Waterlife: Improving Access to Safe Drinking Water in India

How a social enterprise provides a sustainable and affordable drinking water solution to underserved populations in rural India

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Contact Information
Social Enterprise Innovations
Leadership, Learning, and Innovation at the World Bank Group
Contact: Cristina Navarrete Moreno
www.worldbank.org

Waterlife India Private Limited
Madhapur, Hi Tech City, Hyderabad, India
Contact: Sudesh Menon, CEO
info@waterlifeindia.com
Web: www.waterlifeindia.com
Facebook: www.facebook.com/waterlifeindia
Twitter: @waterlifeindia

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Summary

With 700 million people residing in rural India over a large and diverse topography, providing access to safe drinking water is a significant challenge. The government has tried, playing a key role in financing and implementing drinking water schemes. However, about 30% of urban and 90% of rural households still depend completely on untreated surface or groundwater.[1]

The health and economic burdens of poor drinking water are enormous. It is estimated that about 21% of communicable diseases in India are water-related. The economic costs of these waterborne diseases are an estimated USD 600 million annually with 73 million days of lost labor.[2]

In response, Waterlife, a for-profit company based out of Hyderabad, has experimented with an innovative business model—building and operating stand-alone water purification plants in underserved areas of India that would otherwise have no access to safe drinking water. Waterlife partners with local governments to provide the location and money for construction of the plants. Customers pay a small fee to fill up their 20-liter water jars, and this fee is used to pay back the government expenditure and cover ongoing plant maintenance and operations.

This is a decentralized safe drinking water model, with each plant able to serve approximately 5,000 individuals—in an area of about 5 km radius for walk-in customers and 10 km for the small portion of customers who have water delivered. Satisfaction levels of surveyed customers are quite high, at almost 100%.

The Waterlife model builds strong community ownership due to a transparent operating system with responsive customer service; community awareness campaigns on the importance of safe drinking water; locations in convenient public settings; and the training of a local corps of villagers to manage plant operations and maintenance. This community connection and trust, along with a replicable business model, effective and self-sustaining operations and maintenance, and strong partnerships with local governments and leaders, lend promise to the scaling up and sustainability of Waterlife plants.

Impact to date can be seen in a reduced incidence of waterborne diseases and related medical expenses and improved job opportunities and school attendance for local villages. The expectation is that if continued and expanded, the utilization of Waterlife plants will enhance long-term economic and health development outcomes for disadvantaged and disenfranchised populations in India.

Challenge

Health and Economic Burdens

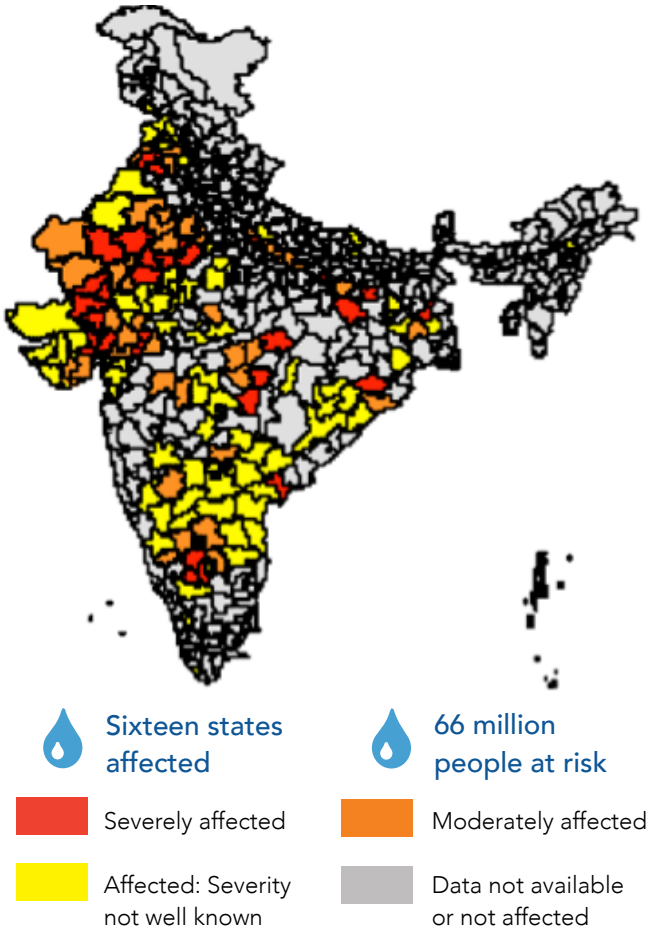
India ranks 122 out of 123 countries surveyed on the safe water index.[3] Water sources are increasingly being contaminated from pollution and over use. The population in rural India is mainly dependent on the groundwater as a source of drinking water. Groundwater in one-third of India's 600 districts is not fit for drinking as the concentration of fluoride, iron, salinity and arsenic exceeds tolerance levels.[4]

The health burden of poor drinking water is enormous. Waterborne diseases affect nearly 37.5 million Indians annually. Unsafe water leads to stunted development in approximately 20 million children every year. The single largest cause of ill health and death among children is diarrhea, resulting from the inadequate water quality along with poor sanitation practice and hygiene.[5] Additionally, 66 million Indians are at risk due to excess fluoride and 10 million due to excess arsenic from drinking water.[6]

The economic costs of these waterborne diseases are an estimated USD 600 million annually with 73 million days of lost labor.[7] Individual families bear the burden with high household medical expenses. Nearly two-thirds of hospital beds are filled with patients with waterborne diseases, stressing an already inadequate health infrastructure.

The hardest hit by these economic, health and social burdens are those living in extreme poverty: according to the India National Family Health Survey, 40% of those in extreme poverty used unimproved drinking water.[8] In rural and undeveloped areas it is not economically feasible to build expensive infrastructure for conventional water distribution systems. Monitoring groundwater quality is challenging because of the geographical spread of villages and many are not accessible to regular monitoring by central agencies.[9]

Figure 1. Water Quality Status in India as of 2012



Source: WHO and UNICEF Joint Study, 2012

There are also environmental concerns. 26.5 billion liters of untreated wastewater are discharged into bodies of water every day, leaving these bodies of water not up to environmental protection standards.[10]

Government Strategy

The Government of India set targets to provide access to 40 liters per capita, per day of piped water to households, or within a 100-meter radius of their household for at least 50% of the rural population.

The provision of clean drinking water has been given priority in the Constitution of India. Article 47 confers the duty of providing clean drinking water and improving public health standards to the individual states. However, within each state, the water sector is fragmented, with separate agencies responsible for irrigation, domestic and industrial water supply. Supply to domestic consumers, especially in the urban areas, is further fragmented.

