Water Quality Improvement

Maynilad, Philippines
Issues

Domestic Wastewater contributes 60% to 80% of the pollution load and volume.

Cost of managing domestic waste is very expensive.

- Treatment plant
- Conveyance
- Sludge Management
- Outfall

Private Sector investment

Need to call it Water Reclamation Facilities

Land Availability

Combined system vs separate system

Centralized system against use of small systems

Technology of choice

New regulations

Water reuse

Production of biosolids

Waste to energy

Public participation in planning

Carbon Sequestration Initiatives
**OTHER CHALLENGES**

**Right-of-way and permits of conveyance systems**
- Deep excavation
- Narrow road
- Traffic
- Community inconvenience
- Permitting concerns

**Informal Settlers**
Along easements

**Space and physical concerns**
- Limited available vacant lots
- Right-of-way issues

**Community acceptance on sewerage projects**
- Dirty facility
- Odor
- Noise
Wastewater Generation at HOME

WASTEWATER GENERATED
(80% OF SUPPLIED WATER)

SEPTIC TANK

SEPTIC TANK

SEPTAGE TREATMENT PLANT

DRAINAGE SYSTEM

DRAINAGE SYSTEM

CONVEYANCE SYSTEM

CSO

SEWAGE TREATMENT PLANT

SEWER SERVICENETWORK

RECEIVING BODY OF WATER

WATER SUPPLY
SEWERAGE AND SANITATION STRATEGIES

Maximize utilization of existing network

Expand coverage using combined system and treat dry weather flows

Maintain sanitation facilities to serve customers outside sewered areas desludging of septic tanks
QUEZON CITY CATCHMENT
Small treatment plants

- BAGBAG STP
- TANDANG SORA STP
- LEGAL STP
- GRANT STP
- BAESA STP
- CONGRESSIONAL STP
- BAHAY TORO STP
- PROJECT 7 STP
- SAMSON STP
- SAN ANTONIO STP
- PALTOK STP
- DEL MONTE STP
- TATALON STP
- KAPILIGAN STP

Quezon City

MANILA BAY

PASIG RIVER
SEWERAGE need for private sector investment

Population
- 1997-2001: 595K
- 2002-2006: 525K
- 2007-2011: 670K
- 2012-2014: 1.1M
- 2015-2016: 2.7M
- 2017-2022: 5.9M
- 2023-2027: 8.5M
- 2028-2032: 10.5M
- 2033-2037: 11.5M

Sewerage Coverage
- 1997-2001: 485K
- 2002-2006: 413K
- 2007-2011: 267K
- 2012-2014: 223K
- 2015-2016: 157K
- 2017-2022: 94K
- 2023-2027: 79K
- 2028-2032: 58K
- 2033-2037: 56K

Facilities
- 1997-2001: 2
- 2002-2006: 2
- 2007-2011: 5
- 2012-2014: 19
- 2015-2016: 12
- 2017-2022: 25
- 2023-2027: 25
- 2028-2032: 25
- 2033-2037: 25

Capacity (MLD)
- 1997-2001: 146
- 2002-2006: 146
- 2007-2011: 157
- 2012-2014: 2.9B
- 2015-2016: 20.5B
- 2017-2022: 37.8B
- 2023-2027: 1,610
- 2028-2032: 1,966
- 2033-2037: 2,246

Investment
- 1997-2001: PhP 2B*
- 2002-2006: PhP 2B*
- 2007-2011: PhP 132M
- 2012-2014: PhP 2.9B
- 2015-2016: PhP 20.5B
- 2017-2022: PhP 37.8B
- 2023-2027: PhP 32.2B
- 2028-2032: PhP 35.2B

TOTAL INVESTMENT PhP 148B=$3B

- *MSSP 1, 2 and 4 – ADB Loan
- All Cities/Municipalities with at least 1STP
Technology Options

1. Sequencing Batch Reactor (SBR)
2. Moving Bed Biofilm Reactor (MBBR)
3. STM Aerotor
4. Conventional Activated Sludge (CAS)
5. Oxidation Pond

Technical

- Process robustness
- Process efficiency
- Compact footprint
- Ease of operation and maintenance
- Potential for expansion
- Potential for upgrading to new standards
EXISTING FACILITIES

