

Project for the Development of a Water Supply Service in Same and Ainaro

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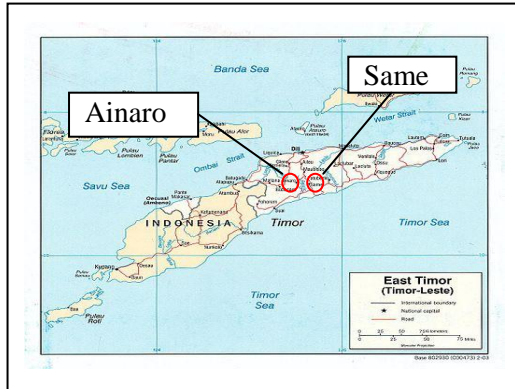
0. Summary

To provide a stable supply of safe water for the residents, this Project repaired, improved, and renewed water purification facilities and intakes in Same and Ainaro. The relevance of this project is high as it was highly consistent with the development plan of the government of Timor-Leste, the ODA policies of Japan, and the development needs at the time of planning. In the course of its implementation, the project was temporarily suspended due to conflicts that had been difficult to foresee, but it was completed as planned as far as the period of suspension is disregarded. The budget was not exceeded over the budget, either. Therefore, the efficiency is also high. However, after the project was completed, chlorination was discontinued in both areas and at the time of this evaluation. In Ainaro, the Nugupo Water Purification Plant supplies treated water only for a limited time of a day, and the river water without treatment is directly supplied as a tap water while the plant does not supply the water. In light of the above, the project has yet to achieve its target of a “stable supply of safe water,” as it was planned. In Same, the 24 hour water supply is operated although the chlorination is not resumed. Also, provided 200 saddles were all installed. On the contrary, in Ainaro, water pipes laid in this project have been connected to only 33 households so far, and the utilization rate of the newly laid pipes remains low. As a result, the impact of this project cannot be clearly observed and its effectiveness is low. The sustainability of the project is low from the facts that, despite signs of some improvement in the financial conditions with the increase in the maintenance budget, the National Directorate of Water and Sanitation Services, DNSAS, cannot properly procure necessary materials. There are still many challenges to be solved in terms of the organization and maintenance, including the shortage of workers at the Ainaro Branch Office and the lack of a maintenance plan, which are necessary to sustainably show the functions of the facilities provided.

In light of the above, this project is evaluated to be unsatisfactory.

Timor-Leste is a young country, which only past ten years since its independence from Indonesia. In particular after the termination of the Indonesian governance, Timor-Leste has experienced the difficulties in developing the capacities of water works engineers and in acquiring sufficient budget to maintain its water facilities. However, in order to establish the sustainable water works, Department of Public Works prepared Action Plan (2013-2017) which includes rehabilitation of water works, and DNSAS prepared short and medium term action plans. DNSAS recognized the importance to acquire necessary budgets for sustainable supply of safe water, and thus its integrated continuous efforts are highly expected.

1. Project Description



Project Location



Nugupo Water Purification Plant, Ainaro

1.1 Background

The water service facilities in Same and Ainaro were not properly maintained after these facilities were constructed during the Portuguese rule between 1950 and 1974, or Indonesian rule between 1975 and 1995. Also, in 1999, these facilities were seriously damaged by people, and maintenance was no longer sustained due to evacuation of Indonesian water engineers from Timor-Leste. As a result, by the time of its independence in 2002, the existing water service facilities already caused serious troubles to residents, such as water cutoffs resulting from leakage and poor water purification. Also, people often stole water by illegal connections.

In 1999 when United Nations Transitional Authority in Timor Leste started its governance after Indonesia left, Japan conducted a “Study for the Project for Urgent Development of Water Supply Systems” to examine water supply facilities in major 15 cities, including Same and Ainaro, as part of its work to support their restoration. Japan also conducted a study of “Support Program for the Reconstruction of Timor-Leste” which recommended the necessary assistances to rehabilitate water supply and sewage system in Timor Leste. Based on the findings of the study, Japan examined contents of assistances for the rehabilitation. In November 2002, the Government of Timor-Leste made a request to the Government of Japan regarding this project. Japan sent two basic design study teams to the country in March 2003 to conduct local field study and in August 2003 for dissemination of the result.

1.2 Project Outline

The objective of this project is to “provide a stable supply of safe water for the residents by improving water supply service in the districts through developing and repairing water service facilities (water intakes, aqueduct, and distribution facilities, etc.) in Same and Ainaro, districts of Timor-Leste”

Since the water quality in Same is relatively good, Same originally does not have a water purification plant. The water supply system in Same is to chlorinate the reserved water in reservoirs. Thus, the Project only develops and repairs water intakes, aqueduct, and reservoir.

Since Nugupo Water Purification Plant in Ainaro, the only one water plant in Ainaro, had a deteriorated function in terms of water treatment, this project renovated sedimentation tank and filter basin in addition to rehabilitation of water intakes and aqueduct.

Table 1: Project Outline

Grant Limit/Actual Grant Amount		1,064 million yen/1,062 million yen
Exchange of Notes Date (Grant Agreement Date)		May, 2005 March, 2007 (extended)
Implementing Agency		Ministry of Infrastructure/Directorate-General of Electricity, Water and Sanitation/National Directorate of Water and Sanitation Services
Project Completion Date		March, 2008
Project contractor	Main Contractor(s)	Dai Nippon Construction
	Consulting	Tokyo Engineering Consultants Co., Ltd.
Basic Design		March, 2003
Related Projects (if any)		[Technical support] Capacity Development Project for the Water Supply System in Dili and four Towns (Ainaro, Same, Liquica and Lospalos) (November, 2008 - March, 2011) [Grant aid] Study for the Project for the Urgent Development of Water Supply Systems (February, 2000 - February, 2001) Support Program for the Reconstruction of Timor-Leste Project for the Improvement of Water Service Facilities in Dili, implemented by UNOPS (June, 2000 - July, 2003; June, 2003 - March, 2004)

2. Outline of the Evaluation Study

2.1 External Evaluator

Hisamitsu Shimoyama, IC Net Limited

2.2 Duration of the Evaluation Study

A study was conducted for the evaluation of the project.

Duration of the Study: September 2011 – November 2012

Duration of the Field Study 1st: November 21 - December 22, 2011;

2nd: May 17 - June 1, 2012

2.3 Constraints during the Evaluation Study (if any)

As almost all of the flow meters of the water purification plant, intakes, and reservoirs concerned were decrepit¹. Thus, information about the amount of water taken in, produced and supplied by the plant was unavailable. The lack of this data, which had been designated as

¹ The flow meter in Hoarula is the only one, which confirmed its operation at the time of the evaluation.

indicators to measure the effectiveness of this project, made it difficult to conduct some quantitative analyses, especially in evaluating its effectiveness.