Traditionally throughout India, local governments have set up large-scale, centralized piped water schemes where untreated water from a source is treated through sand filters, chlorinated and then pumped up to overhead tanks for piping to houses. It is supply driven, involves large capital expenditure, insufficient support structures at the state and community levels, and lack of budget and professionals who can regularly operate and maintain the systems. This leads to intermittent supply and poor quality of water.

The purification methodology commonly used to disinfect water is bleaching powder or hypochlorite solution. Most of the time, the quantity added into the water is uncontrolled; leaving the possibility of too little being added so that the water is not disinfected properly, or too much is added, allowing the water to become carcinogenic and toxic. Furthermore, this method only removes biological contaminants and does not remove fluoride, iron and arsenic.

In April 2009, the National Rural Drinking Water Program was launched to provide grants for the construction of rural water supply schemes with a special focus on areas where water has poor quality. The goal of the program is decentralization—putting the planning, implementation, operation and maintenance in the hands of beneficiaries, which can be more effective. Private participation to help with the planning and operation of water systems is encouraged to this end.

Continuing Need

Despite the combined efforts and investment of both the national and state governments, the goal of providing safe and adequate domestic water to every rural person in the country remains to be achieved. Nearly 30% of urban and 90% of rural households still completely depend on untreated surface or groundwater.[11]

Considering India's large and diverse topography and social and cultural differences, a "one-size fits all" solution will not work. Private actors have made efforts to bridge the gap, such as:

- Water "ATMs," which are cloud-managed, solar-powered, cashless vending machines providing clean drinking water 24 hours a day
- Water, Sanitation and Hygiene (WASH) community hubs run by women's groups that account for the internal revenue returns from water dispensing and sanitation charges

However, the scaling up of these initiatives is difficult. Constraints include the limited availability of human resources, lack of transparency, lack of coordination mechanisms among private actors, civil society and government, and bureaucratic delays by the local governments and states.

Table 1. Summary of Key Issues in the Quality of Water

PROBLEM	POSSIBLE SOLUTIONS
Weak oversight by government institutions and poor provider accountability with respect to quality of water provided.	A decentralized, community-owned and managed system in the hands of beneficiaries could ensure the sustainability of impacts and benefits achieved.
Expensive, large-scale infrastructure systems that are not economically viable for low-density (rural) areas.	Stand-alone water systems with purification components that serve a certain radius provide added value and a cost-effective scheme.
Poor operation and maintenance, including lack of replacement and expansion, which results in support structures that are insufficient or decaying and rapid deterioration in the quality of water services.	Operation and maintenance measures can be implemented at the local level to ensure the skills and finance for operation and maintenance, replacement and expansion.
A limited purification methodology and system failures that lead to biological and chemical contamination. Ensuring water quality at the source and finding new technologies are crucial for water quality.	A water safety plan implemented at the local level could prevent contamination at the source along with cost-effective and more stringent purification technologies.

Despite these difficulties, the need for strong, scalable water delivery models remains high—demand for clean drinking water will rise drastically, with intense competition for water from agriculture and industry, and increasing scarcity and variability of water resources. Continuing financial and technological contributions from the private sector in the development of sustainable water solutions is important. Synergy between the private and public sectors will be crucial in solving the imminent water crisis.

Innovation

Waterlife Organization

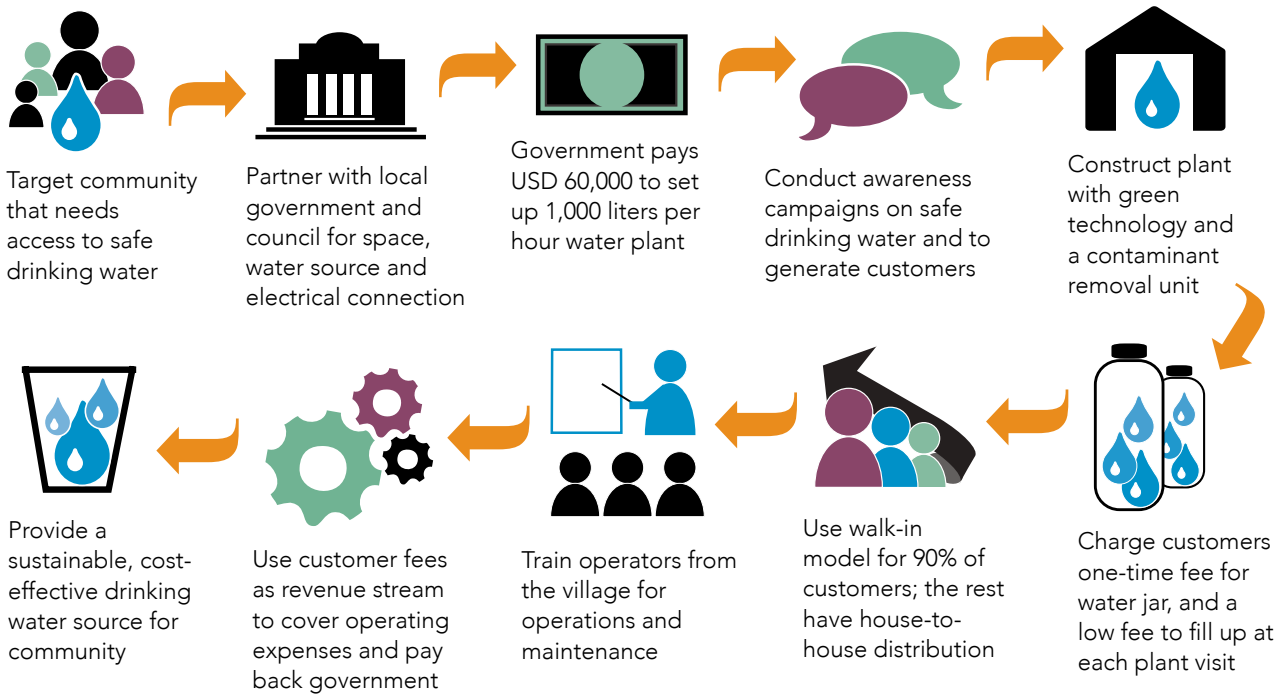
In 2008, Waterlife established as a for-profit company based out of Hyderabad, India. Waterlife came about through a chance meeting of Mr. Sudesh Menon, one of the co-founders, with Dr. Anji Reddy, founder of Dr. Reddy's Laboratories, one of the largest pharmaceutical companies of India. Mr. Menon was inspired by Dr. Reddy's strong beliefs on the importance of clean drinking water for the Indian people. Mr. Menon co-founded Waterlife along with Mohan Ranbaore and Indranil Das to provide high quality safe water to underserved and challenging areas in an affordable and sustainable manner.