SEQUENCING BATCH REACTOR
- BAGBAG: 10,400 CMD
- CONGRESSIONAL: 567 CMD
- GRANT: 621 CMD

MOVING-BED BIOREACTOR
- PALTOK: 4,900 CMD
- DEL MONTE: 3,500 CMD

STM Aerotor
- TANDANG SORA: 1,200 CMD
- SAMSON: 1,900 CMD

CONVENTIONAL ACTIVATED SLUDGE
- LEGAL: 410 CMD
- PROJECT 7: 2,400 CMD
- TATALON: 8,100 CMD

SAN ANTONIO: 3,300 CMD
KAPILIGAN: 6,000 CMD
SAHAY TORO: 13,400 CMD
TALAYAN: 15,400 CMD
ALABANG: 10,000 CMD

PACO: 410 CMD

PRELIMINARY TREATMENT
TONDO PUMPING PLANT: 432,000 CMD

STABILIZATION POND
DAGAT-DAGATAN: 26,000 CMD
<table>
<thead>
<tr>
<th>STP Facility</th>
<th>Year Constructed</th>
<th>Capacity (m³/day)</th>
<th>Technology</th>
<th>Cost of Construction (MPhp)</th>
<th>Land Area (m²)</th>
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</thead>
<tbody>
<tr>
<td>Baesa STP</td>
<td>2011</td>
<td>390</td>
<td>STM Aerotor</td>
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<td>San Antonio STP</td>
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<td>3,310</td>
<td>Moving Bed Bioreactor</td>
<td>170</td>
<td>605</td>
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<td>Del Monte STP</td>
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<td>Tatalon STP</td>
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<td>200</td>
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<tr>
<td>STP Facility</td>
<td>Year Constructed</td>
<td>Capacity (m³/day)</td>
<td>Technology</td>
<td>Cost of Construction (Php)</td>
<td>Land Area (m²)</td>
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<td>Legal</td>
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<td>409</td>
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<td>460</td>
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<td>Talayan</td>
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<td>620</td>
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<td>Veterans Village (Project 7)</td>
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<td>1,300</td>
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<td>Paco</td>
<td>2013</td>
<td>410</td>
<td>Moving Bed Bioreactor</td>
<td>57</td>
<td>500</td>
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</tbody>
</table>

Exclusions
1. Capital cost – land, relocation of informal settlers and conveyance and sludge management
2. Operating cost - manpower, environmental management plan
3. Portions of treated water are being reused, golf courses, facilities upkeep, watering street plant boxes
<table>
<thead>
<tr>
<th>Type of Technology</th>
<th>Capital Cost per land area (USD/m²) (excl. land cost)</th>
<th>Capital Cost per Treated Volume (USD/m³)</th>
<th>Operational Cost per Treated Volume (USD/1000m³)</th>
<th>Land Area (m²) per Volume (m³)</th>
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</thead>
<tbody>
<tr>
<td>STM Aerotor</td>
<td><strong>1,978</strong> (1,504-2,899)</td>
<td><strong>1,293</strong> (1,029-1,481)</td>
<td><strong>61.03</strong> (48.62-73.89)</td>
<td><strong>0.518</strong> (0.335 – 0.736)</td>
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<tr>
<td>MBBR</td>
<td><strong>4,154</strong> (1,306-6,323)</td>
<td><strong>1,103</strong> (770-1,581)</td>
<td><strong>78.87</strong> (46.84-217.56)</td>
<td><strong>0.196</strong> (0.164 – 0.308)</td>
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<td>Conventional Activated Sludge</td>
<td><strong>2,686</strong></td>
<td><strong>321</strong></td>
<td><strong>15.01</strong></td>
<td><strong>0.119</strong></td>
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<tr>
<td>SBR</td>
<td><strong>1,569</strong> (821-2,151)</td>
<td><strong>817</strong> (465-1,070)</td>
<td><strong>59.61</strong> (26.30-89.49)</td>
<td><strong>0.626</strong> (0.255 – 1.095)</td>
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</table>
## On-going Construction

<table>
<thead>
<tr>
<th>STP Facility</th>
<th>Year Started</th>
<th>Capacity (m³/day)/area m²</th>
<th>Technology</th>
<th>Contract Amount (MPhp)</th>
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</thead>
<tbody>
<tr>
<td>Pasay</td>
<td>2014</td>
<td>46,600 10,000</td>
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<td>Parañaque</td>
<td>2015</td>
<td>76,000 28,000</td>
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<td>Valenzuela</td>
<td>2015</td>
<td>60,000 25,900</td>
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<td>Cupang</td>
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<td>Tunasan</td>
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<td>20,000 10,900</td>
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<td>Cavite</td>
<td>2017</td>
<td>21,000 8,000</td>
<td>Fixed Bed Activated Sludge</td>
<td>639</td>
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<tr>
<td>Southvale</td>
<td>2017</td>
<td>1,000</td>
<td>Sequencing Batch Reactor</td>
<td>86</td>
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</tbody>
</table>
Adding nutrient removal facilities will increase capital cost by 20%, retrofitting existing plants will cost higher.
Septage Collection and Treatment Facilities
Application of septage and biosolids in commercial sugarcane farms
Determination of Carbon Sequestration
Potential in Rehabilitated Mangroves: 
A Case Study on the Practice of Corporate 
Social Responsibility of Maynilad in 
Cavite, Philippines

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J. B. De la Torre  
M. J. Gonzales  
S. G. Salmo III

M. M. Sablas  
D. R. Labapis  
I. A. Navarrete

2nd ASEAN Mangrove Congress 2017 
Manila, Philippines
Kawit  Natural barrier from flooding....since most areas were reclaimed  Bacoor City

Noveleta City  Cavite City
Mud crabs shrimps returned in the area giving alternative income to the families
Manila Bay during its glory days...

famous for its sunset