3. Results of the Evaluation (Overall Rating: D²)

3.1 Relevance (Rating: [3]³)

3.1.1 Relevance to the Development Plan of Timor-Leste

Timor-Leste's National Development Plan (2002/2003-2006/2007), mentioned the sustainable supply of sufficient safe water in urban areas, including Same and Ainaro, as one of its objectives. The development plan set two targets: (1) supply of safe water through pipe networks to 80 percent of the urban population⁴; and (2) the installation of safe small-scaled water-supply systems for 80 percent of the community population⁵. This project was helpful mainly in achieving the Target (1). At the time of planning of this project, the water supply rate was merely 27 and 66 percent at Same and Ainaro, respectively, which was far below the Target (1). The Secretary of State of Timor-Leste emphasized that the country would focus on development of water services in 2012 according to the interview with DNSAS at the time of the evaluation. As a result, the development of water service remains a priority policy for the country through the period from the planning to this evaluation.

3.1.2 Relevance to the Development Needs of Timor-Leste

At the time of the planning process in 2004, Same and Ainaro faced a wide variety of challenges to be resolved in providing water services, such as the underdeveloped organization and legislation that are related to water supply in DNSAS, poor equipment and the logging of its use, the aging of the facilities, and deteriorated distribution pipes caused by inadequate maintenance arrangements, and a lack of log books. In Same, the insufficient capacity for water taken in and the large amount of water leaking or being stolen from the distribution pipes arose, which resulted in a failure to supply sufficient water. In Ainaro, the aging Nugupo Water Purification Plant, its only purification plant, and aged distribution networks failed to work properly. Furthermore, the evacuation of Indonesian water engineers at the end of Indonesian governance contributed to leaving the town short of safe water. Therefore, at the time of planning, development needs for improvement of water supply systems in Same and Ainaro were high.

3.1.3 Relevance to Japan's ODA Policy

In 1999, when Timor-Leste's independence from Indonesia was in view, a Donors' Meeting for East Timor was held in Tokyo and Japan initiated offering aid to the country followed by other foreign governments. In 2000, JICA conducted the "Study for the Project for the Urgent Development of Water Supply Systems", and surveyed rehabilitation assistances for water facilities in major cities including Same and Ainaro. Japan's Timor-Leste aid program for FY2002, when Timor-Leste became independent, mentioned that water service is one of the priority areas in its ODA for the country. Therefore, the project is highly relevant to Japan's ODA policy.

² A: Highly satisfactory; B: Satisfactory; C: Partially satisfactory; D: Unsatisfactory

³ [3]: High; [2] Fair; [1] Low

⁴ The urban population is the population in district capitals including Same, Ainaro and other specified towns.

⁵ Community population is the population where is outside district capitals.

In light of the above, this project has been highly relevant to the country's development plan, development needs, as well as Japan's ODA policy. Therefore its relevance is high.

3.2 Effectiveness⁶ (Rating: [1])

3.2.1 Quantitative Effects (Operation and Effect Indicators)

3.2.1.1 Operation and Effect Indicators

(1) Same

Information on the operation and effect indicators could not be obtained because the Same Branch Office of the DNSAS, failed to record measurements, such as the amount of water taken in and distributed, and water quality. As part of this project, water intake stations and reservoirs were equipped with flow meters. However, the Same branch neglected to keep quantitative records due to poor supervision of the workers and the lack of the means of transport for the workers to go to read the meters. This made a quantitative assessment impossible. Qualitative indicators for assessing effectiveness of this project - the level of stability in water withdrawal, and the state of sterilization with chlorine for controlling water quality - will be described in 3.2.2.

(2) Ainaro

Just as in the case of Same, information on the operation and effect indicators was unavailable as the Ainaro Branch Office of DNSAS failed to record measurements, such as the amount of water taken in and distributed, and water quality. However, with regard to the Nugupo Purification Plant, the operating hours and the amount of water purified will be described below based on information obtained through interviews with employees at the branch office. Qualitative indicators for assessing the effectiveness of this project - the state of sterilization with chlorine for controlling water quality at the Nugupo Purification Plant and the effects of the repair of its aquaduct - will also be described in 3.2.2.

Before the project, Ainaro's Nugupo Purification Plant was left with aging equipment and facilities, and at the time of planning, its water purification system had ceased to work. It was expected that once the project was completed, the plant would operate 24 hours a day. However, according to interviews with members of the DNSAS, the plant lost the accesses to the external electric source due to the troubles that DNSAS did not pay connection fees and water charge. In addition, there emerged other problems, such as, delays in the delivery of generator fuel, and a lack of workers to operate the plant during the nighttime⁷. Thus, the plant supplied the water only for ten hours in the daytime even as of October 2011, when the evaluation started. Before October 2011, DNSAS mobilized neighboring residents and the staffs at the plant cleaned the sand in the slow filtering system with helps of these residents. However, due to delays in disbursement of the maintenance budget, the branch office had to stop mobilizing these neighbors. Specifically, staffs boycotted cleaning sands due to its heavy labors after the stoppage although the staffs are supposed to clean it only by themselves. Between November and December 2011, the plant stopped working due to this maintenance problem. Since it seems that the staffs in the Same office misunderstood cleaning procedures, the staffs experienced unnecessarily hard labors. As a result, these staffs disfavored cleaning duties.

⁶ The sub-rating for Effectiveness is to be put with the consideration of Impact.

⁷ The short and medium term action plans prepared by DNSAS indicate the increases of operational staffs in the water treatment plant.

With the increased maintenance budget, from 500 USD to 1,000 USD per month, from January 2012, it started mobilizing those residents in neighboring communities to resume cleaning the sand. Nevertheless, even after January the plant still needed to stop operating for one or two weeks a month to wash the sand, leaving only two or three weeks per month for the plant to work. Besides cleaning methods, there is the problem that the gate valves at the filtering ponds were clogged due to a coagulation of calcium. Thus the staffs experienced difficulty in opening and closing the valves. This clogging issue contributed to prolonging time for cleaning sands.

Table 2: Operating Hours and the Amount of Water Purified in Ainaro at the Time of the Ex-Post Evaluation

Name	Plan/Actual results	Nugupo Plant
Operating hours*	Plan	24 hours/day
	Operating period/month	2 - 3 weeks
	Actual operating hours/day	10 hours/day
	% to plan/month	19 - 29%
Amount of water purified	Plan	36,000 m ³ /month
	Operating period/month	2 - 3 weeks
	Actual amount	6,840 - 10,440 m ³ /month
	% to plan/month	19 - 29%

Source: Summary of findings from the field survey by the External Evaluator

* According to interviews at the Ainaro branch office, in the months with two or three weeks of operation, the plant was in operation for ten hours per day.