Waterlife provides several services, including retail products to treat specific contamination on a small- and large-scale basis, treatment systems for institutional complexes such as apartments and restaurants, and mobile water purification units (see Appendix IV).

Community Drinking Water Solution

Waterlife's flagship service is building and managing community drinking water plants in underserved areas of rural India that otherwise have no access to safe drinking water. The plants provide safe, convenient, and affordable drinking water in 20-liter jars to individual walk-in customers (Figure 2).

Figure 2. Overview of Waterlife's Community Safe Drinking Water Solution



Each plant offers a standard 1,000 liters per hour—the total capacity of the plant is 24,000 liters per day. The plants are designed to be flexible and can cater to small hamlets at 500 liters per hour, or to bigger villages at 5,000 liters per hour. The most cost effective is a 1,000-liters per hour tank that can be expanded to 2,000 liters per hour by just adding a few additional components. In non-grid areas, Waterlife uses a solar powered model.

The purification system removes both biological and chemical contamination, including fluoride, arsenic, nitrates and iron. The water quality meets Indian standard specifications for drinking water and WHO guidelines.[12] Depending on the contamination of the water source, the configuration of the treatment system changes with multiple types of filtration.

To raise demand for its product and access a large customer base, Waterlife forms non-traditional partnerships with community volunteers, NGOs, hospitals, schools and colleges to increase awareness about the importance of safe and hygienic drinking water. It also trains and appoints local youth as plant operators to instill ownership among the community and maintain continuity of operations.

Waterlife makes sure it is the community that benefits from the plant by restricting water sales to individual customers and local institutions serving a catchment of around 5 km radius (for walk ins) and 10 km radius (for household distribution). By offering water only through 20-liter jars, it creates regular community visits to the plant.

Cost Structure and Analysis

Capital expenses

- USD 50,000 to set up a 1,000 liters/hour plant
- USD 65,000 to set up a 1,000 liters/hour solar enhanced plant

Operating expenses

For a typical individual plant, total monthly operating costs equal about USD 410

- Spares and consumables total USD 112 monthly
- Electricity totals USD 102 monthly
- Salaries total USD 196, broken down as follows:
  - Operator salaries are USD 162 per month
  - Collection agent (covering 20 plants) is USD 5 per month
  - Service agent (covering 20 plants) is USD 5 per month
  - Supervisor with Technician (covering 20 plants) is USD 8 per month
  - Health and awareness executive for outreach campaigns (covering 10 plants) is USD 16 per month

Revenue streams

For a typical individual plant, total monthly sales equal about USD 1,215.

- Customers pay a one-time fee of about USD 2.4–3.2 for a 20-liter water jar, and USD 2.5 for a dispenser, which is optional.
- Customers pay USD 0.08–0.11 for a 20-liter refill of the jar on each visit.
- From the customer fees, about USD .01–.03 goes back to the government, toward paying the capital expenditure.
- The service delivery charge is incorporated into the cost of the 20-liter jar.
- Customer fees pay all of the operating expenses, listed above.

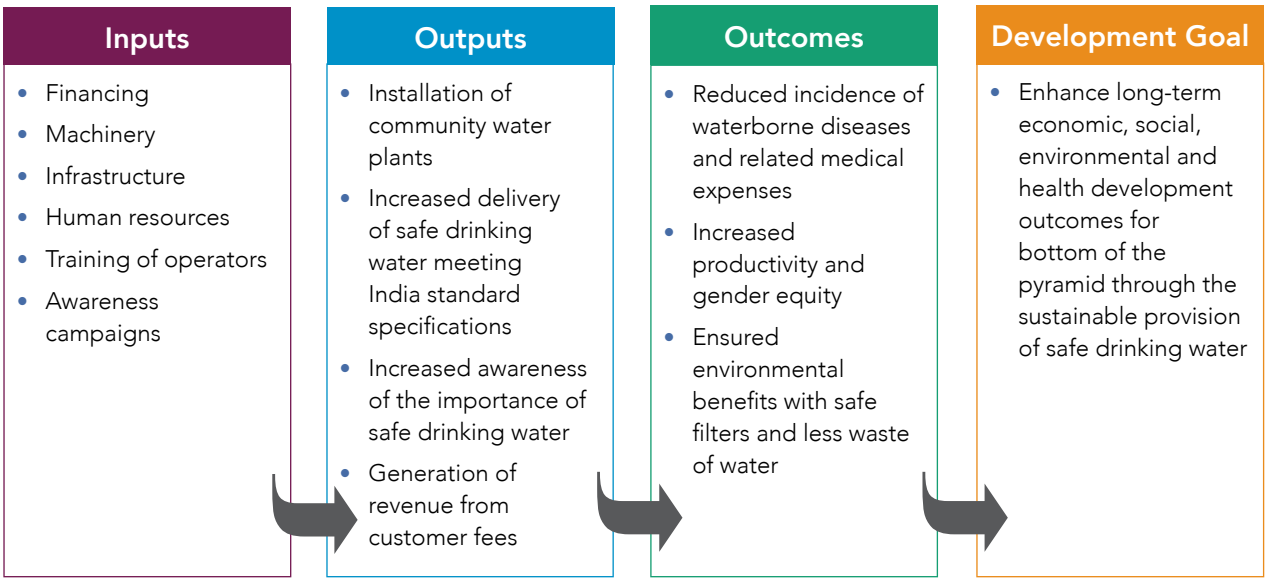
In a conventional water system that pipes water into homes, the cost to the customer is 0.25 cents/month for unlimited usage, and the cost to the government is approximately USD

8 million. In the Waterlife model, the cost to the customer is 0.0004 cents/liter, and the cost to the government is a one-time USD 60,000 for the capital expenditure.

A detailed breakeven analysis covering detailed revenues and expenses for individual Waterlife plants in available in Appendix VI—this table indicates operations and maintenance are cost-effective and self-sustained through customer fees. When considering capital expenditure, a detailed payback analysis is also available in Appendix VI.

Results Chain

Figure 3. Results Chain for Waterlife Model



Implementation

Location

Since Waterlife depends on government subsidies for covering the costs of the plants, identifying the location of the plant depends on government recommendations. A list of possible locations is jointly drafted. The Waterlife head office team reaches out to local governments, either through direct contact or personal introductions and presents the community water plant solution. After the meeting, the regional office follows up.

