

| | |
|----------------------|--|
| Country Name | Project for Capacity Development of Distribution Network Management of ESSAP |
| Republic of Paraguay | |

I. Project Outline

| | | | | | | | | | | | | | | | |
|--|---|--------------|---|---------------|-----------------|-----------------------------------|--------------------------------|----------------------------------|--|--|---|--|--|--|--|
| Background | <p>The water coverage in the Asuncion Metropolitan area in 1993 remained at a very low level of 63%. Then, a drinking water facility was built in the same year by the Government of Paraguay, and another new facilities for water purification, water conveyance, and water supply were installed in some parts of the city by the ODA loan, the "Asuncion Metropolitan Area Potable Water Project" (1995-2002). As a result, the coverage in the same area improved to 80% in 2005. On the other hand, a non-revenue water (NRW) rate reached 48% in 2008, which revealed that the rate had not been improved as planned. In the Metropolitan area, water pipe bursts which occurred 96 points a day in average caused various problems such as the enormous repair cost, a decrease in operating revenues due to a huge volume of water leakage, and damages on paved roads. The limited progress in dividing water pipe network into blocks with an adequate area for management also constrained not only obtaining the data of water supply volumes and water consumption volumes but also coping with an increase in the number of illegal connections to the distribution pipes associated with a rapid population growth.</p> | | | | | | | | | | | | | | |
| Objectives of the Project | <p>Through desk-top training and on-the-job training (OJT) in model areas, the project aimed at enhancing capacity of the Sanitation Services Company of Paraguay (Empresa de Servicios Sanitarios del Paraguay S. A.: ESSAP) for distribution network management (DNM), thereby contributing to improvement of its water supply service.</p> <p>1. Overall Goal: ESSAP's water supply service is improved. 2. Project Purpose: Distribution network management capacity of ESSAP is enhanced.</p> | | | | | | | | | | | | | | |
| Activities of the project | <p>1. Project site: Paraguay. 2. Main activities: Training of headquarters (HQs) staff on methodologies of DNM, NRW management, and water pressure control, OJT in model areas, training for Regional Branch Office staff on DNM, development of training manuals and technical guides, etc. 3. Inputs (to carry out above activities)</p> <table border="0"> <tr> <td>Japanese Side</td> <td>Paraguayan Side</td> </tr> <tr> <td>1) Experts from Japan: 13 persons</td> <td>1) Staff allocated: 23 persons</td> </tr> <tr> <td>2) Training in Japan: 10 persons</td> <td>2) Land and facilities: Office space, meeting room, space for equipment installation and storage, etc.</td> </tr> <tr> <td>3) Training in the third country: 13 persons</td> <td>3) Local cost for training expenses, etc.</td> </tr> <tr> <td>4) Equipment for NRW management and water pressure control, etc.</td> <td></td> </tr> <tr> <td>5) Local cost for training expenses, monitoring expenses, etc.</td> <td></td> </tr> </table> | | | Japanese Side | Paraguayan Side | 1) Experts from Japan: 13 persons | 1) Staff allocated: 23 persons | 2) Training in Japan: 10 persons | 2) Land and facilities: Office space, meeting room, space for equipment installation and storage, etc. | 3) Training in the third country: 13 persons | 3) Local cost for training expenses, etc. | 4) Equipment for NRW management and water pressure control, etc. | | 5) Local cost for training expenses, monitoring expenses, etc. | |
| Japanese Side | Paraguayan Side | | | | | | | | | | | | | | |
| 1) Experts from Japan: 13 persons | 1) Staff allocated: 23 persons | | | | | | | | | | | | | | |
| 2) Training in Japan: 10 persons | 2) Land and facilities: Office space, meeting room, space for equipment installation and storage, etc. | | | | | | | | | | | | | | |
| 3) Training in the third country: 13 persons | 3) Local cost for training expenses, etc. | | | | | | | | | | | | | | |
| 4) Equipment for NRW management and water pressure control, etc. | | | | | | | | | | | | | | | |
| 5) Local cost for training expenses, monitoring expenses, etc. | | | | | | | | | | | | | | | |
| Project Period | March 2011 to December 2014 (Extended period: March 2014 to December 2014) | Project Cost | (ex-ante) 360 million yen, (actual) 421 million yen | | | | | | | | | | | | |
| Implementing Agency | Sanitation Services Company of Paraguay (Empresa de Servicios Sanitarios del Paraguay S. A.: ESSAP) | | | | | | | | | | | | | | |
| Cooperation Agency in Japan | Ministry of Health, Labour and Welfare, Kurashiki City, Hamamatsu City, Kyowa Engineering Consultants Co., Ltd., Chuo Kaihatsu Corporation | | | | | | | | | | | | | | |

