Vientiane water supply system and development plans for improvement

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Additional Information:

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Metadata Record: [https://dspace.lboro.ac.uk/2134/29306](https://dspace.lboro.ac.uk/2134/29306)

Version: Published

Publisher: © WEDC, Loughborough University

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Background
The Vientiane Water Supply Company (VWSC), a State-owned Enterprise, formerly known as Nam Papa Lao, was established in 1959 and was turned into a business enterprise following the new economic roadmap of the Lao People’s Democratic Republic (Lao PDR), introduced in 1986.

The development of the water supply system in Vientiane Capital City started from the construction of Kaolieo water treatment plant in 1964. This was followed by rehabilitation and expansion of the scheme in 1983. An additional water treatment plant was constructed at Chiniamo in 1980, which was rehabilitated and expanded in 1996. The total production of both treatment plants is 100,000 cubic meters per day. In 1988, the utility became a self-sustaining enterprise as part of the public works improvements.

The Vientiane Water Supply company is responsible for the management and operation of the water supply system. The management and operation systems of Nam Papa are based on commercial principles. Human resources development is one of the main challenges faced by Nam Papa. The shortage of skilled manpower and the insufficient number of technical staff for water supply utilities in the country to implement development plans need to be addressed. Presently, an average of 200 staff from the provinces throughout the country joins the various annual training courses at VWSC’s training center to try to improve the technical and management skills of the staff.

Water resources
The Mekong River has abundant water throughout the year to serve the Kaolieo and Chiniamo water treatment plants. In the rainy season, turbidity of the Mekong River goes up to 1500-2000 NTU. In some years, the turbidity is over 4000 NTU (1996). In the dry season the turbidity goes down to 15-20 NTU.

Nam Ngum River, one of the largest tributaries of the Vientiane Capital City is in the process of improving its social and economic conditions according to the development plans of the government in line with the National Growth and Poverty Eradication Strategy (NGPES). Vientiane Water Supply Company (commonly known as Nam Papa Vientiane) currently serves central and fringe areas of the capital city. Nam Papa Vientiane has plans to increase the quantity and quality of services in near future to meet the increasing water demands and ensure sustainable development and hygienic living environments for the citizens of Vientiane Capital City.

Vientiane capital city population
The past population trend of Vientiane Capital City was estimated by using the average growth rate. The 25-year population increase ratio from 1985 to 2000, was 3.05%, and the total population was nearly 600,000 persons in 2000 as shown in Table 1 below.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>381,000</td>
<td>464,000</td>
<td>532,000</td>
<td>583,000</td>
<td>599,000</td>
</tr>
<tr>
<td>Average Increase Ratio from 1985 to 2000</td>
<td>3.05%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Future Populations and Served Population

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>599,000</td>
<td>687,084</td>
<td>788,165</td>
<td>902,716</td>
<td>1,034,521</td>
</tr>
<tr>
<td>Served Population</td>
<td>215,522</td>
<td>275,567</td>
<td>370,269</td>
<td>466,981</td>
<td>564,648</td>
</tr>
<tr>
<td>Population in Service Area</td>
<td>297,575</td>
<td>380,342</td>
<td>499,737</td>
<td>586,710</td>
<td>662,441</td>
</tr>
</tbody>
</table>
Future population forecast
Based on population growth rate from 1995 to 2000, future population of the city up to year 2020 is estimated at well over one million. According to the action plan for expansion of water supply, the served population and population in service areas are compared and shown in the Table 2.

Future service area
Expansion of the service area (Refer Figure 1) is planned in three steps based on priority of water needs as follows:

Step 1: Year 2004 to 2007
Installation of pipelines, distribution network and connection in domestic areas.

Step 2: Year 2008 to 2012
Installation of pipelines, distribution network in commercial areas.

Step 3: Year 2012 onwards
Installation of pipelines, distribution network in outer fringe – in remote rural areas.

Water Demand
Domestic water consumption per capita is approximately 174 lpcd, which might be rather high compared to that of other Southeast Asian counties. Future domestic water demand is significantly increasing based on the served population and per capita water consumption. The future water demand of the served population is calculated from total population and service ratio of respective villages. Understanding the rather higher per capita water consumption, the VWSC is implementing a ‘Water Saving Campaign’ to achieve a water conscious society and to reduce wastage for the effective use of the water supply system depending on Non Domestic Water Demand, is anticipated to increase in line with the urban development plan of Vientiane Capital City, new industrial zones planned in the eastern and central parts of the city (covering about 3,000 ha). So water demand for existing and new industrial areas will increase with a higher rate (refer Figure 2).