Based on the recommendation, the Waterlife team meets with ward councilors or Panchayat members (the local body representatives at the village level). They create awareness about the proposed solution and understand community demands and openness of the local body to provide necessary infrastructure, such as space for construction, available water source and electricity connection. Once the local body gives consent, the Waterlife team tests the water to understand water quality in that area.

Viability

Three main areas are considered regarding the viability of a plant:

(1) Customer base

For a plant to be operationally viable, Waterlife needs about 3,000 individuals in their population area of around 2 km from the plant.

(2) Awareness of community

To create brand value before the plant is built, Waterlife runs a door-to-door hygiene education campaign that reaches out to schools and institutions and organizes regular health clinics. These campaigns make the customer base aware of the issues with contaminated drinking water and how the plant will change community members' health.

(3) Identification and training of operators

To create a sense of ownership, Waterlife recruits operators from the community, based on recommendations by the local council. They train the operators onsite while the system is set up, so that on the day the plan is commissioned, the operators are ready to manage daily activities.

Delivery Model

Waterlife generally follows a walk-in model for delivery of water to create a sense of ownership among community members (Figure 4). Customers interviewed say they take comfort that the plant is safe and hygienic and not filled with water from contaminated sources since they can see for themselves they are receiving safe water directly to their jars from the source.

In addition, when customers walk in with their jars to the plant, Waterlife can take this opportunity to educate or remind customers about the importance of safe drinking water and check whether the jars are being properly cleaned before the next visit. This helps monitor and control the health aspects of the customers.

Operations, Monitoring and Maintenance

It takes about 45 days to construct a plant once all approvals have been received. Appendix V provides a sample chart of the main activities with the number of days to complete each.

Figure 4. Distribution Methods for Water from the Waterlife Plant

Operators are critical to ensuring that the plant properly runs and receives needed maintenance. Waterlife recruits operators from the community and trains them during construction. Plant operators are contracted to an outside company, and Waterlife pays the rest of the team.

Figure 5 shows a typical Waterlife team that manages all of the plants within the state and reports to the head office. The service-in-charge takes care of operations and maintenance-related issues within a geography. Generally one service-in-charge takes care of 2–3 districts covering about 10–20 plants. Service engineers report to the service-in-charge and are responsible for servicing 5–10 plants within a district. The plant operators are also trained as technicians and by default each plant has one technician.

Figure 5. Typical State-Level Service Team for Plants

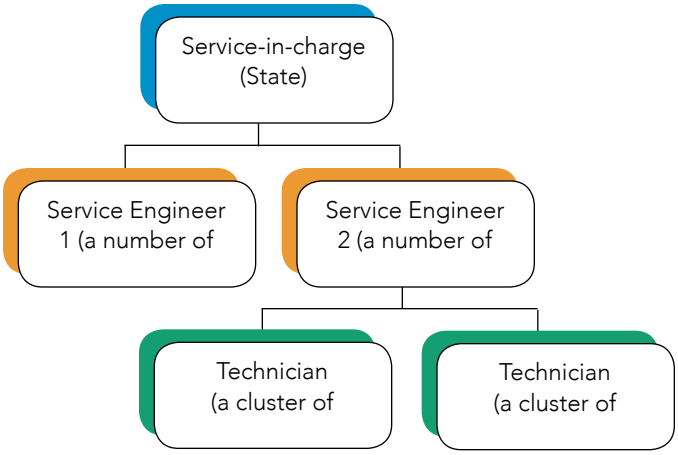


Figure 6. Typical Operations Flow Chart for Waterlife Plant

- Track daily water sales and transmit report
- Register new customers
- Perform daily plant maintenance
- Conduct water tests

- Spread awareness of plant
- Conduct marketing and canvassing

- Visit plants for daily/weekly cash collection
- Check sales and tally with flow meter
- Deposit cash in bank

- Conduct preventive maintenance
- Trouble shoot
- Train operators
- Conduct water tests

- Review data and monitor
- Reconcile accounts with bank
- Perform audits

Operators conduct daily maintenance of the plant. All plants have a maintenance chart, which is the Standard Operating Procedure for the plant. It is primarily an easy maintenance model:

- The first change of major parts and filters takes place only after 3–4 years depending on the water quality of the plant for 500 bottles per day capacity.
- The average downtime of visited plants in a year is just two days.
- The operator is able to perform minor maintenance and repairs.
- For major maintenance requests, Waterlife has appointed service engineers who are on call 24/7 through a toll-free number.

Waterlife has a customized management information system to track bottle sales and total cash collection each day from plants across India. The system is based on a mobile platform that sends an SMS at the end of each day to the head office giving water meter readings, electricity meter readings and total jar sales.

Water quality of each plant is monitored every month through analysis in certified labs and reports are prominently displayed in each plant for customers. In some cases the local government also conducts monthly analysis in their own labs and displays this report.

All plants prominently display a toll-free number for customers and operators to connect with the head office team in case of any complaints and for maintenance issues. This gives customers a direct line to ensure the plant is maintained well and the quality of the water is accounted for.

Outreach Strategy

To reach out to its customers and educate its beneficiaries on the importance of safe drinking water, Waterlife uses both traditional and non-traditional outreach methods.

- **Health workers:** Waterlife appoints health workers who go from house-to-house building awareness with leaflets and posters about safe drinking water and how it can impact overall health (see Appendix IV for samples). The health workers mainly target women of the household since they play a critical role in the water the family drinks.
- **School campaigns:** To increase awareness among students who can influence their parents on the need for safe drinking water, Waterlife conducts drawing competitions and other awareness camps. It provides drinking water from its source to the school so that the teachers and students can sample the water and communicate its qualities to the community.
- **Health camps:** In some of the project areas, Waterlife conducts health camps that provide free diagnoses and in some cases medicines to its beneficiaries. The health camp aims to diagnose waterborne diseases in the locality and communicate the importance of prevention from such diseases by drinking safe water.

Environmental Standards

Waterlife ensures full compliance with Indian environmental regulations and is driven by environmentally friendly solutions. Waterlife ensures safe disposal of filters, membranes and discharge water. Membranes are down cycled for disposal at authorized centers.

Due to high pressure pumping of water into the filters, the present water recovery for Waterlife plants range from 70–75%. The wastewater is discharged into the sewerage system.

The water follows filtering standards in which it becomes free of all suspended impurities down to 1 Micron, including organic impurities and waste as well as color, odor and taste. Additional components ensure that a specific impurity, such as fluoride, is treated before the water is released into the main stream or secondary usage.

