

Summary of Terminal Evaluation

1. Outline of the Project	
Country: Jamaica	Project Title : Capacity Building of Water Maintenance in Jamaica
Sector : Water Resource	Cooperation Scheme : Technical Cooperation Project
Division in Charge : Environmental Management Division 2, Environmental Management Group, Global Environmental Department	Total Cost (at the time of evaluation) : 340 million yen
Period of Cooperation (R/D): March 2007 to November 2010	Partner Country's Implementation Agency : National Water Commission (NWC)
	Supporting Organization in Japan : NJS Consultants Co., Ltd

1-1 Background of the Project

The Government of Jamaica has formulated a range of policies, strategies and action plans for the overall water and water supply sector including “Water Sector Policy (2004)” and “Strategies and Action Plan (2004)” in an attempt for:

- 1) All Citizens to have potable water by 2015
- 2) All major towns to have adequate sewerage services by 2020

The objectives to be achieved will relate to improvements in supply coverage, system reliability, water quality, operational efficiency, customer service, capital project implementation environmental compliance and financial performance.

The National Water Commission (hereinafter referred to as “NWC”) has been operating its water supply systems in accordance with these policies, however, the technical levels of its staff remain insufficient and capacity building of its staff is recognized as one of the most important issues to overcome.

As a result, NWC requested assistance from the Government of Japan to strengthen the capacity of water maintenance through technology transfer. In responding to this request, the Japan International Cooperation Agency (hereinafter referred to as “JICA”) dispatched a pre-evaluation mission in October 2006. It was agreed to execute the technical cooperation project “Capacity Building of Water Maintenance (hereinafter referred to as “the Project”)” between JICA and the relevant authorities of the Government of Jamaica in March 2007.

The Project is divided into two stages. Stage 1 (preparation period) carried out from March 2007 to September 2007 in order to identify the detailed plan of the project framework, activities and target areas. After stage 1, the framework was agreed by Jamaican and Japanese side. Stage 2 (implementation period), which started in January 2008, is to implement technical transfer based on the agreed framework. It was planned to be implemented for three years to improve and strengthen the capacity of staff for Operation and Maintenance (hereinafter referred to as “O&M”) of Water Treatment Plants (hereinafter referred to as “WTPs”), Water Quality Management and Water Supply Management.

Prior to the end of the Project in November 2010, a terminal evaluation was conducted to examine the

degree of achievement on a comprehensive level in the Project. The specific objectives of the terminal evaluation are summarized in the next section.

1-2 Project Overview

The Project aims at enhancing the capacity of the NWC to provide quality and quantity of water supply through an improvement of efficiency of O&M of WTPs, water quality management and water supply management.

(1) Overall Goal

Reliability of NWC's water supply is enhanced both in terms of quality and quantity.

(2) Project Purpose

The capacity of the NWC to provide quality and quantity of water supply is enhanced through piloting at four water treatment plants.

(3) Outputs

0) The project framework, pilot areas and activities are specifically identified.

1) Efficiency of O&M is strengthened.

2) Water quality management is strengthened.

3) Efficiency of water supply is enhanced through applications of water supply management planning.

(4) Inputs (at the time of evaluation)

Japanese Side:

Cost: 340 million yen in total

Experts: Nine(9) Experts in total

Provision of Equipment: 35 million Japanese Yen

Training of Panamanian Counterpart Personnel: Sixteen (16) counterpart personnels in total

Local Cost: 8.9 million yen in total

Jamaican Side:

Counterpart Personnel: Twenty-seven (27) counterpart personnels in total

Land, office space and necessary facilities for the Project's head office

Local Cost: 5.1 million Jamaican dollar

2. Evaluation Team

Member of Evaluation Team	Leader: Keiko YAMAMOTO (Senior Consultant, JICA) Cooperation Planning: Yoshikazu TANIGUCHI (Environmental Management Division 2, Environmental Management Group, Global Environment Department, JICA) Evaluation Analysis: Izumi SAKAYA (Senior Consultant, Global Group 21 Japan Ltd.)	
Period of Evaluation	14/6/2010-1/7/2010	Type of Evaluation : Terminal Evaluation

3. Result of Evaluation

3-1 Achievement

(Achievement of the Project Purpose)

As seen below, the Indicators 1, 3, 4 and 5 have been achieved to a large extent while only Indicator 2 has not been achieved at the satisfactory level. Assessing the indicators overall, the Evaluation Team judged that the Project Purpose would be mostly achieved at the time of completion of the Project in November 2010.

(Indicator 1)

By extending filtration time and minimizing water loss by filter washing, for the Great River and the Logwood pilot WTPs, water loss was reduced by 35% and 39% respectively after December 2009, compared with the data in 2007. The indicator has been achieved.