In Ainaro, river water is distributed to the users without purification while the plant does not distribute the purified water. The town is still unable to offer a 24-hour supply of safe water after all the project work done.

3.2.2 Qualitative Effects

3.2.2.1 Qualitative effects expected at the time of planning

(1) Same

Same has no water purification plant because the town can withdraw raw water that is of relatively good quality. Once withdrawn from two rivers, the water is stored in two reservoirs before being sterilized with chlorine and then distributed. This project improved the intakes of the town's water supply system through replacing pipes in intakes and deepening the pipes laid. At the time of planning, the performance of the intakes was so poor that the amount of water withdrawn from the rivers was greatly affected by changes in the flow between the dry and the rainy seasons. After the implementation of this project, improved intakes exhibited better performance in water withdrawal, and the newly constructed reservoirs hold water in the intakes for a longer time, which also helps improve the water distribution performance.

Though quantitative data was unavailable, none of the 20 respondents among the people living in communities in Same, which were selected for a the simplified beneficiary study conducted during this evaluation study, said that the water supply was limited. But, the exception is the period when the branch office temporarily closes the valve of the intakes and limits water supplied during times of high turbidity at the rainy season. In interviews with members of the Same branch office, they said the town became able to withdraw a sufficient amount of water and that no complaints had been made by the residents. Based on these findings, Same withdraws a sufficient amount of water and offers a 24-hour water supply.

As for water quality, Same, with no purification plant in the town, has equipment installed at its reservoirs to inject chlorine and sterilize the raw water. However, the equipment has been left unused since 2010 as the workers there neglected to operate it. Asked the reason for this in the interviews, the workers of the Same branch office pointed out the lack of supervision whether the workers sterilize the water and of a means of transport in resulting a limitation of move for the staffs as major factors.

Coliform and other bacteriological examinations were not practiced and no data was available. The branch office explained that these test items were not found in the form, it submits to the DNSAS to report the results of water quality inspections. The instruments they use to count the bacteria are powered by electricity. However, until 2011, electricity had been available only during the night time every other day. Thus, it was impossible to keep the instruments ready for use all through the business hours⁸. In conclusion, without sterilization with chemicals, there should be no differences in the number of general and coliform bacteria contained in the tap water from that counted in the raw water.

In light of the above, the amount of water withdrawn and supplied in Same is sufficient, while, in terms of water quality, sterilization yet to be performed as planned. Therefore, the “supply of safe water” is not achieved there.

(2) Ainaro

At the time of planning of this project, the Nugupo Water Purification Plant, with no sedimentation basin or filter bed, was poor in terms of performance and was unable to treat highly turbid raw water. With the implementation of this project, the purification plant has been equipped with a sedimentation basin and a slow filtration system, which enables the plant to deal with more turbid water than it could before the project. However, while the plant stops the distribution of treated water, river water is distributed without any treatment. According to the interview with the staffs at the plant, given that the plant operates for two or three weeks in a month as shown in the table 2, working for ten hours a day, its working ratio is between 19 to 29 percent in a month. It distributes unpurified water for some period of time between 71 and 81 percent of any month.

⁸ In 2012, power conditions improved both in Same and Ainaro, and electricity is now available between 6:00 p.m. and 6:00 a.m. in urban districts. However, the power supply is still cut off during the daytime.

In terms of quality, the Nugupo Water Purification Plant treats water to reduce its turbidity but provides no sterilization. This is because the plant has no accesses to external power⁹, and the delivery of fuel to run its generator is often delayed, with its machines to inject chlorine left idle. The similar problems as in the case of Same — misunderstandings among the plant workers and a shortage of power, which prevents its equipment from counting coliform and other bacteria.

The Nugupo Water Purification Plant led water into it through the drains which laid in ground, coated in ground and sides by concretes, and used covers on top to prevent the water from being contaminated before the project was implemented. The drains constituted a channel to supply raw water from the intakes to the plant. However, some of the covers were left broken, and in the rainy season, extraneous materials, such as animal excrement and mud, went into the drains, which was a serious problem. With the implementation of this project, these drains have been replaced by conduits, which prevent such contaminants from getting into the water and helps improve the water quality.

(3) Technical components

1) Technical transfer for the planning of water supply pipeline construction (Common to Same and Ainaro)

This training aimed at improving the capacity of maintenance for existing water supply pipelines and targeted directors of the two branches. The original training plan set three goals: (1) plans for the water supply pipeline construction would be completed, and that construction would be ready to start; (2) the current state of water distribution and supply pipes would be checked to make their management easier; and (3) the capacity for planning water distribution and supply systems would be enhanced. At the time of this evaluation, however, no map of the existing pipelines were produced, with the overall picture left unknown. Interviews with several participants of the training revealed that none of what they had learned in the training being effectively used in their work. This is because, although these directors obtained relevant knowledge to some extent through the training, these directors did not have the staffs who can work under them to follow the instructions.

2) Technical transfer for preparing customer files (Common to Same and Ainaro)

As part of this project, a plan was formed to give guidance on how to produce customer files as preparation for collecting water charges in future. Expected training outcomes were: (1) the preparation of customer files as a way to monitor the state of the water supply and (2) the production of files useful for the effective implementation of the collection of water charges. However, interviews to the participants from the Same and Ainaro branch offices revealed that they produced no customer files based on the techniques they learned in the training. Due to the political situation in Timor-Leste, which will be described below in the sustainability section, the branch offices had failed to start collecting water charges up to this evaluation. As a result, it was not possible to confirm any impacts achieved by this training.

⁹ The electrical company charge a connection fee when DNSAS connect its incoming panel to the lines, which are owned by the company. However, since DNSAS did not pay the connection fee resulting in the trouble, the external power remains unconnected.

3) Technical transfer for water quality analysis (Common to Same and Ainaro)

At the time of planning, no water quality tests were being conducted. Technical guidance was offered for the staffs in water quality control division and ones in the water purification plant to introduce the minimum level of measuring techniques they would need to examine the water quality. Objectives of the training were: (1) increasing the awareness for the necessity of water quality tests; (2) acquisition of the minimum level of techniques needed for testing the water quality; and (3) increasing a level of understanding for safe water and establishing of the minimum necessary monitoring scheme.

At the time of the evaluation, though not perfectly, the Nugupo Water Purification Plant in Ainaro conducted inspections of the items specified by the DNSAS regarding what purification plants should examine, such as turbidity, pH value, water temperature, and residual chlorine on a regular basis, using the tools they had been granted¹⁰. Therefore, that the techniques transferred through the training are used in an effective manner.

In Same, however, tests of water quality are rarely examined due to negligence by the workers and insufficient transportation modes from the branch office to water intakes and reservoirs, and thus very few records are kept. As a result, it is impossible to conclude that the transferred techniques through the training are properly used.

