Wastewater: the Untapped Resource
Water Quality Management in Bangkok

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Bangkok Metropolitan Administration
- **Bangkok**: Area 1,568.74 km² (Inner 266.77, Middle 426.20, Outer 875.77)
- **Population**: Register Population 5.69 million (2015)
- **Surface Water**: Canal 1,682 canals Length 2,604 km
- **Chao Praya River**: 372 km (Total Length) Bangkok 35 km
- **Source of Water Supply to Bangkok and vicinity**: Upstream of Chao Praya River at Sam Lae, Pathum Thani
- **Water Consumption (2015)**: 2.54 mil.m³/day
Water Pollution in Bangkok

- **Major Sources of Wastewater**
  1. Domestic 75%
  2. Industry 20%
  3. Agriculture 5%

- 300 Sampling Points in 165 major canals and 9 Sampling Points in Chao Praya River
- The BOD and DO of 300 sampling points are highly polluted about 70%

Water Quality Monitoring Program in Bangkok

- **BOD (2016)**
  - 0-4 mg/l (5 points)
  - >4-10 mg/l (69 points)
  - 10-15 mg/l (93 points)
  - 15-55 mg/l (133 points)

- **DO (2016)**
  - >3 mg/l (70 points)
  - 2-<3 mg/l (50 points)
  - 1-<2 mg/l (59 points)
  - <1 mg/l (121 points)
Wastewater Treatment System

1. Central Wastewater treatment System
2. Community Wastewater treatment System
3. Cluster Wastewater treatment System
4. Onsite Wastewater treatment System

Base on the regulation “the Building Control Act, B.E. 2522 (1979)”

Septic Tank
Existing Project and Future Plan

**8 WWTPs under O&M**
- Year 2015
- Wastewater 2.54 mil m$^3$/d

- Capacity 1.112 mil m$^3$/d
- 45% of WW generation
- Construction Cost 26,578 mil B
- O&M Cost 612 mil. Baht/year (~17.22 mil. USD)

**4 WWTPs Implementation**
- Year 2022
- Wastewater 2.54 mil m$^3$/d

- Capacity 0.665 mil m$^3$/d
  (Total Capacity 1.777 mil m$^3$/d)
- 71% of WW generation
- Construction Cost 34,170 mil B
- O&M Cost 485 mil. Baht/year (~13.65 mil. USD)

**15 WWTPs in Future Plan**
- Year 2040
- Future Wastewater 3.55 mil m$^3$/d

- Capacity 1.631 mil m$^3$/d
  (Total Capacity 3.408 mil m$^3$/d)
- 96% of WW generation
- Construction Cost 71,033 mil B
- O&M Cost 1,190 mil. Baht/year (~33.48 mil. USD)

Remark: Exchange rate 35.542 Bath = 1 USD (November 2016)
In 2016, ~6% of treated water is reused for several purposes such as planting, cleaning the road and market.
**Sludge for Land Application**

- **Digested Sludge from WWTPs used as raw material for composting and then mainly provide to BMA public park**
- **In 2016, about 11,679 m³ of sludge compost has been used**

<table>
<thead>
<tr>
<th>Year</th>
<th>Used</th>
<th>Produced</th>
</tr>
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<tbody>
<tr>
<td>2006</td>
<td>281</td>
<td>979</td>
</tr>
<tr>
<td>2007</td>
<td>3,689</td>
<td>5,320</td>
</tr>
<tr>
<td>2008</td>
<td>5,201</td>
<td>5,193</td>
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<tr>
<td>2009</td>
<td>9,431</td>
<td>9,673</td>
</tr>
<tr>
<td>2010</td>
<td>7,609</td>
<td>7,625</td>
</tr>
<tr>
<td>2011</td>
<td>10,713</td>
<td>10,439</td>
</tr>
<tr>
<td>2012</td>
<td>8,473</td>
<td>10,507</td>
</tr>
<tr>
<td>2013</td>
<td>12,946</td>
<td>15,340</td>
</tr>
<tr>
<td>2014</td>
<td>10,304</td>
<td>9,181</td>
</tr>
<tr>
<td>2015</td>
<td>13,153</td>
<td>16,421</td>
</tr>
<tr>
<td>2016</td>
<td>11,679</td>
<td>13,750</td>
</tr>
</tbody>
</table>

*Used and Produced sludge volumes for the years 2006 to 2016.*
Wastewater Tariff

• Principle of Wastewater Tariff in Bangkok

“Polluter-Pay-Principle”

“Service-Pay-Principle”

<table>
<thead>
<tr>
<th>No. of District</th>
<th>Area Coverage (m²)</th>
</tr>
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<tbody>
<tr>
<td>21</td>
<td>212.74 m²</td>
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1. Si Phraya WWTP
2. Rattanakosin WWTP
3. Chong Non Si WWTP
4. Nong Khaem WWTP
5. Tung Kru WWTP
6. Din Daeng WWTP
7. Chatu Chak WWTP
8. Bangsue EECC
Propose from Special Committee of Bangkok Metropolitan Council
(Under consideration of BMA: Recover maintenance cost only)

1. Household > 10 m³/month
   - Fix cost = 30 Baht/month

2. Government Sector, Real Estate, Office, Religion Place, Foundation, Education Organization, Hospital and Clinic
   - <500 m³/month = 500 Baht/month
   - 500 – 1,000 = 1,000 Baht/month
   - > 1,000 = 1,500 Baht/month

3. Hotel, Industry, Shopping Mall, and Department Store
   - 80% \times Water Supply \times 4 \text{ Baht/m}^3
The Construction cost to the 8 WWTPs = 26,578 M.b.
Community Participation

• Selected community especially nearby canal for participation in with strong point of strong leader with their strike rule for water quality control

• Education Program
  • Planning
  • Sharing

• Project
  • Phase I (2015) 9 communities + 4 canals
  • Phase II (2016-7) 150 communities + 1 canal
  • Phase III (2018) in planning/ budgeting
Community Participation

- Improving water quality in the Canals by people in their communities

- Classify 150 Communities in 8 districts

- Give Knowledge

- Meeting & Discuss & Implementation

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1. Most area of Bangkok should be serviced by Wastewater Treatment Facility according to the Master Plan

2. In some certain area, onsite and community wastewater treatment systems should be the alternatives choices

3. By-product from wastewater treatment process such as effluent, sludge and the reuse should be improved in quality and their reuse should be promoted as much as possible

4. Collecting the wastewater tariff is the BMA future plan and should be pushed to practices
Thank You for Your Attention