(Indicator 2)

As for turbidity, the target was achieved in 2009 at the Hope and the Spanish Town WTPs with frequency of 93.1% and 99.2% respectively, while at the Great River and the Logwood WTPs the frequencies were 54.0% and 73.1% respectively. This was mainly due to deterioration in the performances of filtration at the Great River and the Logwood.

As for residual chlorine, the target was not achieved in 2009 at all 4 pilot WTPs. The frequencies were 68.3% at the Hope, 97.9% at the Spanish Town, 80.1% at the Great River and 63.4% at the Logwood. Thus, the degree of achievement of the indicator is limited. In this regard, additional training for water treatment plant operators is required and an improvement in the equipment/instrument at these facilities should be addressed.

(Indicator 3)

Electricity consumption per water production (KWh/m³) decreased at the Hope and the Logwood WTPs by 6.4% and 0.5% respectively. As energy efficiency improves, it is interpreted that the indicator 3 has been achieved.

(Indicator 4)

Since October 2008, the JICA Expert Team has prepared training courses in the areas of O&M, water quality and water supply management in conjunction with NWC C/P. Training materials were prepared by JICA Experts and C/P. So far of a total 17 training courses (8 for O&M, 7 for water quality and 2 for water supply management) around 400 trainees attended. Although specific target was not set in advance, the number of courses and attendants seem to be sufficient for the output of the activities.

(Indicator 5)

For 8 training courses, 19 master trainers have been registered so far (The detailed list of master trainers is shown in Annex 9.). Although the specific target was not set previously, the number of registered master trainers seems to be large enough to conduct training courses.

(Achievement of the Outputs)

(1) Judging from the results as below on indicators 1.1 to 1.3, which shows improvement, Output 1 will be achieved at the satisfactory level at the end of the Project.

(Indicator 1.1)

At all 4 pilot WTPs operation manuals for "chemical dosing" and "filter washing" were prepared, while training for operators for "treatment process", "chemical dosing" and "water quality" was carried out as seen in the Tables below. Whether actual operation is conducted in accordance with manuals are not fully certain, according to the observation by the Evaluation Team. Further strengthening of appropriate operation is expected.

(Indicator 1.2)

Actually, there have been no full "plant down time" at 4 pilot WTPs therefore the targets were not set. However, the records of 'service orders' which are the reporting format for the outsourcing of maintenance services, there were significant decrease in both Eastern and Western Division in 2009, compared with 2007, in terms of the number of services, indicating improvement of preventive maintenance in general.

(Indicator 1.3)

Daily inspections by plant operators are scheduled to be introduced shortly, for which 30 operators were trained. Regular maintenance is being conducted by maintenance sections in both Eastern and Western Division. The templates for maintenance are being examined by the NWC maintenance section for finalization.

(2) Judging from the results as below on indicators 2.1 to 2.3, to a large extent, has been fairly achieved.

(Indicator 2.1)

At four pilot plants, jar test and chlorine demand tests were conducted. Based on the results, a correlation between raw water turbidity and alum dose was determined. The Chemical Dosing Manual was developed and training for chemical dosing was conducted utilizing the manual in 2008 at the four pilot plants; 27 staff members were trained.

As a result, application of optimum chemical dosage has been improved though there is still room for further improvement.

(Indicator 2.2)

The results of the chemical and microbiological tests carried out by the laboratories were recorded both in the "LabMIS" Database System and in existing spreadsheets. Water quality data from the pilot plants was recorded both in the log sheets and in the GIS System (Spanish Town, Great River and Logwood WTPs). Training for Water quality testing and management was conducted, and 21 laboratory staff members, 28 operators were trained. Throughout the training, the importance of recording data and record keeping were highlighted.

(Indicator 2.3)

The following materials were prepared for the training:

- a. Water Quality Testing Procedures for Mobile Operators
- b. Chlorination Training (for both operators and mobile operators)
- c. Treatment plant operation (for both operators and mobile operators)
- d. Sampling Procedures (for both operators and mobile operators)
- e. Water Quality Testing Procedures for WTP operators.

13 operators at the other water treatment plants and 40 mobile operators have been trained in both the Eastern and Western Division to date. More training for operators at the other water treatment plants is scheduled for the rest of the Project period and will be conducted by the NWC Training Department.

(3) Judging from the results as below on indicators 3.1 to 3.2, Output 3 has been highly achieved.

(Indicator 3.1)

With the designed water supply management plan, efficiency of water supply was improved as follows:

1) Water Supply Management Plan for the Hope System

A) The number of pumps in use at the Hope High Level pumps was reduced from 4 to 3, saving about 16% of pump running time.

B) Operating time of the Beverly Hills pump was reduced from approximately 10 hours to 8 hours per day/all pumps, saving 20% of its daily energy use.