4) Lectures on the slow filtration system and maintenance (only for Ainaro)

The lectures were given to three workers at the Nugupo Water Purification Plant in Ainaro to allow them to carry out appropriate maintenance on a slow filtration system installed in the plant. The training was conducted for two days. Specifically, they learned maintenance planning and the methodologies they would need to take care of its filter beds. As mentioned above, the workers at the plant disfavored this cleaning process as they wrongly believed too much labor was needed for cleaning the sand in the slow filtration system to maintain it. The method of maintenance originally planned was that all they had to do is to remove the sediment on the surface of the sand for every 20 to 40 days. However, they wrongly believed they needed to take all the sand out of the filter beds to wash it, before bringing it back into the beds. Therefore, that the appropriate effects by the training are yet to be realized.¹¹

3.3 Impact

3.3.1 Intended Impacts

This evaluation study conducted a simple beneficiary survey in order to verify reduction of time needed to get water, outbreak of water-borne diseases, and utilization of new pipes laid in this project. The number of samples was 57, including 20 in Same and 37 in Ainaro for the first

¹⁰ As aforementioned, the branch office does not use equipment to count general and coliform bacteria due to a lack of electrical supply, and thus they are not counted.

¹¹ According to the interview to the workers of the plant in December 2011, the evaluator heard that they followed the procedure described, and determined that these staffs did not properly follow the instructions given by the training for at least four years after completion of this project. However, at the second visit in June 2012, the director of the branch in Ainaro answered that the proper procedures and methods to clean the sands in a filter although the evaluator could not observe if those staffs actually follow the instructions. Thus, it seems the branch office improved the cleaning procedures by June 2012.

visits. These beneficiaries live along with distribution pipes. In the second visit, 56 samples were randomly selected and interviewed with the questionnaire only in Ainaro.

(1) Reduction of time needed to get water

In Same, the study demonstrated that this project improved water distribution conditions in the town, which enabled families to spend less time in getting water than when they had to go to a river or a spring to fetch water. The study has also revealed that any member of a family can be a person to get water, and that it is wrong to consider that women and children are primarily responsible for this work. Therefore, the study confirmed that this benefit even reached to adult males.

(2) Outbreaks of water-borne diseases

In interviews with two directors of the largest hospitals in both districts respectively, they could not identify any causal relations between tap water and outbreaks of water-borne diseases. Moreover, the director in the branch office of Same also mentioned no such causal relations.

On the contrary, the Ainaro branch office concerned that tap water might cause some water-borne diseases, and asked the district's Health Bureau to examine whether there were such causal relations and any outbreaks of water-borne diseases. However no progress is observed in this examination, leaving unclear whether there is such relations.

(3) Utilization of the new pipes laid in this project

In Ainaro, the distribution pipes were also replaced. It is a fact that even those who still connect the water supply pipes laid in the period of Indonesian governance found the benefits of this project, because water supply was improved by the rehabilitation of the plant. However, only a small number of households have been connected to the new pipes. As of May 2012, when the beneficiary survey was conducted, the Ainaro branch office recognized only 33 households that were connected to the new pipes¹². In the second beneficiary study conducted in May 2012 with 56 households living in its urban area, 68 percent of the respondents (38 families¹³) answered that they were not connected to the new pipes. Among the remaining 32 percent of the respondents (18 families), who answered they had not been connected to the new pipes, 67 percent (12 families) said their house was too far away from the new pipes to be connected to them, while 22 percent (four families) answered they hesitated to pay the connection charge of 55 USD.

In this project, the Timol side is responsible for connecting distribution pipes to users' houses. Technically, the DNSAS is responsible for plumbing maximum of six meters of a water distribution pipe to a house. On the contrary, plumbing work beyond this range, if necessary, must be carried out by the users in principle. Partly because few plumbing materials are locally available, the work to connect households to the new pipes is delayed.

¹² Action Plan (2013-2017) prepared by Department of Public Works includes the ideas, such as, to improve the situation of connecting newly laid pipes by this project.

¹³ 38 households answered that they had been connected to the pipes laid by JICA, a larger number of families than the 33 households recognized by the Ainaro Branch Office, since for each household connected to a pipe there were several neighbors who had unlawfully laid a branch pipe between their house and the pipe in order to connect without registration.

In Same, as many as 200 households have been connected to the new pipes. In this project, 200 ferrules with a saddle¹⁴ were distributed and nearly all of them are in use. In May 2012, when the evaluation was being conducted, about another 900 households requested to connect to the pipes. The Timol side is responsible for procuring the ferrules exceeding 200, which were originally provided by Japan in this project. However, this connection work does not catch up the growing needs of the local residents.

3.3.2 Other Impacts

(1) Impacts on the natural environment

As this project was designed to repair existing facilities, it was not expected to occur any negative impacts to natural environment. At the time of this evaluation, the no impacts on the natural environment were observed.

(2) Land Acquisition and Resettlement

Since this project mainly repaired existing facilities, and laid new water supply pipes along the public roads, the project required no land acquisition or resettlement of residents without their agreements.

This project achieved its objectives at a limited level. Therefore its effectiveness and impact is low.

3.4 Efficiency (Rating: [3])

3.4.1 Project Outputs

The project was completed with the outputs mostly as planned.



Hoalula Reservoir, Same



Nugupo Water Purification Plant, Ainaro

¹⁴ A type of joint used to connect a distribution pipe laid in an urban district with a service pipe leading to an end user.

Table 3: Comparison between the Planned and the Actual Outputs

Plan	Actual results
<p>(1) Outputs 1) Same [1] Merupachi (Amount of water taken: 560 m³/day) Intake station: Infiltration gallery (new): 1 Distribution station: Reservoir (addition): 1 (with partitions); Flow meter (new): 1; Sterilizer (new): 1 unit</p> <p>[2] Darelau (Amount of water taken: 864 m³/day) Intake station: Intake crib (repair): 1; Penstock: Penstock (new): 1; Distribution station: Reservoir (addition): 1 (with partitions); Flow meter (new): 1; Sterilizer (new): 1 unit</p> <p>[3] Kotalala (Amount of water taken: 130 m³/day) Intake station: Sterilizer (new): 1 unit; Penstock: (new): 1; Distribution station: Flow meter (new): 2</p> <p>[4] Same Water Distribution District Distribution pipe extension: 15.5 km</p>	<p>(1) Outputs 1) Same [1] Merupachi (As planned) Intake station: As planned; Distribution station: As planned (However, the sterilizer has been out of use since the evaluation.)</p> <p>[2] Darelau (As planned) Intake station: As planned; Penstock: As planned; Distribution station: As planned (However, the sterilizer has been out of use since the evaluation.)</p> <p>[3] Kotalala (As planned) Intake station: As planned (However, the sterilizer has been out of use since the evaluation.) Penstock: As planned; Distribution station: Flow meter (new): 1</p> <p>[4] Same Water Distribution District Distribution pipe extension: As planned; <ul style="list-style-type: none"> • Water pipe bridge: 2; • Shared faucet: 32 • Shared faucet (repair): 15 </p>

