Yangon’s Water Supply Treatment Issues

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- Problems & Challenges
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Overview of Yangon City Water Supply System
Yangon City Water Supply System

1842  Dug Well (30)
1879  Kandawgyi lake *(stop using)*
1884  Inya lake *(stop using)*

1904  Hlawga Reservoir
1940  Gyobyu Reservoir
1992  Phugyi Reservoir
1995  Ngamoeiyeik Reservoir
2005  Ngamoeiyeik WTP *(1st Phase)*
2014  Ngamoeiyeik WTP *(2nd Phase)*
Data of Four Main Reservoirs

**Hlawga Reservoir**
- Catchment Area: 10.5 sq miles
- Water Surface Area: 4.4 sq miles
- Effective Capacity: $48 \times 10^6$ m$^3$
- Total Capacity: $54 \times 10^6$ m$^3$
- High Water Level: 62 Ft
- Low Water Level: 47 Ft

**Gyobyu Reservoir**
- Catchment Area: 12.7 sq miles
- Water Surface Area: 2.8 sq miles
- Effective Capacity: $38 \times 10^6$ m$^3$
- Total Capacity: $75 \times 10^6$ m$^3$
- High Water Level: 215 Ft
- Low Water Level: 138 Ft

**Phugyi Reservoir**
- Catchment Area: 27.27 sq miles
- Water Surface Area: 6.8 sq miles
- Effective Capacity: $90 \times 10^6$ m$^3$
- Total Capacity: $104 \times 10^6$ m$^3$
- High Water Level: 119 Ft
- Low Water Level: 90 Ft

**Ngamoeyeik Reservoir**
- Catchment Area: 160 sq miles
- Water Surface Area: 17.19 sq miles
- Effective Capacity: $207 \times 10^6$ m$^3$
- Total Capacity: $222 \times 10^6$ m$^3$
- High Water Level: 107 Ft
- Low Water Level: 91 Ft
Available Water Resources & Water Supply Amount

- **Surface water**  
  Gyobyu, Phugyi, Hlawga, Ngamoeyeik Reservoirs

- **Ground water**  
  442 Tube Wells operated by YCDC

- **Lakes and ponds**  
  Existing 261 nos., used 108 nos. in 12 townships

### Daily Water Supply Amounts in Yangon City

<table>
<thead>
<tr>
<th>Reservoir/Source</th>
<th>Daily Supply</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gyobyu Reservoir</td>
<td>27 MGD</td>
<td>122727 m³/day</td>
</tr>
<tr>
<td>Phugyi Reservoir</td>
<td>54 MGD</td>
<td>245454 m³/day</td>
</tr>
<tr>
<td>Hlawga Reservoir</td>
<td>14 MGD</td>
<td>63637 m³/day</td>
</tr>
<tr>
<td>Ngamoeyeik Reservoir (1st Phase)</td>
<td>45 MGD</td>
<td>204545 m³/day</td>
</tr>
<tr>
<td>Ngamoeyeik Reservoir (2nd Phase)</td>
<td>45 MGD</td>
<td>204545 m³/day</td>
</tr>
<tr>
<td>Y.C.D.C Owned Tube Wells</td>
<td>20 MGD</td>
<td>90910 m³/day</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>205 MGD</strong></td>
<td><strong>931,818 m³/day</strong></td>
</tr>
</tbody>
</table>
Ngamoeyeik Water Treatment Plant

Inlet flow -> Chemical Dosing (A.C.H) -> Flocculator -> Sedimentation tank -> Rapid sand filter -> Clear water tank -> Outlet flow

Open channel -> Intake reservoir -> Low lift pumps -> Water tower -> Flocculator -> Sedimentation tank -> Rapid sand filter -> Clear water tank -> Pump station
Ground Water Treatment Using Aeration Method
Problems & Challenges
## Major problems facing in Yangon City Water Supply System