Impact

Community Empowerment

One of the most important aspects of the Waterlife business model is the sense of ownership and trust that is created among community members because of the transparency of operations and opportunity for feedback. The plant operations are visible to customers who walk in every day to fill their jars. They see that the water they receive is actually filtered, every individual from every caste is treated equally, the plant is always kept clean, and they can call a posted toll-free number if they are not satisfied with the quality of the water, the operator or the plant.

Community Perceptions of Waterlife

In 2013, the Institute of Rural Management (IRMA), Anand, India surveyed 195 households in areas where Waterlife has community water plants: 120 in rural areas and 75 in urban areas. At present almost 60% of respondents in the urban and rural areas use Waterlife water for drinking.

Since acceptance of Waterlife as the preferred mode of drinking water by the targeted population is important for both financial viability and impact on health, the research captured information on reasons why an existing customer would shift to using water from Waterlife plants. The survey found that the main factors are:

- In the rural areas: 57% listed better health and 16% listed better taste.
- In the urban areas: 89% listed better taste and 33% listed better health.

The difference in factors might be that in urban areas, alternatives are available if the existing source is not good but in rural areas, there are no such alternatives. Other triggering factors listed were affordability, better quality of life and following a trend.

Health and Economic Impact

Based on the IRMA research, along with analysis of data and interaction with customers and public health center health workers, 97% of customers in the rural areas have seen improvement in their overall health, leading to a decrease in their visits to health centers and reducing costs for medicine. In the urban areas 56% of the respondents said that there have been significant health benefits.

Data from a public health center in Madavganfarata, Maharastra, India, one of the health centers covered in the study area, indicates there has been a significant reduction in waterborne diseases: about 65% in diarrhea, 57% in urinary stones and 57% in skin diseases (Table 2).

In a cost-savings analysis undertaken among the targeted households it was found that monthly savings in expenditures due to better health was USD 28 for rural households and USD 15 for urban households.

Table 2. Before/After Installation of the Plant, Average Cases Per Day

Diseases	Before	After
Diarrhea	30–40	10–15
Urinary stone	15–20	5–10
Skin diseases	30–40	10–20

Source: Public Health Center, Madavganfarata, Maharashtra

Waterlife has also seen a corresponding increase in attendance at nearby schools or anganwadis (courtyard centers that provide education and health care) due to a lower rate of illness in children. For example, data from an aganwadi in Gingera in the state of Karnataka, showed the average number of school days missed due to waterborne diseases was three days per month. After usage of the purified water, the absence was zero.

Table 3. Summary of Impact from Waterlife Plant Usage

An assessment of the Waterlife model based on an analytical framework.

Reach	• *Access:* Expanded access to safe drinking water to underserved communities. • *Availability:* Community centered plants serve an area of around 5 km radius (walk ins) and 10 km (distribution), equipped to serve about 5,000 individuals. • *Affordability:* The one-time cost for a 20-liter water jar is USD 2.4. This jar can be filled up over the course of its life for USD 0.08 per visit.
Effectiveness	• Provides safe drinking water that is needed in underserved areas, with the purification process customized to local water conditions. • Walk-in delivery model is an efficient and convenient way for community to access water. • Satisfaction levels of surveyed customers is almost 100%.
Accountability	• Water quality meets Indian standard specifications. • Waterlife has a service and quality team for quality assurance. • Monthly water tests conducted at accredited labs and water results are prominently displayed at the plant. • Posted toll-free number for customers if they are not satisfied with the quality of water, operator or the plant.
Economic Efficiency	• Surveyed customers indicate they are fine with paying for a trusted source of clean, quality drinking water. • Cost to the government is USD 60,000 as the capital expenditure, but with revenue stream coming from customer fees.
Impact on Development Outcomes	• Job creation for youth in underserved areas, who are trained in operations and maintenance of the plants. • According to a public health center data, reductions of 65% in diarrhea, 57% in urinary stones, 57% in skin diseases. • Significant drop in frequency of visits to doctors and related household medical expenses. • Related increase in children's school attendance and academic results • Water recovery of Waterlife plants is 70–75%. • Safe disposal of filters, membranes and discharge water.
Potential for Sustainability	• Revenue from customer fees pays back government capital expenditure costs. • Revenue from customer fees creates a sustainable stream that takes care of all operating expenses—the individual plant monthly cost analysis shows a gross margin of 66%. • Plant operations and maintenance are locally managed. • Waterlife takes care of operations and maintenance of the plants for an extended period, thereby ensuring that the quality of the end product is not compromised.
Potential for Scalability	• Strong partnerships with community groups, NGOs, local governments. • Variety of outreach channels.

Please note: At present Waterlife has no separate monitoring and evaluation department or an individual directly responsible for gathering and analyzing data. While the monthly water quality and daily sales data of each plant is looked at, they do not track data to help measure impact on a regular basis. Impact is still being measured and progress will be updated.

Sustainability and Scale-up

Opportunities

Waterlife is a community-based approach that involves local governance authorities and actors and encourages the participation of beneficiaries in the management of water resources. Waterlife is in a competitive position to partner with local governments to scale up and reach a larger audience.

Based on financial data, the Waterlife model operates with cost-effectiveness and efficiency. The constant revenue from customer fees covers a plant's monthly operating and maintenance expenses, including salaries and electricity. According to monthly cost analysis, the gross margin for revenues vs expenses for individual plants is 66%. Capital expenditure has a specific payback plan, as described in Appendix VI.

Strong partnerships with the local government, NGOs, Panchayats, women's groups, commercial institutions and international aid agencies help weave long-term sustainability. In particular, Waterlife partners with community volunteers, NGOs, hospitals, schools and colleges to increase awareness about the importance of safe and hygienic drinking water. It trains and appoints local youth as plant operators to instill ownership among the community and maintain continuity of operations.

To date, Waterlife has approximately 600 community water systems and 3,500 contamination removal units across 12 states. After a successful pilot working with the Ranchi Municipal Corporation, they are working with the government of Jharkhand for a larger roll out of the community water system model across the state. Over the next three years they expect to set up hundreds of units in Maharashtra, Pondicherry, Rajasthan and other states.

Factors to Consider Moving Forward

Partnerships

- It can take time to explain the Waterlife business model and convince local government or bodies to allot land and water sources for the plant.
- Legal formalities and delays in documentation can also pose issues.

Financing

- Currently, scaling is based on a capital expenditure by the government and corporates.
- The budgets are spent in needy areas where the community generally does not have access to safe water. This helps Waterlife scale fast and keeps costs low.