<p>2) Ainaro [1] Nugupo Water Purification Plant Intake station (Sarai: Amount of water taken: 1,200 m³/day): Broken weir (repair): 1 unit; Intake (new): 1; Penstock: Penstock: 1; Purification station: Ordinary sedimentation basin (modified slow filtration bed): 2; Slow filtration bed (new): 4; Reservoir (addition): 1 (with partitions); Office building (new): 1; Manager's house (new): 1; Facilities: Sterilizer (new): 1 unit; Power incoming unit: 1 unit; Power distributor (new): 1 unit; Monitoring equipment (new): 1 unit; Power generator (new): 1</p> <p>3) Ainaro Water Distribution District [1] Distribution pipe extension: 8.3 km</p> <p>4) Provision of equipment [1] Same</p> <ul style="list-style-type: none"> • Water quality analysis kits: 1; • Ferrules with a saddle: 190; • Mortising machines: 2 <p>[2] Ainaro</p> <ul style="list-style-type: none"> • Water quality analysis kits: 1; • Ferrules with a saddle: 190; • Mortising machines: 2 (Spare bit: 8) 	<p>2) Ainaro [1] Nugupo Water Purification Plant Intake station (Sarai: Amount of water taken: 1,200 m³/day): As planned; Penstock: As planned; Ordinary sedimentation basin: As planned; Slow filtration bed: As planned (Out of operation at the time of the evaluation); Reservoir: As planned; Office building: As planned; Other facilities: As planned</p> <p>3) Ainaro Water Distribution District [1] Distribution pipe extension: As planned (However, there are as few as 33 households connected.)</p> <ul style="list-style-type: none"> • Water pipe bridge: 8; • Shared faucet: 2; • Shared faucet (repair): 18 <p>4) Provision of equipment Common to [1] & [2] left</p> <ul style="list-style-type: none"> • Water quality analysis kits: As planned; • Ferrules with a saddle: As planned; • Mortising machines: As planned
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<p>5) Non-physical components</p> <p>[1] Technical guidance for the planning of water supply pipeline construction/Technical guidance for preparing customer files;</p> <p>[2] Technical guidance for enhancing the skills for water quality analysis;</p> <p>[3] Lectures on the slow filtration system and its maintenance</p> <p>(The basic design study has no information on inputs, etc.)</p>	<p>5) Non-physical components All implemented as planned.</p> <p>[1] Technical guidance for the planning of water supply pipeline construction/Technical guidance for preparing customer files (1.3 months from November 2006; Given by three Japanese consultants);</p> <p>[2] Technical guidance for enhancing the skills for water quality analysis (1.0 month from January 2008; Given by one Japanese consultant);</p> <p>[3] Lectures on the slow filtration system and maintenance (0.5 months from November 2007; Given by one Japanese consultant)</p>
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3.4.2 Project Inputs

3.4.2.1 Project Cost

At the time of planning of this project, the grant limit was set at 1,064 million Japanese yen. After several alterations to the contracts, the project was completed with an actual project cost of 1,062 million Japanese yen, 99.8 percent of the plan. The project costs were thus within the planned.

A major change from the original plan was the temporary suspension of construction work amid a conflict in May 2006 with evacuation of the Japanese experts in compliance with an order from the Japanese embassy. Extraordinary expenses of 19 million yen during the suspension and for the resumption of the construction work were added to the project costs. Since the contract amount before evacuation was 1,043 million Japanese yen, this add made the contract amount to 1,062 million Japanese yen.

The Timor-Leste's side obtained the lands, and procured the gates and fences of rehabilitated water facilities as their outputs. On the contrary, at the time of the evaluation, Nugupo water purification plant was not connected to external electrical sources yet. The amount of expenses borne by Timor-Leste was not confirmed as the necessary data was not prepared.

3.4.2.2 Project Period

The project period was estimated to be 29 months, from May 2004, the month of the exchange of notes, to September 2007. Actually the project was started in May 2004 and finished in March 2008 after 35 months, 120.7 percent of the plan. The project period was prolonged because construction work was temporarily suspended amid a conflict in June 2006 with the evacuation of Japanese experts in compliance with an order from the Japanese embassy. This considerable delay in the work period is not considered as a factor that has decreased the efficiency of the project. This is because the suspension of the construction work caused by the conflict is regarded as an unforeseeable and unavoidable accident. In short, the suspended 12 months are not regarded as construction period, and thus actual period is 23 months, which is 79

percent of the plan. Extra efforts by the project stakeholders especially after the suspension contributed to shortening the period for 6 months. Therefore, the project period is considered to be within the planned.

As stated above, the project cost was lower than planned. The project period was longer than planned, but this alteration was reasonable because it was the result of an action in response to the conflict, an unforeseeable factor. Therefore, the efficiency of the project is high.