| Technical problems | (1) Low demand coverage  
|                    | (2) High non-revenue water amount  
|                    | (3) Poor treated water quality  
|                    | (4) Ageing water facilities and main pipelines  
|                    | (5) Inappropriate layout of facilities  
|                    | (6) Insufficient O&M facilities  |
| Organizational problems | (1) Lack of planning section  
|                        | (2) Lack of monitoring section  
|                        | (3) Lack of O&M and management  
|                        | (4) Poor awareness for customer services  
|                        | (5) Poor water quality monitoring system  
|                        | (6) Poor human resources development in the organization  |
| Institutional problems | (1) Standards for installation of service connections  
|                        | (2) Standards for water meter  
|                        | (3) Standards for installation of individual storage tank  
|                        | (4) Standards for installation of individual pumping facilities  
|                        | (5) Inspection of installation works for service pipe  |
| Financial Management problems | (1) Cheap water price  
|                               | (2) Water pricing system  
|                               | (3) Need for introducing corporate accounting system  
|                               | (4) Budget with little freedom  
|                               | (5) Computerization in limited services  |
Major Challenges

1. Aged pipe lines (>100 year) and pumping stations
2. Direct injection of groundwater into the surface water distribution network at low pressure area
3. Unadequate and unequalized water pressure
4. Higher population growth
5. Rapid expansion of new satellite townships
6. Industrial and commercial development
7. Increasing water demand
8. Customer complaints for both water quality & quantity
9. High NRW %
Group’s Proposal
Group’s Proposal

• Capacity building for O & M of water treatment process and water quality monitoring

• Rehabilitation the existing water treatment processes such as post chlorination facilities, disinfection facilities

• Implementing continuous water quality monitoring system, for example, Supervisory Control and Data Acquisition (SCADA) system

• Introducing the new sustainable water resources for ceasing the underground water consumption
Cooperate Request
Cooperation Request

• Capacity building for engineers and staffs form our departments with the help of international organizations concerning about the treatment technologies, advanced methods and techniques
THANK YOU FOR YOUR ATTENTION
Past and Future Population Trend of Yangon City (1800-2040)
Yangon City Water Supply System

Supply Sources

- Hlawga Reservoir (1904) 14MGD
- Gyobyu Reservoir (1940) 27MGD
- Phugyi Reservoir (1992) 54MGD
- Ngamoeyeik Reservoir (2005) 45MGD (1st Phase)
- Groundwater sources 20MGD

Total supply capacity (2013) 160MGD

Demand Site (Yangon City)

- Population 5.14 million (2013)
- Daily water use 30 gpcd (imp. gallons/cap/day)

Daily water demand 154MGD

Service level target of YCWSS

<table>
<thead>
<tr>
<th>Performance Indicators</th>
<th>Target Year</th>
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<tbody>
<tr>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>Non-revenue water (%)</td>
<td>66</td>
</tr>
<tr>
<td>Leakage rate (%)</td>
<td>50</td>
</tr>
<tr>
<td>Demand coverage (%)</td>
<td>35</td>
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<tr>
<td>Water consumption (gpcd)</td>
<td>30</td>
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<tr>
<td>Supply Pressure (bar)</td>
<td>0.75</td>
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<tr>
<td>Supply duration (hour)</td>
<td>8hrs.</td>
</tr>
<tr>
<td>Water quality</td>
<td>Non-drinkable Drinkable</td>
</tr>
</tbody>
</table>

Pricing System

- Fixed price per unit

Water Price

- 0.11 USD per m³ (commercial)
- 0.08 USD per m³ (domestic)

Ongoing and Proposed Future Projects of YCWSS

<table>
<thead>
<tr>
<th>Project</th>
<th>Supply capacity &amp; Start-up year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ngamoeyeik 2nd Phase</td>
<td>45MGD (’14)</td>
</tr>
<tr>
<td>Lagunpyin Reservoir</td>
<td>40MGD (’15)</td>
</tr>
<tr>
<td>Kokkowa River (240MGD)</td>
<td>15MGD (’20) + 45 MGD (’25) +</td>
</tr>
<tr>
<td></td>
<td>60MGD (’30) + 120MGD (’40)</td>
</tr>
<tr>
<td>Toe River (180MGD)</td>
<td>15MGD (’25) + 15MGD (’30) +</td>
</tr>
<tr>
<td></td>
<td>30MGD (’35) + 120MGD (’40)</td>
</tr>
</tbody>
</table>
River Source:
1. Kokkowa River
2. Toe River

WTP:
1. Gyobyu
2. Nyaughnapin 1 & 2
3. Lagunpyin
4. Kokkowa
5. Toe

Ground water:
0 in 2040