2) Water Supply Management Plan for the Logwood System

Operating time of the Logwood pumps was reduced from 66 hours to 60 hours per day/all pumps, saving 9% of the daily energy use.

(Indicator 3.2)

Additionally, water supply management plans for the Hellshire system and the Minard system were completed in March 2010. Hydraulic models and water supply management plans were developed for the both systems. The taskforce team found some deficiencies in the systems and sought to formulate a more effective pump operation schedule. After the analysis of models and field tests, suggestions were made for energy reduction in a couple of pumps and cut down on overflows at the tanks. The above activities were as a result of the initiative of NWC staff.

3-2 Summary of Evaluation Results

(1) Relevance

The Project is consistent with the policies of the Jamaican Government as well as needs of the beneficiaries, and with the cooperation policy of the Japanese Government; hence it is clear that the relevance of the Project is high.

1) Jamaican Policy

Under the Vision 2030 Jamaica National Development Plan (NDP), transportation, telecommunications, water supply and sanitation are critical elements on the NDP strong economic infrastructure. Specifically, the Project addresses capacity strengthening of NWC staff which complements the NWC's major capital investments in its infrastructure.

2) Needs of the beneficiaries.

The Project is completely relevant to the needs of the NWC, which supplies 90% of potable water in Jamaica, as the NWC needs to enhance capacity of its staff that are responsible for operation and maintenance of facilities, water quality management and water supply management planning.

3) Japanese Policy

Japan's basic ODA policy for Jamaica sets 4 priority areas; 1) job creation and human resources development, 2) health and sanitation, 3) environment protection and disaster prevention, and 4) agriculture and fisheries, tourism, etc. The Project is relevant to 1), 2) and 3).

4) Japan's Advantage

Japan has high level of skills and technologies in the water sector and JICA has abundant experiences in assistance with other countries in the field.

(2) Effectiveness

The effectiveness of the Project is high. The project purpose will be mostly achieved at the time of completion as seen in 3-4, and it is confirmed that the Outputs of the Project have contributed to the achievement of the Project Purpose as seen in 3-3. All the external assumptions stated in PDM2 to achieve the Project Purpose have been maintained during the Project period.

All the following factors have promoted the achievement of the Project Purpose;

- Relation between Japanese Experts and Jamaican C/P was quite good and which facilitated the smooth implementation of the project activities.
- C/P Training in Japan was effective. After they returned, the trainees' skills/knowledge were applied to the Project activities and also transferred to other NWC staff contributing much to the Project.
- Registered "master trainers", the NWC's in-house trainers, are one of the most important benefits of the Project. They have played and will play a vital role in the transfer of skills/knowledge from Japanese Experts to Jamaican staff and will result in identification of more NWC staff being developed into master trainers.
- Various training activities under the Project have been effective reflecting practical needs of the NWC staff.

On the other hand, some negative factors to hinder smooth implementation of the Projects were as follows:

- As the NWC does not have a section or department which is solely responsible to formulate water supply management plan, it was difficult to smoothly introduce activities on WSM under the Project, though institutional arrangement is currently underway.
- Some of facilities at the pilot water treatment plants are old and inadequate, which has impeded maximization of the Project effects.

(3) Efficiency

The Project is sufficiently efficient. Assessment of efficiency is as stated below.

1) Appropriateness of Input

The Japanese Experts have fully dedicated themselves to the Project transferring skills/knowledge with which most of C/P is satisfied. While all Experts provided the services on the "shuttle-type" visit basis, where they did not reside but visited Jamaica periodically as scheduled, they had close contact through e-mail, etc. even when they were away.

Machinery and equipment provided for the Project, have been appropriately selected, installed, operated and utilized. Although some cases of delay in installation and technical troubles of the machinery and equipment were observed, they did not affect the Project to a large extent.

Up to the time of the Terminal Evaluation, 12 Jamaican staff members participated in C/P training courses in Japan, as mentioned in 3-1. The training was carried out as scheduled and almost all of the participants show satisfaction with the training. The participants have been transferring their experience that they acquired from the training in Japan, not only technical

skills/knowledge but also mindset such as attitude to work/work ethics, to other NWC staff after their return.

The allocation of C/P has been generally appropriate as their capability is good enough to conduct activities. However, it appears that at the initial stage of the Project there was some difficulty in adjustment of work load of C/P between their routine jobs and Project activities.

2) Achievement of Output

Most of outputs have been achieved through the Project. The degree of achievement of the outputs is high enough in proportion to the Project inputs.

(4) Impact

Apart from the likeliness of achieving Overall Goal mentioned in 3-5, the following positive impacts of the Project are observed. Unexpected negative impacts were hardly observed during the evaluation.