3.5 Sustainability (Rating: [1])

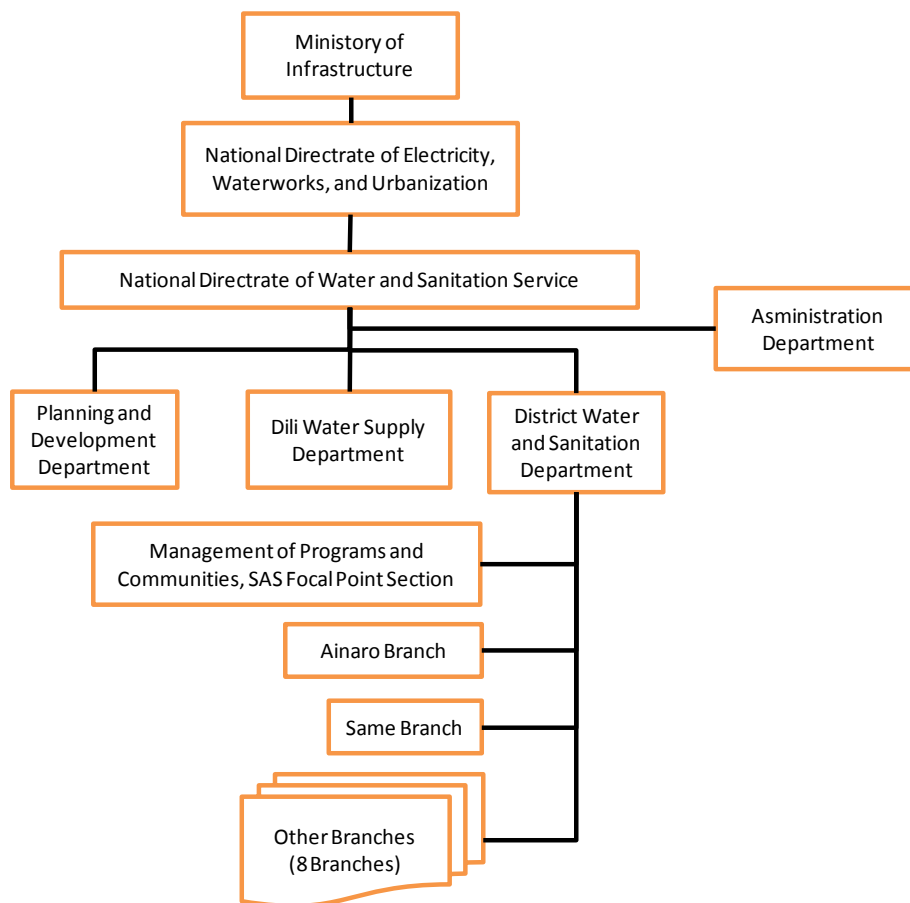


Figure 1 Institutional Chart of DNSAS (At the time of the ex-post evaluation)

3.5.1 Structural Aspects of Operation and Maintenance

(1) The Same and Ainaro branch offices both belong to the District Water Service Operation Management Department, DNSAS. DNSAS is composed by four departments: Planning and Development, Dili Water Supply, District Water and Sanitation, and Administration. The institutional chart is shown in Figure 1. At the time of planning, responsibility demarcation between DNSAS headquarters and the branches were unclear and partially neither was the division of responsibility assignments. JICA's technical cooperation project, which was conducted from 2008 to 2011, prepared the draft demarcation plan, which helped these issues reorganize.

According to the job description, DNSAS has many authorities of budget management of branches, payment of consumables for water treatment and materials to supply water, and salaries of staffs. On the contrary, the branches are responsible for operation and maintenance of water facilities in covered areas, customer services including connection of water supply pipes and any relevant trouble shooting. However, according to the interview with both branches, there are many problems. A budget for operation and maintenance, these consumables, and necessary materials are often delayed in delivering. Also, the engineers in DNSAS never visited at branches to instruct maintenance of water facilities.

(2) The Same branch office, operated with five employees at the time of planning, increased to 11 members, six more than before, when the evaluation was conducted. The materials from JICA suggested that the branch office should have three more employees, a total of eight. In the end, the branch office was staffed with three more workers than in the plan. A more than satisfactory number of employees is allocated.

On the contrary, the Ainaro branch office was operated with six employees at the time of planning. The materials from JICA suggested the branch office have nine more employees, a total of 15. By the time of the evaluation, however, it allowed only six additional employees, staffed with a total of 12 members.

The Same Branch Office was staffed with a sufficient number of employees. On the contrary, the Ainaro branch office is still understaffed to operate the Nugupo Water Purification Plant for 24 hours and to allot for rural water services in neighboring areas¹⁵ that the Ainaro branch covers. However, local branches have only limited human resources, and adjust the distribution of duties between the workers in a flexible manner whenever necessary to carry out the work.

3.5.2 Technical Aspects of the Operation and Maintenance

(1) According to the final report of the “Capacity Development Project for Water Supply System in Dili and four Towns,” produced in 2011, it seems unlikely that the necessary techniques had been properly transferred at the completion of this grant aid project. This conclusion comes mainly from the poor understanding of the workers at the water purification plant about its operation and the lack of opportunities for them to take part in training to enhance their abilities. The facilities granted in the grant aid project were not used as originally planned under its design, as seen in the fact that Same had long supplied unsterilized water. In Ainaro, the Nugupo Water Purification Plant failed to operate its facility in the correct way to wash the sand in its slow filtration system with the appropriate manner, which resulted in a shutdown of the plant. These cases demonstrate that the workers there lacked a proper understanding of the techniques they needed. In particular, about the washing methods, the proper understanding by the staffs in the plant will contribute to improving the current situation that the plant shuts down to wash the sands for one to two weeks every month¹⁶.

¹⁵ The Ainaro branch office plans to allot its engineers to Maubisse, Hato Buliko, and Hato Hudo. But, the branch has not sent them at the time of evaluation.

¹⁶ In December 2011, the External Evaluator interviewed all the staff members of the Nugupo water treatment plant in the Ainaro branch about the sand washing methods in the slow filtering system. Although they had been instructed to clean only the top portion of the sand, i.e., from the surface to the depth of about 3 cm, they said that they scraped and washed all the sand in the filtering system. Therefore, the External Evaluator concluded that the staff members did not understand the washing methods correctly. However, the comments from DNSAS, the implementing agency,

(2) The manuals produced as part of this project were distributed, but also found that they were rarely referred to either in Same or Ainaro. In the interviews, the workers said the manuals were not used mainly because they did not understand English. As a part of the Capacity Development Project for the Water Supply System in Dili and four Towns, simplified manuals were produced in Indonesian for the workers at the plant. However, according to the interview with three workers in the Nugupo water plant, they said that these manuals were rarely referred in their daily works. This is because these workers hardly understand the contents of the manuals. Therefore, it was not observed that the manuals were used in an effective way.

(3) According to the interviews with JICA Timor office and DNSAS, the people who spent their youth under the rule of Indonesia were deprived of opportunities to have normal education amid the conflicts of those days. As a result, DNSAS sometimes faced difficulty in sustaining the trained skills among some of these workers. In addition, for most of the ten years since the country's independence in 2002, both the agency and the society have been in disorder and could not afford to make sufficient capacity development of the youth. It seems that these background factors prevented the agency from improving the operation and maintenance skills of its workers when it had hoped to.

3.5.3 Financial Aspects of Operation and Maintenance

(1) The Table 4 shows the cash income of both Same and Ainaro branch offices. They are fully financed by the DNSAS. Same and Ainaro have had the amount of their maintenance and personnel budgets raised to 336 and 270 percent of the level at the time of planning, respectively. In particular, in January 2012, their maintenance budget was raised from 500 USD per month to 1,000 USD per month. In interviews, members of the branch offices mentioned that they can clean the facilities more than before by mobilizing local residents. On the contrary, the branch offices still have many difficulties in their operation, such as the scarcity of financial resources to pay allowances to the workers when they have to work overtime¹⁷, because they are not allowed to use the maintenance budget to pay for these expenses, which are budgetary issues to be addressed. In addition to the issues of maintenance budgets and salaries, there are still many problems in operation. Some materials are provided instead of paid by cash. The fuels for the motorcycles and generator, spare parts, chemicals for sterilization, and etc are scares in general due to logistic problems of the DNSAS.

state that the staff members understood the washing methods properly. This differs from what the External Evaluator learned in the interviews with the staff members.

