CHAPTER 9

PROJECT EVALUATION

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9.1 Engineering Aspects

To secure sustainability of the water supply system as a sole source of water supply to people living in Vientiane, the JICA Study Team adopted the following as the basic engineering strategies for the planning and designing of the water supply infrastructure for the 1st Stage Project.

- Selection of an adequate intake facilities

Several alternative types of intake facilities were compared and the intake pipe type was selected as the best alternative. This intake pipe type will not obstruct river water flow and therefore will not cause turbulent flow which may damage the existing intake tower downstream and damage the existing river bank. Possible sediment inside the intake pipes and pump suction well will be flushed out by pre-installed flushing piping.

- Use of a vertical mixed flow type intake pump

Comparing submergible pumps and vertical mixed flow type pumps for the intake facility, use of a submergible pump may be better in respect of its efficiency. However, the submergible pumps can not be repaired by NPVC in case of failure. While the vertical mixed flow type pump has a rather low efficiency compared with the submergible type, it can be maintained by the NPVC. Taking into account the mission of the water supply company, a stable and continuous water supply is the most important factor to be considered. Therefore, the vertical mixed flow type pump is recommended.

- Use of hydraulic energy for chemical mixing and flocculation instead of adopting mechanical agitators and flocculators at the water treatment works

To minimize mechanical and electrical equipment, a hydraulic type mixing well (weir type) and flocculation basin of baffling type will be employed. These systems will require less maintenance and less power costs.

- Adoption of horizontal flow sedimentation basins

This type of sedimentation basin is the same as ones at the existing Chinaimo and Kaolieo Treatment plants, with the advantage that the method of maintenance is already familiar to the operators. Sludge accumulated in the basin will be cleaned manually and modifications to the design were made to ease the desludging process in this study.

- Use of an air scoring type filtration basin

To save the backwash water of the filtration basin, an air scoring type (after air scoring, backwashing by water) will be employed. Saving water means also saving power costs since the water needs to be pumped up from the Mekong River.

- Rehabilitation of the Existing Kaolieo Treatment Plant

The Kaolieo Treatment Plant, which has a capacity of 20,000 m3/day, was originally constructed in 1963, with rehabilitation works implemented in 1983. 20 years has passed since the last refurbishment and not only structural deterioration, but also electro-mechanical equipment malfunctions and deterioration were found on inspection. In order to secure water supply to the existing service area from the Kaolieo Treatment Plant under such a situation, the study team considers that rehabilitation work for the Kaolieo Treatment Plant is indispensable. Furthermore, the pipeline expansion from the Kaolieo Treatment Plant is an on-going project using the financial support of the AFD, hence, production at the Kaolieo Treatment Plant should be secured for future decades.

- Separation of the treated water transmission mains from distribution mains

The Chinaimo Treatment Plant was originally designed for water to be transmitted to elevated tanks and reservoirs throughout the town. Therefore, the total capacity of the pumps in the Chinaimo Treatment Plant is 80,000 m3/day, the same as the plant capacity. This means that the plant is not able to distribute water which also has hourly fluctuations. Accordingly, the capacity of reservoirs is about 3,000 m3, equivalent to less than 1 hour of plant production capacity.

Although the plant was designed only for transmitting water to the elevated tanks and reservoirs, distribution lines are branched from the transmission pipeline to distribute water directly to the town. The amount of the distribution is about 50 % of treated water, 40,000 m3/day. Because of the mixture of distribution systems and transmission systems at the Chinaimo Treatment Plant, the distribution system cannot meet hourly fluctuations and the transmission system becomes unstable, depending on the quantity of distributed water, as pointed out in the previous chapter.

Given these conditions, it is considered that the separation of the systems is indispensable to achieve a stable distribution and transmission system of delivering water. To improve this system, expansion of the reservoir capacity (a new reservoir adjacent to existing one), the installation of distribution pumps to meet hourly fluctuations to meet the demand, and the installation of an independent transmission main line from the plant to the branch point of existing transmission pipelines is required. For the transmission system, the existing pumps will be utilized.

- Adequate technology level

The 1st Stage Project was planned and designed by careful technical examination as described above and the project does not require any new, high, and advanced technology for its operation and maintenance.

9.2 Financial Aspects

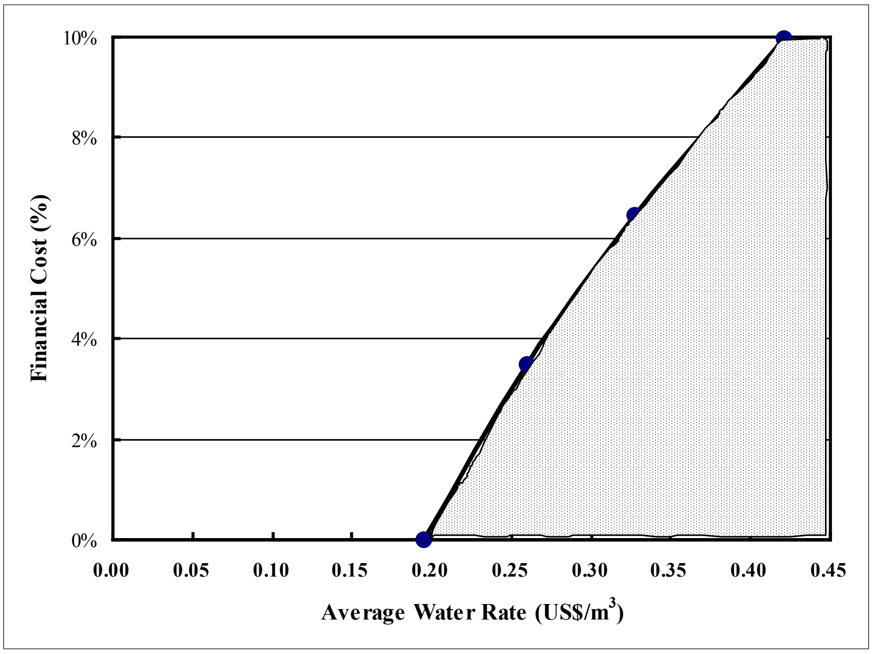
In the economic evaluation, the evaluation indices of the priority projects were calculated as shown in the table below. Under the present socio-economic conditions, the indices were 8.1% of the EIRR, minus US$5.8million of the NPV, and 0.77% of the B/C. Thus, the priority project was determined to be not feasible, because of a lower EIRR than economic opportunity cost of capital (12%). With the future projected economic growth however, the indices were 12.4% of EIRR, US$0.68 million of the NPV, and 1.03 of B/C. In these improved socio-economic conditions thus, the project could be feasible from the economic point of view.

