus the daily volume of faecal sludge collected, BORDA and CDD decided to deploy the Planted Drying Bed (PDB) technology for the first time in India. A DEWATS module is used to treat the water which will keep operations simple and costs very low.

5. Respect for Operators: While sanitation workers do one of the most hazardous and difficult jobs to keep our city clean, they receive low pay and face inhumane work conditions. The FSTP will have a comfortable office and rest area to provide them with a positive work environment and dignity.

6. Re-use of Waste Resources: BWC will develop a plant nursery where the treated water and compost will be used for greenification projects. This water can also be supplied to the nearby Children's Park for creating green spaces or to urban farms.

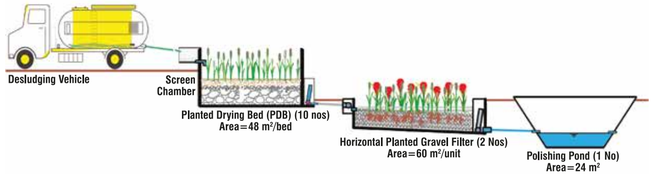
The Faecal Sludge Treatment Plant (FSTP)

At the heart of the system sits the FSTP which must handle both the challenges of high altitude and extreme climatic conditions, as well as highly variable sludge inflow as activities will be minimal in the winter. This plant is designed by BORDA and CDD Society and executed by MCL and Blue Water Company, and will make Leh the first ODF++ city in India.

To keep operating costs low and retain flexibility to adapt to changing conditions, a biological system was chosen, which uses almost no electricity or chemicals. The Planted Drying Beds, Horizontal Planted Gravel Filter and Polishing Pond use plants and the strong sunlight of Leh for drying and disinfection.

FEATURES AND BENEFITS

- Planted Drying Bed Technology used in India for first time—robust and flexible for extreme conditions
- No direct human contact with faecal sludge
- Minimal odour during entire process and aesthetically designed to locate it near habitation
- Gravity-based system, based on natural and biological treatment with no use of chemicals or electricity – green and ecofriendly
- Minimal and simple operations with no skilled operator required – minimizing O&M costs
- The treated water and compost will be used for greenfication of the next door Children's Park and other city beautification projects.



SPECIFICATIONS

Construction Period	7 weeks
Construction Cost	Rs. 52 lakhs (Rs. 5 lakhs/m^3)
Total Area	60 m^2/m^3
Population served	30,000
Design capacity	12 m^3/day
Sludge Loading Rate	100 kgTS/m^2/Yr
Effluent quality	BOD < 30 mg/l

PRIMARY MODULES

The system is designed for low cost and simple operations and maintenance.

1. Planted Drying Bed (10 units)
Solid-liquid separation and digestion of solid fraction
Capacity : 12 m^3/day/bed | Area : 48 m^2/bed

2. Horizontal Planted Gravel Filter (2 units)
Treat liquid fraction using plants and controlled flow
Area : 60 m^2/unit

3. Polishing Pond (1 unit)
Ultraviolet disinfection of water and storage
Area : 24 m^2

Filter material used in 1 and 2 : Graded Gravel, Sand
Plants used in 1 and 2 : Phragmites karka, Canna indica 1