II. Result of the Evaluation

<Points to be considered at the time of the ex-post evaluation>

- Indicator 2 of the Project Purpose was the number of ESSAP staff who completed training during the project period. At the ex-post evaluation, ESSAP's organizational system and capacity for sustaining the project effects were verified as part of sustainability.

1 Relevance

<Consistency with the Development Policy of Paraguay at the time of ex-ante evaluation and project completion>

One of the priority policies set forth in the "Economic and Social Strategic Plan" (2008-2013) was the promotion of infrastructure development. In addition, as in the "Social Development Public Policy (Paraguay para Todos)" (2010-2020), development and maintenance of public service infrastructure and improvement of the access to drinking water were prioritized. Thus, the project objectives were consistent with Paraguay's development policies at the time of both ex-ante evaluation and project completion.

<Consistency with the Development Needs of Paraguay at the time of ex-ante evaluation and project completion>

There was little progress in dividing water pipe network into blocks (management of blocks with adequate size dividing the water distribution areas) constrained measuring the water supply volume and the water consumption volume and coping with the increase in illegal connections associated with a rapid population growth. There were urgent needs for developing a system for managing NRW and technical capacity for DMN. Thus, the project was consistent with development needs of Paraguay.

<Consistency with Japan's ODA Policy at the time of ex-ante evaluation>

One of the priority areas, which was confirmed by the ODA task force in the economic cooperation policy dialogue between Paraguay and Japan in July 2010 was sustainable economic development, and the development objective under this priority was the enhancement of economic and social infrastructure¹.

¹ Ministry of Foreign Affairs (2011) "ODA Databook 2010."

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement for the Project Purpose at the time of Project Completion>

The Project Purpose was achieved. ESSAP staff, learned a series of distribution network management technologies through the trainings delivered by the project and used them in their daily work. They also used the technologies to support other departments in daily operation work (Indicator 1). This was attributed to the learning results of the HQs staff and Regional Branch Office engineers and technicians through OJT in the model areas and basic training (Indicator 2). The water distribution network improvement plan was developed by the project, and it was officially approved at the board meeting as an ESSAP's action plan (Indicator 3). This plan aimed at developing the system for NRW for each large block.

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

The project effects have continued. The DNM technologies strengthened by the project have been continuously utilized in the daily work including measurement of water flows and water pressures in the model areas. Efforts for sustaining technologies have been confirmed, as surveys were conducted to establish new model areas. In addition, the water distribution improvement plan developed by the project has been continued. Based on the plan, ESSAP has conducted surveys and works on NRW management such as water provision by block in the area, monitoring volumes of water usage in the block, and investigation for water leakage reduction.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