Infrastructure

- Waterlife depends on the local government or bodies for access to viable sites for installation and water and power sources.
- The availability of power poses challenges in areas that have regular load shedding (intentionally engineered electrical power shutdowns).

Communication and Education

- Pushing for first-time usage and increasing adoption rates takes time and concerted efforts. Increasing the usage will require continued awareness campaigns and significant commitment to manpower with the requisite financial implications.

- Creating awareness is one of the major challenges to change customers' mindset, yet Waterlife has not implemented its communication strategy as a standard operating procedure. It is left to the regional coordinator or the state in-charge to decide whether to undertake any outreach activities.

Usage and Distribution

- As of yet, Waterlife is solely a safe drinking water solution and does not provide water for multiple uses.
- Waterlife is primarily a walk-in model. They do not provide formal, networked distribution to individual households or any other point of source.

Data Collection and Evaluation

- From an impact assessment perspective, the company has, to date, not put efforts into developing a monitoring and evaluation plan. They do not collect baseline data and have not identified outcome indicators to understand its impact on the community from a social perspective.
- According to Waterlife senior management, a monitoring and evaluation plan is not a priority right now since they are too focused on reaching out to as many communities as possible.

Lessons Learned

Business model focused on ease of replication

Waterlife innovated a standard business model that can be operationalized within a short timeframe across any geography and thus can scale and replicate quickly. Waterlife insists on a "pay and fetch" model that has a clear competitive advantage and value added in the water distribution businesses.

Ownership and trust of local community

By involving government and community leaders at the outset and training and recruiting local actors to manage the units, Waterlife brought a necessary sense of ownership to the plants that improved management and sustainability for their business model. They focused on earning the community's trust by showing water drawn from the source, ensuring the plants run smoothly and provide uninterrupted water and supplying an experienced team of service engineers so that all issues related to the plant are addressed immediately.

Need for education and marketing

Pushing for first-time usage and increasing adoption rates can be difficult. Waterlife conducted several camps to educate the community about the benefits of safe drinking water and the availability of the plant. Distribution of pamphlets and door-to-door campaigning helped. They also distributed jars, creating a tie-in and reminder for customers to come back regularly to the plant.

Customized to needs of the area

Wherever Waterlife has a presence, they conduct a detailed hydro and topographical mapping of the geographical area and customize their water and purification solution based on the issues from that groundwater.

APPENDIX I

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APPENDIX II

Case Study Research

To understand the business model of Waterlife, the World Bank team conducted a study over two weeks covering rural, peri-urban and rural locations over different topographies where Waterlife has a running plant, including old and new units and one solar unit. The study relied on interaction with customers, operators, engineers and supervisors, including top management, and studying relevant materials shared by Waterlife.

The study also relied on data and findings from a separate study conducted by a management student with the Institute of Rural Management (IRMA), Anand, India.

Study objectives

- To do a holistic assessment of the impact of Waterlife on the lives of rural and urban people by providing them with safe drinking water at the village level and thereby influencing their lives at the household level.
- To conduct a control-treatment group study in two villages to throw light on the ripple effects of providing safe drinking water.
- To present case studies so as to highlight the impact of providing safe drinking water and the findings of a cooking experiment.
- To map the business model on a sustainable development framework and based on findings develop a Logframework Matrix.

Primary sources of data

- Field visits
- Baseline study of the villages
- Questionnaire survey
- Interviews and unobtrusive observations

Secondary sources of data

- Online data sources
- Data on health collected from the public health centers
- Panchayat records and Aganwadi registers
- Data shared by Waterlife team

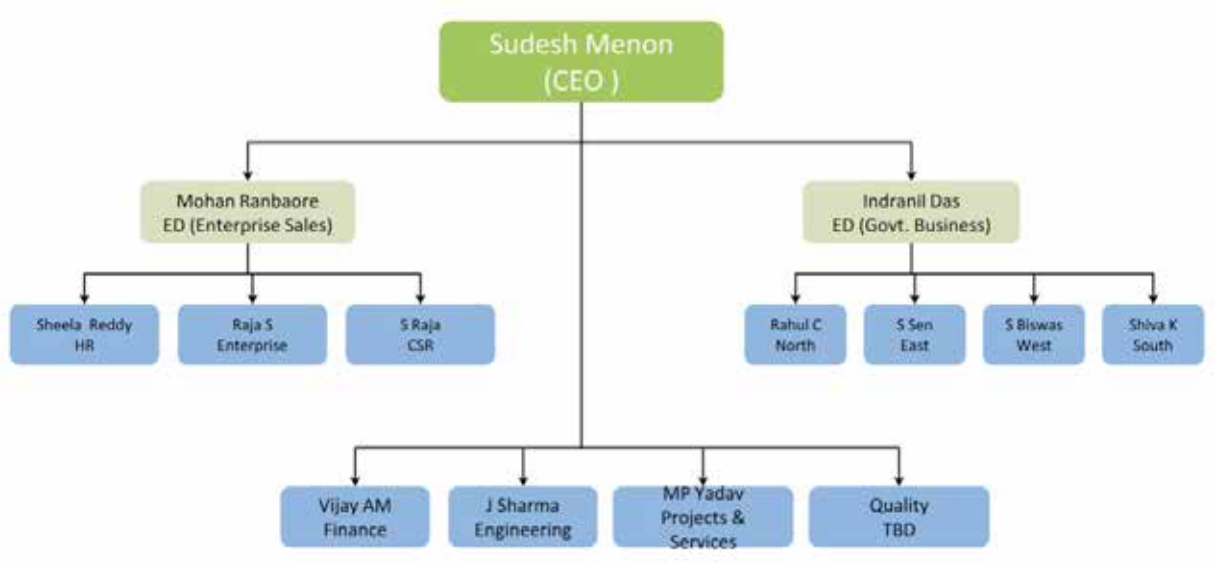
Sample locations

- Maharashtra—Mandavganpharata, Naigaon, Maregaon, Nanded
- Karnataka—Irkalgada, Mangalore, Ginigeda, Basapur
- Pondicherry—Kombakkam, Thengaithitu, Rainbownagar, Iyyanagar, Veduthalainagar