¹⁷ Although DNSAS could not allocate the sufficient budget for the consecutive two years from 2010, DNSAS plans reallocating the sufficient budget for maintenance in 2012.

Table 4: Budget of the Same and Ainaro Branch Offices

(USD per year)

Item	Region	At planning	At ex-post evaluation
Maintenance	Same	3,000	12,000
	Ainaro	3,000	12,000
Personnel	Same	5,916	18,000
	Ainaro	7,392	16,008
Total	Same	8,916	30,000
	Ainaro	10,392	28,008
% to plan	Same	336%	
	Ainaro	270%	

Source: Summary of the findings from interviews in the field study by the External Evaluator

The Director of the Administration answered that it would be quite difficult to improve these financial problems. It is likely that they will start collecting water charges in the medium- to long-term. However, these collected fees will go to the national treasury anyways. Even if they start the fee collection, it is unlikely that these fees become own financial resources.

3.5.4 Current Status of Operation and Maintenance

(1) Neither Same nor Ainaro conducts maintenance in an appropriate manner at the time of the evaluation. Neither of the offices has any maintenance plan for their equipment or facilities. Maintenance fully depends on the voluntary activities of the workers in charge. These branch offices neither have records of operations nor of water production. If the information is not properly gathered, it will become a serious hindrance to prepare maintenance plan in the future. To improve such a situation, in principle, the District Water and Sanitation Department in DNSAS should instruct preparing the maintenance and operation plans. Nevertheless, since it was not observed that these instructions were conducted in these branches, the solutions are not provided.

The Ainaro branch office asked the DNSAS, regarding the Nugupo Water Purification Plant observing some troubles with its equipment, to replace broken parts and fix the trouble in monthly reports. However, no repairers have come so far and the trouble has been left unresolved. DNSAS does not provide technical assistance properly clean the sand in its slow filtration bed. In interviews with members of the DNSAS in Dili, they explained that the directorate had difficulty in sending repairers to the plant because it had trouble in identifying the parts needed for the repair and securing the budget to send its employees to the plant.

The Nugupo Water Purification Plant in Ainaro needs electricity to inject chlorine into the water, but the plant has no external power supplied because of a trouble with the electric company as aforementioned. As a result, the plant cannot currently inject chlorine. The DNSAS explained that the power supply to the external source would be resumed soon, and thus the progress should be continuously monitored. Even the original plan was designed on the basis

that during the daytime an in-house power generator would be run to supply electricity since no electrical power is generated during daytime in Ainaro. However, due to little fuel allotted to its power generator, the plant is now unable to operate its chlorine injection equipment.

The Nugupo Water Purification Plant has solidified sand deposits blocking some of its conduits and water distribution pipes, and these have accumulated sufficiently to decrease sizes of spaces inside the pipes¹⁸. This problem was first pointed out in 2011 in an internal study by JICA. The water quality laboratory of the DNSAS confirmed that 200mg per liter of calcium contained in the water of the plant due to the geological feature in Ainaro. This calcium helps to accumulate sand layers. To tackle with this problem, an NGO working in the region helped the plant construct a new intake at another spring-fed pond and laid conduits made of a material that was effective in preventing the sand from accumulating. As the intake is in operation, the problem of calcium layers piling up inside the conduits is likely to be avoided for a while. The intakes and conduits constructed in this project have also been in use. However, they may be necessary to renew the conduits in the future with the further piling-up of sand layers.

In light of the above, major problems are observed in this project in terms of its maintenance scheme and technical aspects, despite some improvement in the financial conditions. Therefore the sustainability of the project effects is low. In order to realize the effectiveness of the project, which was implemented as the recovery assistant projects in newly established country, as planned, and make such effectiveness sustainable, further development is necessary through an appropriate structure for maintenance and operation, and applying proper technologies.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

To provide a stable supply of safe water for the residents, this Project repaired, improved, and renewed water purification facilities and intakes in Same and Ainaro. The relevance of this project is high as it was highly consistent with the development plan of the government of Timor-Leste, the ODA policies of Japan, and the development needs at the time of planning. In the course of its implementation, the project was temporarily suspended due to conflicts that had been difficult to foresee, but it was completed as planned as far as the period of suspension is disregarded. The budget was not exceeded over the budget, either. Therefore, the efficiency is also high. However, after the project was completed, chlorination was discontinued in both areas and at the time of this evaluation. In Ainaro, the Nugupo Water Purification Plant supply treated water only for a limited time of a day, and the river water without treatment is directly supplied as a tap water while the plant does not supply the water. In light of the above, the project has yet to achieve its target of a “stable supply of safe water,” as it was planned. In Same, the 24 hour water supply is operated although the chlorination is not resumed. Also, provided 200 saddles were all installed. On the contrary, in Ainaro, water pipes laid in this project have been connected to only 33 households so far, and the utilization rate of the newly laid pipes remains low. As a result, the impact of this project cannot be clearly observed and its effectiveness is low. The sustainability of the project is low from the facts that, despite signs of some improvement in the financial conditions with the increase in the maintenance budget, the

¹⁸ At the time of planning, any counter actions against dealing with the raw water containing high levels of calcium were neither pointed out, nor considered. If conduits and distribution pipes accumulate the sand layers inside due to a function of calcium, the efficiency of water purification may be decreased.

National Directorate of Water and Sanitation Services, DNSAS, cannot properly procure necessary materials. There are still many challenges to be solved in terms of the organization and maintenance, including the shortage of workers at the Ainaro Branch Office and the lack of a maintenance plan, which are necessary to sustainably show the functions of the facilities provided.

In light of the above, this project is evaluated to be unsatisfactory.

Timor-Leste is a young country, which only past ten years since its independence from Indonesia. In particular after the termination of the Indonesian governance, Timor-Leste has experienced the difficulties in developing the capacities of water works engineers and in acquiring sufficient budget to maintain its water facilities. However, in order to establish the sustainable water works, Department of Public Works prepared Action Plan (2013-2017) which includes rehabilitation of water works, and DNSAS prepared short and medium term action plans. DNSAS recognized the importance to acquire necessary budgets for sustainable supply of safe water, and thus its integrated continuous efforts are highly expected.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Stable supply of safe water is the major policy concern with a given priority. However, the most serious problem is financial shortage that prevented the Nugupo Water Purification Plant, which is the target facility under the project, from supplying safe water for 24 hours. One of the problems causing the shortage of water supply hours is insufficient allotment of staffs in the plant. According to the branch office in Ainaro, the office needs two staffs for every eight hours. It means that the office needs to at least prepare three teams for 24 hour operation. The DNSAS should immediately allot necessary budget for the said sufficient numbers of staffs. Even if the directorate cannot allot the sufficient staffs, the directorate should consider increasing numbers of the staffs to extend operational hours within its capacity.