It is judged that the Overall Goal has been achieved. Regarding the control of water flow and water pressure in service areas (Indicator 1), flow meters and water pressure meters have been installed at all well outlets in the distribution network of the Asuncion Metropolitan area, and the volumes of water distribution have been monitored in real-time (SCADA system). Within the Gran Asuncion Area, optimization of blocks within the service area has been underway. According to interviews with the Metropolitan Piping Network Department, the volume of water distribution has been stabilized. ESSAP has been planning to give advices to the Regional Branch Offices on measurement techniques of flow meters and improvement of water distribution networks. The number of customers has been on the slight increase (Indicator 2). The number new contracts in the Asuncion Metropolitan area and rural areas from 2017 to 2018 increased by 1.1% and 1.9%, respectively. Regarding the customers' satisfaction (Indicator 3), only three customers were able to be interviewed by the evaluator due to the limited survey period. They were mostly satisfied, but issues of water leakage were pointed out. As supplementary information on improvement of water supply services, although there have been water leakages, the number of claims including water leakage decreased from 2,472 cases in 2014 to 1,865 cases in 2018 in four blocks of the Asuncion Metropolitan area.

<Other Impacts at the time of Ex-post Evaluation>

The recognition for the Non-Revenue Water Section, which had improved their knowledge, has increased within ESSAP, and it has come to receive requests from other departments for providing advices and technical support on measurement of water pressure, identification of valve positions, etc. No impact on the natural environment and gender has been confirmed at the time of ex-post evaluation. In addition, technologies of water distribution network management strengthened by the project and provided equipment were used for formulating the "Water Leakage Reduction Project in New Model Areas (Lambare)" supported by JICA and the Inter-American Development Bank which aimed at making Lambare as the model area.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is high.

Achievement of the Project Purpose and Overall Goal

| Aim | Indicators | Results |
|--|--|--|
| (Project Purpose) Distribution network management capacity of ESSAP is enhanced | 1. DMN technologies transferred under the project are applied in the day-to-day operation. | <u>Status of achievement: Achieved (Continued)</u> (Project Completion) - Learned technologies such as installation of water meters and water pipes, installation and adjustment of pressure reducing valves, measurement of water flow and water pressure and monitoring were utilized in daily work. - These technologies were also utilized upon request from other departments to support daily operation work such as water leakage detection and repair, and water pressure control. (Ex-post Evaluation) - DMN technologies strengthened by the project have been utilized for daily work including measurement of water flow and water pressure in the model areas. |
| | 2. More than 50 engineers and technicians of ESSAP HQs and branch offices complete training of DNM technologies. | <u>Status of achievement: Achieved (Continued)</u> (Project Completion) - 53 HQs staff completed training of water pressure control, facility management NRW management, and water leakage detection. - 130 Regional Branch Office staff completed training of piping works, management of valve facility, installation of water meters, etc. (Ex-post Evaluation) - Verified in the institutional and technical aspects of sustainability. |
| | 3. ESSAP initiates formulation of distribution network improvement plan. | <u>Status of achievement: Achieved (Continued)</u> (Project Completion) - The water distribution network improvement plan was developed and approved after revising principles for water distribution improvement. (Ex-post Evaluation) - ESSAP has conducted surveys and works on NRW management based on the water distribution network improvement plan. |
| (Overall goal) ESSAP's water supply service is improved. | 1. Flow and water pressure in ESSAP service area are properly | <u>Status of achievement: Achieved.</u> (Ex-post Evaluation) - Measurement of water flows and water pressures have been continuously conducted in the |