APPENDIX III

Waterlife Background

Organizational structure

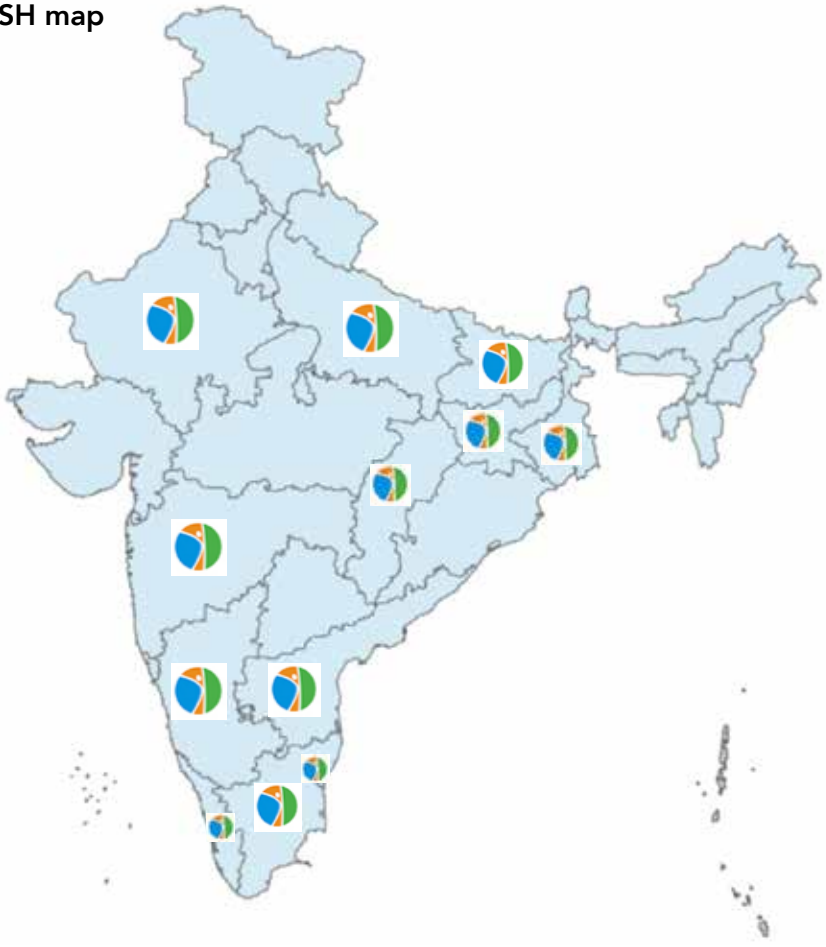


Waterlife presence mapped on WASH map

Waterlife

Waterlife Presence in India:

Andhra Pradesh
Uttar Pradesh
West Bengal
Pondicherry
Maharashtra
Karnataka
Bihar
Jharkhand
Chattisgarh
Kerala
Rajasthan
Tamil Nadu



APPENDIX IV

Waterlife's Other Services and Products

Customized Contamination Removal Units
Hand pump integrated - Working without power

Solar Dual Submersible Pumps Integrated with Handpumps
Escalates the yield of hand pump multifold, catering to the required community volumes, and bifurcates water for drinking and cooking through filtration, from water for general use.

Disaster Management Mobile Units
Treats nuclear, biological and chemical contamination. Also converts chemically contaminated flood water to safe drinking water pouches. Licensed technology from Defence Research Development Organisation, Government of India. Used for disaster management and the armed forces.

Retail Units

Institutional Systems

Mobile Water Purification Units

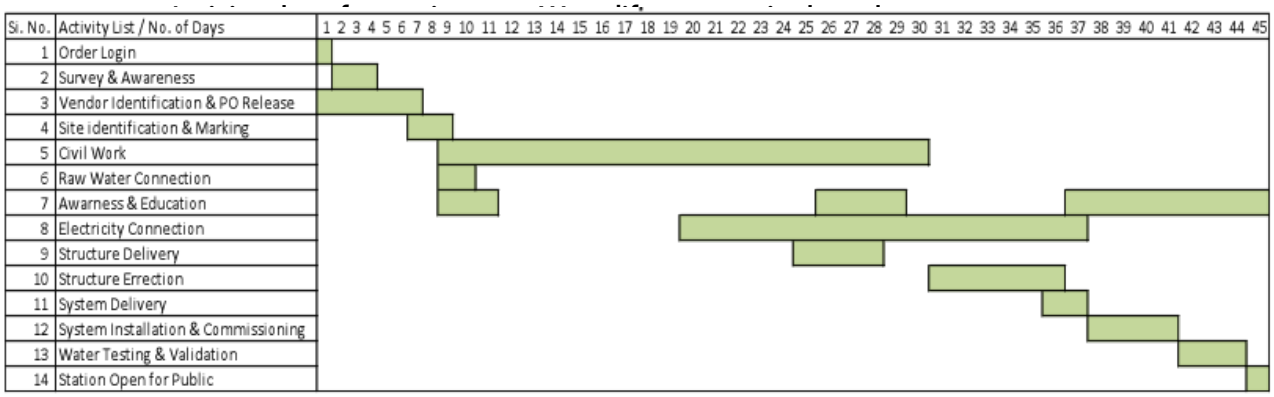
APPENDIX V

Sample Communications

Poster

APPENDIX VI

Implementation Chart



Si. No.	Activity List / No. of Days
1	Order Login
2	Survey & Awareness
3	Vendor Identification & PO Release
4	Site identification & Marking
5	Civil Work
6	Raw Water Connection
7	Awarness & Education
8	Electricity Connection
9	Structure Delivery
10	Structure Errection
11	System Delivery
12	System Installation & Commissioning
13	Water Testing & Validation
14	Station Open for Public

APPENDIX VII

Financial Charts

Individual plant revenues vs expenses for break-even analysis

Particulars	Amt in Rs.	Amount in USD
Investment for Plant	**3,500,000**	57,000
Revenue:		
Number of Jars Sale/Day	500	500
Rate per Jar	5	0.08
Monthly Sales	**75,000**	**1,215**
Operating and Maintenance Costs:		
Operator Salary - (1 + 1 spare operator)	10,000	162
Spares and Consumables	6,900	112
Electricity	6,300	102
Collection Agent Salary (covering 20 plants)	325	5
Service Agent Salary (covering 20 plants)	325	5
Supervisor with Technician (covering 20 plants)	500	8
Health and Awareness Executive (covering 10 plants)	1,000	16
Total Cost per Month	**25,350**	**410**
Gross Margin	49,650	804
Margin %	66%	66%

Capital expenditure payback period analysis

To understand the payback period of a Waterlife plant, a detailed analysis was carried out using the following scenarios:

1. No subsidy on capital expenditure
2. 50% subsidy on capital expenditure
3. 50% subsidy on capital expenditure and operating expenses
4. 100% subsidy on capital expenditure
5. Waterlife solar plant vs diesel generator

For calculation purposes, the following assumptions was taken based on expenses incurred in the existing plants:

Capital expenses were taken at USD 60,000; Annual Maintenance Costs (AMC) costs at around 330/year and Operations and Maintenance (O&M) was taken as USD 3500/year. Average rate for a 20L jar at USD 0.11 and average jar sales per day at around 250.