Item	EIRR (%)	NPV* (US$ Million)	B/C*
Under Present Conditions	8.1	-5.84	0.77
With Economic Growth Conditions	12.4	0.68	1.03

Note: * Discounted at 12%.

According to the sensitivity analysis, the allowance of the investment cost for project feasibility border line was too small. For instance, once the construction costs increases to 5% more than the original estimate, the EIRR would go down to 11.7%, lower than the acceptable level of 12%. At the implementation stage of the project thus, the investment and O&M costs should be estimated with prudence, taking into account any cost over-runs.

In the financial analysis, the evaluation indices of the priority project were 0.12 of B/C and minus US$5.8 million which were discounted at 12%. The FIRR was not calculated because the small revenue from the beneficiaries compared with the investment and O&M costs. Based on this result of financial costs and revenue, the relationship between the water tariff and financial costs were analysed and depicted to realise the financially feasible position in the graph below.



The area shaded in the graph indicates the effective combination of financial costs and water charges. Through this analysis, the following case is considered as the most presumable condition, from the viewpoint of the past performance of the NPVC. The financial source is procured at a financial cost of 3.5% per annum and the water tariff will be set at US$0.26/m^3 on average, corresponding to 5.2 times of the present water rate. This financial cost has already been applied in Chinaimo Expansion Project by the government.

To recover the all inputs for the project proposed, the project entity is expected to manage its revenues and costs through the project life. The water tariff based on the LRAC is to be introduced in the middle of the target year. Then, the initial tariff will be raised over a prolonged period of time to the Long Run Average Cost (LRAC). Finally, the management must strive to recover the total costs by the end of the project life. The LLCR was calculated at 1.016, so the project cash flow could recover the total amount of the loan within the project life.

Yet, there are some difficulties for the management of the project operation. To attain the average water tariff of US$0.26/m^3, however, the management has to wait until 2020 because the water tariff starts from the tariff presently in operation. Thus, the NPVC management will have a large deficit for the first half of the project life. In the second half of the project then, it has to recover these deficits.

Regarding the water charge for domestic consumers, the ratio of the charge to household income is set to 1.1% of the household income at the beginning year. The ratio is 2.2% only even in the year 2037. This ratio could satisfy the beneficiaries of the domestic users. The water tariff for non-domestic consumers could keep the same rate of two times higher than that of domestic consumers even in the year 2037.

Furthermore, the priority project was analysed to find the conditions for sustainable management from the viewpoint of the commercial financial viability. It would be difficult for the project entity to manage the operation of the project in the way shown in the statement. The accumulation of the annual incomes from the sales revenue during the project life must be 37% larger than that in the previous case. The average water rate was calculated at US$0.37/m^3 at 2003 economic conditions, which was also 42% higher than the previous management case and 7.4 times more than the average water rate in 2003. Although the water charge of domestic consumers could be kept to nearly 3.0% on average, it would be question that the beneficiaries might satisfy such high water tariff in the future. The consensus of not only domestic consumers but other stakeholders would be essential for the tariff structure.

9.3 Socio-economic Aspects

As discussed in “Water Demand Management (WDM)”, water pricing is one of the most effective measures for WDM among the various available measures. The water pricing policy is a significant challenge to all stakeholders in the water supply project. Therefore, it is important for the stakeholders to reach an understanding with each other regarding the water pricing policy.

In the Prime Ministerial Decision (No.37/PM), the affordability level for domestic water was set as 3% to 5% of household income. Recently, the WASA established a “Tariff Policy 2003” in May 2003. The new tariff policy suggests that the maximum households are prepared to pay for water and sanitation facilities is in the order of 3-5% of disposable household income, subject to revision in the light of new information. Thus, 3-5% of household income is considered as a standard water charge by the administration. On the other hand, domestic users currently pay around 1.0 to 1.6% of their household income for water consumed, according to household surveys conducted in Vientiane. Then, there still are some differences among the administration, the supply side and the demand sides.

In the financial analysis, the average water tariff was proposed to be US$0.26/m^3 for the priority project. This is almost five times more than the present average tariff. In the current study, the tariff structure was designed to start at the present water tariff level, and to raise the water tariff in accordance with an expected increase of household income, in order to attain the full cost recovery policy. Since the water tariff was designed to have a ceiling of 5% of household income for domestic users, even at the end of the project life, non-domestic users might have to have a heavier burden for water charges. Thus, it is still a serious problem that this cross-subsidisation measure is acceptable for the stakeholders. Again, the consensus among stakeholders is an essential issue for the sound management of the water supply project.