| controlled. | | <p>model areas.</p> <ul style="list-style-type: none"> - In the distribution network of the Asuncion Metropolitan area, flow meters and water pressure meters have been installed at all well outlets, and the volume of water distribution have been monitored in real-time. Several variations of the operation of wells have been developed. The pressure has been more stable because the wells operate only when the pressure in the network has down. Also, within the Gran Asunción Area, the optimization of blocks within the service area has been underway. - HQs has planned to provide advice for measurement by existing flow meters and optimization of the distribution network in the rural areas. | | | | | | | | | | | | | | | | | | |
|---|---------|---|---------|---------|---------|------|------|------|-----------------------|---------|---------|---------|---------|---------|-------------|--------|--------|--------|--------|--------|
| 2. Number of customers is increased. | | <p><u>Status of achievement: Achieved.</u> (Ex-post Evaluation)</p> <ul style="list-style-type: none"> - The number of customers has slightly increased. <table border="1" data-bbox="596 398 1385 495"> <thead> <tr> <th></th> <th>2014</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> </tr> </thead> <tbody> <tr> <td>Metropolitan Asuncion</td> <td>227,920</td> <td>231,545</td> <td>234,137</td> <td>244,398</td> <td>247,280</td> </tr> <tr> <td>Rural Areas</td> <td>80,637</td> <td>87,243</td> <td>91,320</td> <td>95,143</td> <td>96,965</td> </tr> </tbody> </table> <p>Source: Data from the Statistics Census Directorate.</p> | | 2014 | 2015 | 2016 | 2017 | 2018 | Metropolitan Asuncion | 227,920 | 231,545 | 234,137 | 244,398 | 247,280 | Rural Areas | 80,637 | 87,243 | 91,320 | 95,143 | 96,965 |
| | 2014 | 2015 | 2016 | 2017 | 2018 | | | | | | | | | | | | | | | |
| Metropolitan Asuncion | 227,920 | 231,545 | 234,137 | 244,398 | 247,280 | | | | | | | | | | | | | | | |
| Rural Areas | 80,637 | 87,243 | 91,320 | 95,143 | 96,965 | | | | | | | | | | | | | | | |
| 3. Customer satisfaction level is improved. | | <p><u>Status of achievement: Partially achieved.</u> (Ex-post Evaluation)</p> <ul style="list-style-type: none"> - Out of the interviewed three customers in the Metropolitan Asuncion area, all answered that “services have been improved” or “Services are satisfactory.” Two pointed out problems of water leakage. On the other hand, there were opinions that ESSAP’s water provision services and its image were improved, since it responded to water leakage claims quickly and continuously conducted NRW management. | | | | | | | | | | | | | | | | | | |

Source: Project Completion Report and response to the questionnaire surveys from ESSAP, etc.

3 Efficiency

Both the project period and the project cost exceeded the plan (ratios against the plan: 128% and 117%, respectively). Outputs were produced as planned. Therefore, the project efficiency is fair.

4 Sustainability

<Policy Aspect>

The “Paraguayan National Development Plan 2030” (2014) describes the importance of drinking water, sanitation, and power supply in improving the living environment needed for poverty reduction, social development and sustainable environment. In addition, the “National Water Supply and Sewerage Plan” (2018) of the Ministry of Public Works and Communications aims to contribute to improvement of the quality of life and the national social welfare through improvement of water and sanitation services.

<Institutional Aspect>

In ESSAP HQs, the Non-Revenue Water Section under the Technical Department has been responsible for DNM including NRW management and water pressure control. The number of staff is 25 (13 technicians and 12 office workers). The section has worked for reduction of NRW through continuous efforts for water leakage control and water pipe repair in the model area, which has enabled its response to claim of water leakage and others within 48 hours in the area. Thus, the number of staff is judged to be sufficient. On the other hand, at the Metropolitan Area Piping Network Department, there has not been a sufficient number of staff to deal with water leakage due to old water pipes. In the Regional Branch Offices, the number of staff has been sufficient, as complaints such as water leakage have been responded to in almost four hours. ESSAP have annual targets set by the Directorate General of Public Enterprise which supervises public institutions. For these monitoring, the Non-Revenue Water Section receives data such as the number of water meters installed, billing/collection amount and the number of new connections, from the Gran Asuncion Sales Department and Metropolitan Area Piping Network Department of HQs for urban areas and from Regional Branch Offices for rural areas.

