Hybrid Wastewater System for Public Markets
Muntinlupa City, Philippines
LINAW Project (Local Initiatives for Affordable Wastewater Treatment)

Assisting 6 Philippine cities to implement the Philippine Clean Water Act by:

• Promoting the adoption of low-cost sanitation technology (for markets, slaughterhouses, hospitals, SMEs, schools, households)

• Sharing innovative financing solutions

• Raising public awareness
Approach to Developing Sustainable Wastewater Projects

- **Stakeholders** - Multisector stakeholders led by local government determine priority projects
- **Social marketing** – drive the demand for improved sanitation through innovative marketing campaign
- **Technology** – select, design and build treatment technology based on low-cost, low energy requirements and ease of operation and maintenance
- **Full cost recovery** – implement rules, ordinances to user fees and penalties for non-compliance
Social Marketing
Driving the Demand for Wastewater Treatment

• Do market research on target audiences
• Focus on behavior change
• Develop messages
• Pre-test materials
• Launch and evaluate

“Check your septic tank or swallow the consequences”
LINAW
LOCAL INITIATIVES FOR AFFORDABLE WASTEWATER TREATMENT

The Wrong Septic Tank

The Correct Septic Tank

X Wrong

This will contaminate our water and cause diseases.

Right

Desludge your septic tank every 3-5 years to maintain its proper functioning.

"Clean Water, Healthy Environment"

Outlet - piped to treatment facility

Air Space

Scum

Sludge

Liquid Effluent

25 meters
Public Markets
Generate High-Strength Wastewater

Public Markets generate wastewater from:

- “Wet section” stalls – meat, fish, poultry
- Produce sales
- Public restrooms
- Prepared food area

Pre-treatment devices including screens & grease traps needed to protect treatment plant
Project Info
Muntinlupa Public Market

- Flow: 210 cu. meters/day
- Stalls: 1445 wet and dry
- Influent: 600 mg/l+ BOD
- Effluent discharge limit: 50 mg/l BOD
- Area: 160 sq. m
- Timeframe: 7 months
## Technology Selection

<table>
<thead>
<tr>
<th>Technology</th>
<th>Capital Cost</th>
<th>O&amp;M/Month</th>
<th>Land Requirements</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABR/SBR Hybrid</td>
<td>$140,000</td>
<td>$500</td>
<td>150 sq. meters</td>
<td>Selected</td>
</tr>
<tr>
<td>Lagoon</td>
<td>$80,000</td>
<td>$175</td>
<td>2000 sq. meters</td>
<td>Too large</td>
</tr>
<tr>
<td>Constructed Wetlands</td>
<td>$120,000</td>
<td>$175</td>
<td>1500 sq. meters</td>
<td>Too large</td>
</tr>
<tr>
<td>Activated Sludge</td>
<td>$200,000</td>
<td>$700</td>
<td>150 sq. meters</td>
<td>High cost and couldn’t keep parking lot</td>
</tr>
<tr>
<td>Trickling Filter</td>
<td>$200,000</td>
<td>$700</td>
<td>150 sq. meters</td>
<td>High cost and couldn’t keep parking lot</td>
</tr>
</tbody>
</table>
Treatment Steps

- Raw wastewater pumping
- Anaerobic Baffled Reactor
- Sequencing Batch Reactor
- Media Filtration System
- Liquid Chlorine Disinfection
- Chlorine Contact and Reuse Water Holding Tank
- Experimental Cocopeat Media Filtration System
Plant Layout Schematic

TOILETS

WET SECTION OF MARKET & FOOD AREA

ANAEROBIC BAFFLED REACTOR + UPFLOW FILTER

AERATION TANK (SBR)

CLARIFIER

DISINFECTION CHAMBER

MULTI-MEDIA FILTER

DISCHARGE (Alabang River)

COCOPEAT BIOFILTER

IRRIGATION/PLANT BOX

RE-USE
* Street Cleaning
* Fire
* Toilets
Advantages: Small footprint, no electricity required, relatively low cost and easy to operate and maintain.
System includes settling and flow equalization basin, anaerobic treatment, aerobic treatment, clarification and effluent pumping station, all in one tank
Cross-sectional View

Treatment system installed completely underground so there is no loss of parking lot and delivery area
Influent and Effluent Baffles and Flow Control Structures
Tank Lid Under Construction

Tank lid designed by structural engineer:

- Total thickness 8” (17.6 cm)
- Concrete - 3,500 PSI
- Rebar - ¾” (1.65 cm)

Designed to withstand the weight of jeeps and delivery trucks
Control Panel

Controls:

• Raw wastewater pumping station
• Air blower for SBR
• SBR controls for settling and decanting
Lamella Clarifier

- Uses gravity to remove suspended solids
- 90% less space than settling basin
- As solids hit the plates, energy loss causes rapid settling
Air Blower – The Heart of the SBR System

- Provides atmospheric oxygen under pressure to fine bubble diffusers
- Fine bubbles mean less oxygen needed to impart dissolved oxygen to water
- Two alternating blowers would provide better reliability
Cocopeat Filtration System

• Cocopeat is byproduct from coconut producing industry

• Provides high surface area and is very resilient in wastewater environment

• Timed dosing draws oxygen into the pore spaces, providing aerobic treatment and filtration
Re-use Tank

- Filtered and disinfected water is pumped to a gravity holding tank
- Reclaimed effluent is used for public toilet flushing and stall washing
- Using reclaimed water saves on pumping costs and use of potable water obtained from deep wells
Full Cost Recovery

- Cost to construct: 6.8 million pesos ($136,000)
- Operational costs: 27,000 pesos/month ($6,720/year)
- Reuse savings: 15,000 pesos/month ($3,600/year)

User fee structure: 5 pesos ($.10)/stall/day.
1440 stalls * $0.10/day * 365 days = $52,000/year
Full cost recovery period = 3 years
Lessons Learned/Conclusions

• Interest and replication have been high because many facilities face the same problems
• Full cost recovery is feasible with low-cost technology and user fees
• Local government leadership and ownership is key
• Important to build support and willingness to pay fees using effective social marketing campaigns