Water Tariff
The average water rate is verified, taking into account the cost recovery policy. In general, the water rate is set by means of applying the Long Run Average Cost (LRAC) methodology. From the past experience of VWSC, the financial opportunity cost of capital was considered to be 3.5%, as the lowest financial cost. As a result, the LRAC was calculated at US$ 0.26/m3. Thus, the rate of US$ 0.26/m3 was considered as
most applicable for expansion of the water supply system, from the view point of affordability and consumers needs, and the financial status of VWSC.

Water tariff for non-domestic water consumers is to be set at twice the level of domestic consumers, based on the present structure. For the poor sector, which accounts for nearly 20% of the population of Vientiane City, the water tariff is 3% of the household disposable income (disposable income is around 640,000 Kip as of 2003). For the average household consumer, the water tariff is 3.5% of the household disposable income (around 1,600,000 Kip as of 2003). The average cost for domestic users was calculated at US$ 0.17/m3. Incidentally, VWSC also applies the new tariff to government offices. The average tariff is set at 950 Kip/m3. The transitions of the water tariff as an illustration of water tariff changes for domestic users are shown in Table 3 and Figure 3.

### Water Loss in Vientiane Water Supply System

Leak detection and reduction of unaccounted water is another challenge faced by VWSC. The percentage of unaccounted for water loss is now 28.47%, reduced from earlier years though the water production has increased considerably. Table 4 shows the water production, water sales, water losses and number of connections made over the period 1999 to 2003. The data clearly indicates that the performance of NWSC is improving over the years although there is still plenty of scope for further improvements.

### Human resources development

Water supply is indispensable for citizen’s life, urban activities and industrial development. To achieve a stable and sustainable services, Nam Papa effectively utilizes various resources that constitute an effective management of water supply. Trained staff will assure that a water utility’s ability could survive and grow. Providing training for staff is a managerial responsibility, with both utility management and staff having a clear voice in determining what will be done, how it will be done, how the results and impacts are evaluated. Water work and technology has expanded con-

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**Table 3. Transition of Water Tariff Revision: 1994 - 2004**

<table>
<thead>
<tr>
<th>Effective Period: From</th>
<th>Through</th>
<th>Average Unit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1994</td>
<td>April 1995</td>
<td>92 Kip/m³</td>
</tr>
<tr>
<td>May 1995</td>
<td>June 1996</td>
<td>135 Kip/m³</td>
</tr>
<tr>
<td>July 1996</td>
<td>May 1998</td>
<td>162 Kip/m³</td>
</tr>
<tr>
<td>June 1998</td>
<td>May 2001</td>
<td>195 Kip/m³</td>
</tr>
<tr>
<td>April 2001</td>
<td>October 2002</td>
<td>387 Kip/m³</td>
</tr>
<tr>
<td>November 2002</td>
<td>March 2004</td>
<td>550 Kip/m³</td>
</tr>
<tr>
<td>March 2004</td>
<td>June 2004</td>
<td>750 Kip/m³</td>
</tr>
<tr>
<td>July 2004</td>
<td>Present</td>
<td>950 Kip/m³</td>
</tr>
</tbody>
</table>

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**Figure 2. Daily average and daily maximum water demand**

- Day Average Water Demand
- Day Maximum Water Demand
sumer demand and environment quality. Newer and more sophisticated testing and monitoring procedures have led to more stringent regulations and controls. All of these effects how well a utility will survive. To conclude, workforce efficiency and effectiveness is the key to the survival and growth of VWSC.

References

Figure 3. The illustration of water tariff for domestic users

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Production (M³)</td>
<td>31,526,073</td>
<td>36,273,290</td>
<td>36,867,221</td>
<td>36,273,290</td>
<td>43,837,630</td>
</tr>
<tr>
<td>Water Sales (M³)</td>
<td>21,943,494</td>
<td>24,992,460</td>
<td>27,513,899</td>
<td>24,992,460</td>
<td>31,354,982</td>
</tr>
<tr>
<td>Water Losses (M³)</td>
<td>9,582,579</td>
<td>11,280,830</td>
<td>9,353,322</td>
<td>11,280,830</td>
<td>12,482,648</td>
</tr>
<tr>
<td>No. of Connection</td>
<td>37,160</td>
<td>39,507</td>
<td>42,052</td>
<td>43,093</td>
<td>46,314</td>
</tr>
<tr>
<td>% Water Losses</td>
<td>30.40</td>
<td>31.10</td>
<td>25.37</td>
<td>31.10</td>
<td>28.47</td>
</tr>
</tbody>
</table>

Table 4: Water Losses


Contact address
Mr. Saisamone Thammavongsa,
Senior Engineer,
Vientiane Water Supply Company,
Vientiane, Lao PDR