<Technical Aspect>

It is judged that the ESSAP HQs staff have sustained sufficient knowledge and skills, as they have continuously conducted DNM works and even extended works in new model areas based on the project. For construction of pipes and water meters, manuals for piping construction have been distributed to each technician of the Gran Asuncion Sales Department, Regional Sales Department and Metropolitan Area Piping Network Department. After construction, the technicians share their works with the Regional Branch Offices through the social network service (SNS) with photos. On the other hand, according to the Director of Encarnacion Branch, more staff have relied on rules of thumb than manuals in detecting leaks and installing pipes. Of the 53 staff trained by the project, 33 have remained as of the time of ex-post evaluation, being engaged in work related to measures for NRW and maintenance of water distribution facilities. As well, the Regional Branch Office staff have received manuals and share how they worked through SNS with photos, but no technical training has been conducted for new staff. They receive technical guidance through OJTs from HQs as needed. When dealing with a deficiency in the water pressure in the building, a water pressure gauge may be used, or the work may be carried out based on empirical rules such as checking the water pressure with fingers. In the Gran Asuncion Sales Department, part of the manuals developed by the project has been reflected in the bidding technical document of the bidding for commissioned works such as disconnection/reconnection, new connection, expansion, replacement of water meter.

<Financial Aspect>

The Main budget source of ESSAP has been collected water service charges. Others are financed by international organizations. Both revenue and expenditure have increased since 2015, but according to ESSAP, budgets have not been sufficient to invest in renewing aging pipes, updating water supply facilities and dividing distribution networks into blocks. Water charges have been set by the Regulatory Authority of Sanitation Business Administration.

Budgets of ESSAP

| | 2015 | 2016 | 2017 | 2018 | 2019 (until March) |
|-------------|---------|---------|---------|---------|--------------------|
| Revenue | 368,390 | 408,533 | 420,697 | 458,942 | 240,989 |
| Expenditure | 391,825 | 402,550 | 433,033 | 476,543 | 156,072 |

Source: ESSAP.

Fees are collected based on the water consumption volume by customers who have the water meter installed, and fees are calculated and charged based on the past average water consumption volume of the customers whose water meter is not updated. The fee collection rate

in 2018 was 58.2%. In September 2018, the water charge was raised by 9%, and the ESSAP revenue is expected to increase.

<Evaluation Result>

In the light above, there have been some problems in the institutional, technical and financial aspects. Therefore, the sustainability of the effects is fair.

5 Summary of the Evaluation

The Project Purpose was achieved, and the project effects have continued. Through OJT in the model areas and basic research activities, ESSAP HQs staff have got technologies and utilized them in their work on NRW management and water pressure control. As a result, the water volumes and pressures have been appropriately managed through continuous measurement of the water flows and water pressures and real-time monitoring of distribution volumes. Also, the surveys to improve services outside the model areas have been planned. Regarding sustainability, it is necessary to increase the number of staff at some sections of HQs, to improve the technical level of the Regional Branch Offices, and to increase investment to further expand operations. Both the project period and cost exceeded the plan.

Considering all of the above points, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing agency:

- While the technical capacity of the Non-Revenue Water Division has been developed, it is still necessary to upgrade knowledge and skills of other departments and the Regional Branch Offices. It is recommended to ESSAP to conduct 1-2-day technical training so that work and repairs would be carried out in accordance with not the rule of thumb but the manual. It is also recommended to continue OJT by more experience staff upon request on the work site in order so that knowledge would be accumulated.
- It is desirable to organize an inter-sectional technical committee for sharing their progress and problem solving with initiative of the Non-Revenue Water Division for further improving skills and handling complaints by establishing a collaborative system across sections among HQs and Regional Branch Offices.
- For strengthening NRW management, it is necessary to measure the volumes of water supply and distribution. In order to promote utilization of the SCADA system developed by ESSAP, it is recommended to promote further establishment of blocks for water supply services and to obtain information of distribution pipes and customers by each block, as well as to prioritize blocks for taking countermeasures against NRW and to implement them sequentially.



Training on accuracy verification of water meters



Analysis of changes in inflow water in the model area