

Chapter 3 PROJECT EVALUATION AND RECOMMENDATION

3-1 Project Effect

Project effects are summarized from the aspects of “Current situation and problem”, “Scope of this project”, and “Effect of this Project” as shown on **Table-3.1**.

Table-3.1 Project Effect

Current situation and problem	Scope of this project	Effect of this Project
1. Quantity of surface water becomes small in dry season until 30 % of rainy season. Although groundwater is supplied during dry season to substitute water shortage, quantity of groundwater is not enough. Therefore, people should depend on unhygienic alternative water sources.	Groundwater development by constructing wells. Quantity of groundwater abstraction will be 4,000m ³ /day (@800m ³ /day × 5 wells) in Hawa Eliya and 3,200m ³ /day (@800m ³ /day × 4 wells) in Golf Course.	Stable water supply through the year by groundwater development. Per capita water consumption in dry season of 55 lpcd will be increased up to 151 lpcd through the year.
2. Unstable water supply because of lack of reservoir or insufficient capacity of reservoir.	Construction of four new reservoirs (40 ~ 460m ³). Expansion of two existing reservoirs (110 ~ 190m ³).	Stable water supply meeting fluctuating water demand for 24 hours.
3. Service area is not zoned effectively. Quantity of water distributed is not measured because of absence of metering system. Evaluation of unaccounted-for water is difficult.	Establishment of water supply block to enable water quantity control and pressure control. Boundary valves will be installed on boundary of the block. All reservoirs will be equipped with bulk water meters and quantity of water distributed will be measured. Improvement of water transmission and distribution systems to distinguish two systems and to contribute establishment of the water supply block.	Water balance in each water supply block can be analyzed by improvement of measuring system. Waterworks can set prioritization of reduction of unaccounted-for water based on the results of water balance analysis in each water supply block.

To evaluate the project effect after implementation, base-line survey was conducted during the Basic Design Study. Results and method of the base-line survey are shown on **Table-3.2** together with targets.

Table-3.2 Results of Base-Line Survey and Targets

(1) Index of Project Objective Achievement

	Year 2000 (before implementation)	Method of Base-Line Survey	Year 2005 (Target , after implementation)	Basis of Target
Per capita water consumption (lpcd)	55 *	Calculated from data of Nuwara Eliya Waterworks	151	From previous JICA Study after reviewing based on current situation
Duration of water supply per day	93 % of people in service area replied that water supply is intermittent	Results of questionnaire survey in year 2000	24 hour continuous water supply	By groundwater development, improvement of transmission and distribution pipelines and construction of distribution reservoirs
Minimum water pressure	Water does not reach to some area within service area.		Minimum pressure will be 10 m within service area	By improvement of pumping system and transmission and distribution pipelines

* : Available water source in dry season: 4,245 m³/day / peak factor 1.2 x accounted-for water ratio 44 % / served population in year 2000 = 55 lpcd

(2) Other Achievement Index

	Year 2000 (before implementation)	Method of Base-Line Survey	Year 2005 (Target , after implementation)	Basis of Target
Residual Chlorine (mg/l)		Analyzed by the Study Team at the permanent location.		WHO water quality Guideline
City Hall	0		0.1	
UDA Office	0		0.1	
Central Hospital	0		0.1	
Unaccounted-for water ratio (%)	56	Data from Nuwara Eliya Waterworks.	40	From previous JICA Study after reviewing based on current situation

3-2 Recommendations

The most serious problem of the water supply system in Nuwara Eliya is water shortage in dry season. This problem will be solved by implementation of this Project and stable water supply through the year will be achieved. Although the problem in aspect of water quantity will be solved by the Project, following problems concerning water quality and sound management of waterworks should be solved by the effort of Sri Lanka side. To solve these problems, recommendations are listed below.

(1) Continuous Disinfection

Water quality of water source, surface and ground water, in Nuwara Eliya is rather clear and physical and chemical treatment will not be required. However, specially for surface water, bacteria will exist in water and therefore, continuous disinfection is indispensable for safe water supply. Under this project, all reservoirs will be equipped with chlorinator and these chlorination system should be continuously operated. For the continuous operation of these chlorinator, following routine activities will be required.

- Transportation of bleaching powder to each reservoir, once during two or three days
- Preparation of bleaching powder solution
- Control chlorinator
- Confirmation of residual chlorine concentration at several taps in service area
- Maintenance of chlorinator
- Announcement to citizen that chlorination is indispensable for safe water supply although water contain some smell of chlorine.

To conduct above listed routine works smoothly, new organization chart is recommended in the previous section.

(2) Effective Usage of Measuring System and Effective Unaccounted-for Water Reduction

Transmission and distribution system will be clearly distinguished by implementation of the Project. Service area will be also divided into ten supply blocks and quantity of water distributed to each water supply block can be measured. Existing defective meters will be replaced by Nuwara Eliya Waterworks using new water meters provided under this Project. Therefore, water balance will be

obtained accurately after implementation of the Project and the waterworks will be able to identify which supply block has high unaccounted-for water ratio.

For this purpose, following routine works will be required.

- Defective water meter should be replaced by new meter without delay
- Water meter should be categorized or grouped based on water supply block (existing meter list is grouped by road)
- Periodical bulk meter reading at reservoir
- Accumulation of water meter reading by water supply block and total water consumption in each water supply block should be calculated
- Unaccounted-for water should be calculated from bulk water meter reading and total water consumption in respective water supply block.

Based on the results of above routine work, it is recommended to concentrate unaccounted-for water reduction countermeasures on the water supply block which shows the highest unaccounted-for water ratio.

(3) Maintain Adequate Water Tariff Level

According to the results of financial analysis based on the current tariff structure, maintenance costs required will be covered by income of waterworks. To maintain adequate maintenance, water tariff should be reviewed every two to three years considering inflation rate and water tariff should be maintained at the adequate level.

(4) Necessity of Public Sewerage

Increasing BOD load will be mitigate or offset by the effort of Sri Lanka side as stated before. However, environmental situation will be worse in near future because Nuwara Eliya does not have any public sewerage. Therefore, comprehensive environmental improvement including sewerage is indispensable.

(5) Mitigation of Negative Environmental Impacts

Wastewater from big consumer such as hospitals and factories should be treated to reduce BOD load to the environment. It was found that waste water treatment system of brewery factory was not operated and system renovation is strongly recommended for adequate treatment.

(6) Secure Quality of Water Source

Existing water intake is surrounded by undeveloped forest and there will be no possibility of contamination. However housing or cultivation development in the water source forest should be prohibited by the Nuwara Eliya Municipal Council or UDA. Fencing surrounding water intake is also important to avoid washing or bathing at the water intake.