As a secondary issue, the plant is yet to be connected to the external electrical sources due to outstanding of both connection fee and electricity charge to the local electric company. By allotting sufficient budget, it should establish the operation system not to fully depend on a power source from a generator but to be supplied from an external power resource even only during the night.

(2) In Ainaro, the Nugupo Water Purification Plant is in operation for some period of time between 19 and 29 percent of each month. This is due to poor maintenance caused by a lack of access to external power supply and vague understanding of cleaning methods in the sand filtering system. Practically speaking, the DNSAS should immediately (1) conduct proper technical guidance to the staffs, (2) have the plant connected to the grid again, as well as review its plan for allocating fuel for the power generators, and (3) obtain some means of simple transport, such as bicycle, for its workers within a budget it can secure so that they can have uninterrupted access to the plant.

Although these practical ideas should be seriously considered, the directorate should immediately prepare the operation and maintenance plan. The directorate currently does not have the plan, and this is the most prominent problem. The DNSAS does not have to initially

prepare a very complicated plan, but it would be a very simple one, such as, a check list that instructs a periodical check to the staffs. The simple plan can be started whenever these staffs can do it. It is ideal that the plan can be gradually developed to the integrated one, which shows an appropriate structure of operation and maintenance.

(3) As for the Nugupo Water Purification Plant, even if the plant seeks the ways to solve the problem of its lack of access to external power source and the supply of a sufficient amount of fuel for its power generator to raise its utilization rate, there are no guarantees to obtain the 24 hour power supply. Therefore, the development of a solution for injecting chlorine into the water manually, not by using electricity, should be considered as the second best option. According to the JICA adviser, if the manually controlled chlorine injector, which is currently used in Same, can be installed in the said plant, it is highly feasible that chlorine sterilization is carried out without electricity. This option should be urgently considered.

(4) In Same, sterilization equipment granted as a part of this project are not in use, because of insufficient means of transportation for the workers and poor work supervision. Securing the means of transportation is as important as in Ainaro; bicycles, which are cheaper than motorbikes, should be considered as an alternative. The branch office should also give its workers thorough guidance to enable them to understand how important chlorine sterilization is in the water purification process. The guidance aims at improving the work supervision, which also contribute to reducing the negligence for sterilization by the branch staffs.

4.2.2 Recommendations to JICA

JICA has dispatched the adviser to the DNSAS as two years assignment since May 2012. This advisor has a plenty of the experience as a waterworks engineer. As mentioned in the section of sustainability, the adviser aims at improving skills of the engineers in the executing agency by continuous instruction since there are some engineers who face difficulty in improving their skills just by sporadic training. One of his assigned tasks is to assist improving operation and maintenance of waterworks facilities rehabilitated by Japan's grant aid or already existed in Dili. As mentioned in Recommendations to Executing Agency, it is recommended to establish a monitoring structure to maintain these facilities.

Furthermore, at the Nugupo Water Purification Plant, the workers quite likely lack a correct understanding of the sand cleaning process for its slow filtration bed. Workers there said they spent one or two weeks every month for cleaning the sand to maintain the filter. It is highly possible that transfer of the proper maintenance skills to these workers has failed. According to the manual prepared in this project, the workers should scrub a surface of sands for a few centimeters in the bed every 20 to 40 days. Thus, it should not be a duty to take such a plenty of time. It is desirable that the dispatched adviser should provide a technical advice to the workers in the branch office.

4.3 Lessons Learned

(1) Institutional structure for operation and maintenance

Just as was observed in this project, it is often predictable that the countries with only a short history since independence have a weak capacity to maintain any facilities. In terms of this project, the weakness of the DNSAS with regard to maintenance was pointed out as an issue at

the time of planning. Even though the project incorporated minor technical cooperation components, a grant aid program designed to only provide equipment and facilities is likely to face difficulty in ensuring a maintenance capacity. In a case of this project, with observing a status of provided facilities and equipments even after the completion, it was appropriate that JICA implemented technical cooperation project aiming to develop a whole maintenance capacity, and then dispatched an adviser for detailed cares. For the projects under the situation that the country only has a short history, the donor agency should confirm the path that surely establishes the system to maintain the provided facilities and equipments at the planning as long as possible. Then, it is significant that a donor agency provides an integrated assistance in corroboration with other assistant schemes rather than a grant aid if they are needed.

(2) The consistency between project contents and project objectives

Projects carried out in conflict-affected countries at the stage of reconstruction support have more difficulty in setting appropriate project objectives than those conducted in ordinary developing countries. This is mainly because it is more difficult in collecting data within a limited period of time. However, since these projects have bigger hurdles, they should set practically achievable objectives with a deep understanding of the conditions the countries are facing at the stage of reconstruction support and of the capacity of executing agencies. In terms of this project, for instance, the operating hours of the Nugupo Water Purification Plant at the time of planning were only in daytime, just as it is today, due to a short of staffs. Also, in Same, the branch office does not allot the staffs to inject chlorine during nighttime from the time of planning to the time of this evaluation¹⁹. The implementation of this project, mainly aimed at improving the existing facilities, was not sufficient by itself to achieve the objective of providing an 24 hour water supply service. To achieve the target with consistency, more was needed, such as a sufficient number of workers assigned to the plant. One of the lessons to be learned from this project is that the parties concerned should carefully examine the logic of a project design structure by comparing what effects a project is expected to produce and what targets it is likely to practically achieve. Then, appropriate project objective should be set.

(3) The necessary conditions to produce impacts

In Ainaro, there were not available that the materials needed to connect the households to distribution pipes. The branch office should provide steel pipes for any users when they request new connections, but the DNSAS in Dili cannot deliver the pipes to Ainaro. Also, users cannot procure the pipes due to unavailability even when they need it for extension. As a result, the distribution pipes constructed under this project and provided diversion saddles were not being used by residents in an effective way as originally planned, and these factors caused the circumstance that the final benefits of this project is not delivered. When the granted facilities can work effectively with the expenses paid by the beneficiaries, a careful examination should be conducted to find out whether the project will really be feasible. In particular, if any materials needed for a project is locally unavailable, this risk must be fully taken into consideration in preparing the project plan. If possible, it would be necessary for the

¹⁹ As aforementioned in the section of sustainability, the Same branch satisfies the number of staffs as recommended at the time of planning. However, according to the interview at the time of this evaluation, the nightshift staffs for sterilization were not allotted, and thus the branch office was yet to establish the institutional structure for 24 hour water supply.

stakeholders to assess whether any locally available materials can be substituted with the maximum respect for the standards set by the authorities.