Scenario Analysis for Payback Period

1. No subsidy on capital expenditure

No Subisdy :- Huge Loss in Project — Amt in Lacs

Particulars	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Total
Inflow											
Cash From Water Sales	3.78	4.20	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	49.98
Total Inflow	**3.78**	**4.20**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**49.98**
Outflow											
Cost of Investment											
Interest on Loan Payment	5.14	4.88	4.57	4.22	3.81	3.33	2.78	2.13	1.39	0.52	32.76
Principal Payment	1.64	1.90	2.20	2.56	2.97	3.45	4.00	4.64	5.39	6.26	35.01
AMC Cost	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	2.00
O&M Cost	2.16	2.40	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	28.56
Total Outflow	**9.14**	**9.38**	**9.98**	**9.98**	**9.98**	**9.98**	**9.98**	**9.98**	**9.98**	**9.98**	**98.32**
Net Cash Inflow	**(5.36)**	**(5.18)**	**(4.73)**	**(4.73)**	**(4.73)**	**(4.73)**	**(4.73)**	**(4.73)**	**(4.73)**	**(4.73)**	**(48.34)**

At present the capital expenditure of Waterlife is supported by a third party. In case there is no subsidy provided, the plants are at a loss.

2. 50% subsidy on capital expenditure

50% Subsidy on Capex not on Opex Loss in Project

Particulars	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Total
Inflow											
Cash From Water Sales	3.78	4.20	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	49.98
Total Inflow	**3.78**	**4.20**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**49.98**
Outflow											
Cost of Investment											
Interest on Loan Payment	2.57	2.44	2.29	2.11	1.90	1.66	1.39	1.07	0.69	0.26	16.38
Principal Payment	0.82	0.95	1.10	1.28	1.48	1.72	2.00	2.32	2.70	3.13	17.50
AMC Cost	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	2.00
O&M Cost	2.16	2.40	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	28.56
Total Outflow	**5.75**	**5.99**	**6.59**	**6.59**	**6.59**	**6.59**	**6.59**	**6.59**	**6.59**	**6.59**	**64.44**
Net Cash Inflow	**(1.97)**	**(1.79)**	**(1.34)**	**(1.34)**	**(1.34)**	**(1.34)**	**(1.34)**	**(1.34)**	**(1.34)**	**(1.34)**	**(14.46)**

In the second scenario where 50% of capital expenditure is subsidized, the analysis shows that the plants are at a loss.

3. 50% subsidy on capital expenditure and operating expenses

50% Subsidy on Capex and also Opex Project Break Even

Particulars	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Total
Inflow											
Cash From Water Sales	3.78	4.20	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	49.98
Total Inflow	**3.78**	**4.20**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**49.98**
Outflow											
Cost of Investment											
Interest on Loan Payment	2.57	2.44	2.29	2.11	1.90	1.66	1.39	1.07	0.69	0.26	16.38
Principal Payment	0.82	0.95	1.10	1.28	1.48	1.72	2.00	2.32	2.70	3.13	17.50
AMC Cost	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00
O&M Cost	1.08	1.20	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	14.28
Total Outflow	**4.57**	**4.69**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**4.99**	**49.16**
Net Cash Inflow	**(0.79)**	**(0.49)**	**0.26**	**0.26**	**0.26**	**0.26**	**0.26**	**0.26**	**0.26**	**0.26**	**0.82**

In case where both the capital expenditure and operating expenses are subsidized by 50%, the plant breaks even in Year 3.

4. 100% subsidy on capital expenditure

100% Subsidy on capex alone Positive Project Cash Flows

Particulars	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Total
Inflow											
Cash From Water Sales	3.78	4.20	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	49.98
Total Inflow	**3.78**	**4.20**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**5.25**	**49.98**
Outflow											
Cost of Investment											
Interest on Loan Payment	-	-	-	-	-	-	-	-	-	-	-
Principal Payment	-	-	-	-	-	-	-	-	-	-	-
AMC Cost	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	2.00
O&M Cost	2.16	2.40	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	28.56
Total Outflow	**2.36**	**2.60**	**3.20**	**3.20**	**3.20**	**3.20**	**3.20**	**3.20**	**3.20**	**3.20**	**30.56**
Net Cash Inflow	**1.42**	**1.60**	**2.05**	**2.05**	**2.05**	**2.05**	**2.05**	**2.05**	**2.05**	**2.05**	**19.42**

In the existing scenarios, where Waterlife capital expenditures are fully subsidized, the plants break even in Year 1 since operation and maintenance costs are recovered from Day 1 through charging a small fee from the users.

5. Comparison between solar and Diesel Generator (DG) set in non-grid areas

In non-grid areas where the major source of power is through Diesel Generator (DG) sets, the analysis below shows that within a three-year timeframe solar powered plants provide almost 50 percent savings over DG sets, besides being environment friendly.

SOLAR vs DG SET

In non-grid areas the default option for running CWS is a DG Set. Below comparison between DG Set costs and Solar Panel Costs

Solar Power plant	
Solar power required in Kwp	3
Capital Cost	**500,000**
AMC	20,000
YEAR 1 COST	**520,000**
3 YEAR TOTAL COST	**560,000**

Diesel Generator	
Diesel Generator required in KVA	10
Capital Cost for DG	**275,000**
Diesel cost per year	219,000
Maintenance cost per year (oil changes, filters, AMC)	72,000
Total Annual Running Cost	291,000
YEAR 1 COST	**566,000**
3 YEAR TOTAL COST	**11,48,000**

In a 3 year time frame Solar Panels provide 2.3x savings over DG Sets.

Additionally, Solar Panels have nil environmental costs

Providing access to safe drinking water remains a challenge in India, leading to enormous health and economic burdens. Without innovative solutions to plug the gap it is estimated that by 2020, India will become a water-stressed nation, which can lead to local and regional conflicts.

With the help of local government and NGOs, Waterlife establishes decentralized community drinking water plants with purification units as a valuable add on to traditional water supply for underserved populations in rural India. Low customer fees create a revenue stream that covers operating costs and pays back capital expenditures.

The Waterlife model has built a sense of ownership and trust among community members because of its inclusiveness and transparency: 90% of customers are walk-ins to the plant; local villagers are trained in plant operations and maintenance; and awareness campaigns are held throughout the community on the safe aspects of drinking water. Waterlife has started replicating this successful model in East Africa.