Life-cycle cost analysis for rural piped water systems in Viet Nam

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Vietnam & Australia
Background

- Govt of Viet Nam encouraging private sector involvement in rural water supply
- Little has been documented on costs associated with sustainable rural water services
- Better understanding of costs would help govt (e.g. policies, regulation), private enterprises (e.g. tariffs, business planning) and CSOs (e.g. support mechanisms)
- Study aimed to assess cost structures of privately-operated piped schemes
Study focussed on 14 privately-operated piped schemes across 6 provinces

- 4 schemes in north
- 10 schemes in south
## Preliminary results

### Summary characteristics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>System age (years)</td>
<td>13.5</td>
<td>6.9</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Hours of service per day</td>
<td>19.5</td>
<td>5.4</td>
<td>7.0</td>
<td>24</td>
</tr>
<tr>
<td>No. connections</td>
<td>1,633</td>
<td>986</td>
<td>720</td>
<td>3,555</td>
</tr>
<tr>
<td>Production capacity (m$^3$/day)</td>
<td>1,144</td>
<td>783</td>
<td>120</td>
<td>2,400</td>
</tr>
<tr>
<td>Actual production (m$^3$/day)</td>
<td>729</td>
<td>583</td>
<td>120</td>
<td>2,146</td>
</tr>
<tr>
<td>Production per connection (l/day)</td>
<td>470</td>
<td>258</td>
<td>82</td>
<td>933</td>
</tr>
<tr>
<td>Tariff (USD/m$^3$)</td>
<td>0.32</td>
<td>0.04</td>
<td>0.26</td>
<td>0.38</td>
</tr>
<tr>
<td>Connection fee (USD)</td>
<td>53</td>
<td>49</td>
<td>0</td>
<td>153</td>
</tr>
</tbody>
</table>

7 schemes draw on groundwater and 7 schemes draw on surface water
Cumulative investment in new and expanded systems averages ~USD 287 per connection

Around one-third of CapEx relates to system expansions subsequent to initial construction
OpEx averages $21 ($12-34) per connection per year or $0.16 ($0.05-0.42) per m³

Electricity and labour are the major operational cost drivers
On average, CapManEx, interest + taxes increase cost base by 15-20%, equivalent to $4.75 per connection/yr or $0.02 per m³
Systems lifting groundwater incur higher electricity costs but have lower expenditure on chemicals.
Total production and number of customers key drivers of operational expenditure

Preliminary results

\[ R^2 = 0.4484 \]

\[ R^2 = 0.3599 \]
Unit operational expenditure decreases with size of operations, suggestive of economies of scale.

- Production vs. Unit OpEx: $R^2 = 0.2396$
- Connections vs. Unit OpEx: $R^2 = 0.0196$

Preliminary results
Seasonal variability of water consumption affects both expenditures and revenues in the South

Cash flows vs rainfall in 2016 (South)

Profit margin lower in rainy season: demand declines more than costs
CapEx and OpEx higher than WASHCost benchmarks, but CapManEx is lower

Conclusions

• Preliminary results suggest:
  • Historical CapEx of $287 ($104-450) per household connection
  • OpEx of $0.16 ($0.05-0.42) per m³, or $21 ($12-34) per connection per year
  • CapManEx, interest and taxes increase recurrent costs by 15-25%

• Key determinants of OpEx include climate, water source, and size of system
  • Electricity and labour key cost drivers

• Results to inform policies/regulation, business planning (e.g. tariffs), and support mechanisms

• Collecting high quality cost data on rural water services is challenging
Thank you

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