- Communication and relations between Eastern and Western Division of the NWC have become better and frequent through the Project activities, accelerating sharing information and standardization of work formats.
- The findings of the Project were one of the reasons for the establishment of an Energy Steering Committee in the NWC. The Project revealed reduction in electricity consumption and savings in water losses at some of the Pilot Water Treatment Plants. The work methodology/approach and findings of the Water Supply Management component of the project is being used to advise and inform the Committee on how to achieve electricity reduction and reduction in water losses.

(5) Sustainability

The sustainability of the Project is not totally secured because there are a number of factors which may cause hindrance to continuity of the Project. The institutional support and financial resources will be necessary to assure the sustainability. The following is assessment of sustainability by several aspects

1) Policy Aspect

Because improvement in water supply remains high priority in Jamaica under the Vision 2030, it is unlikely there will be major changes in principal policy directions of the water sector.

2) Technical Aspect

Technically, C/P can more or less continue the Project activities including training on operation and maintenance of WTPs, water quality management and water supply management planning by themselves after the termination of the Project since most of C/P have become capable through the Project and are confident about own capability. Technical transfer has been appropriately conducted and training system of the NWC has been improved by the Project. With more than 40 Master Trainers, internal training system is geared for sustainable human resource development of the NWC.

As for physical facilities, with a few exceptions, equipment and machinery provided by the

Project are being actively utilized and well maintained. However, it will depend on budget allocation whether the maintenance of the equipment will be properly made in the future as well.

3) Institutional Aspect

In responding to the recommendation of the Mid-term Review of the Project, the NWC has recognized the need for a Centralized Unit/Department for a Water Supply Management from which a 'structured' WSM Plan can be developed for the NWC. To this end, the NWC has commenced the strengthening of the Divisional Units by:

- Changing of the names of the two Divisional NRW Managers to Water Supply Manager.
- Commencing the process of employment of a Water Distribution Engineer with specific expertise and responsibility in Hydraulic Modeling and Analysis. This person will be employed to the WSM Department and will report to the Department's manager.
- Procurement of water GEMS hydraulic Model software for two Divisional Water Supply Management Units.
- Planning to have an organic link/synergy between the Engineering Department and the eight Operational Areas via the two Divisional Water Supply Management Units.

The institutional arrangement is critical to the sustainability and function of the WSM unit, the NWC has conducted interviews for the personnel and an appointment will be made prior to the completion of the project in November 2010.

4) Financial Aspect

Financial aspect may be the most crucial factor to determine overall sustainability of the Project activities. For the past several years the NWC has been making operational loss. Even after an increase of the water charge in 2008, the operational revenue has not exceeded operational expenditure. In this sense the financial condition of the NWC is not fully secure in the future, although the NWC demonstrates strong commitment to the Project activities after the termination. A number of major Development Projects, financed by international and/or private financial institutions, would have some positive effects on continuity of the Project activities by improving some facilities.

3-3 Conclusion

The Team came to the following conclusion through the field survey of the Project, discussion among the members of the Team and exchange of views and opinions with concerned parties.

3-3-1 Achievement of the Project

It is expected that the Project Purpose will be achieved at the project completion as most of the performance indicators already shown positive results. The Project Outputs are also likely to be fulfilled as planned with satisfactory performance. Meanwhile, the Evaluation Team found that some more efforts are required to improve water quality at pilot plants, which was one of the indicators to measure the achievement of the Project Purpose.

3-3-2 Evaluation by Five Criteria

From the viewpoint of five evaluation criteria, the Project has achieved fairly high "relevance",

“effectiveness” and “efficiency”.

As for “impact”, it is not clear that Overall Goal would be achieved after a few years of the termination of the Project, meanwhile a number of positive impacts were observed.

It is observed that whereas policy sustainability is secured and technical aspect and institutional aspect of the sustainability are to a fair extent secured, financial sustainability is not fully guaranteed at the moment considering the NWC’s financial position. In total, the “sustainability” of the Project is not sufficiently high.

3-4 Recommendations

3-4-1 Issue to be undertaken before the completion of the project

The project has attained a lot of good achievements on the activities and produced tangible results as mentioned in the preceding chapters. However, there are still a few things to be completed by the end of November 2010 when the Project is scheduled to be concluded. These are the followings:

- (1) Achievement of water quality targets
 - 1) Over 80% of treated water samples taken at 2 pilot treatment plants, Great River and Logwood, which are tested by NWC Lab will achieve the concentration of below one NTU as turbidity a year by improving some facilities function.
 - 2) 100% of treated water samples taken at 4 pilot treatment plants which are tested by NWC Lab will achieve the concentration of more than 1.5 mg per liter as residual chlorine a year by strengthening operator’s capacity through the training.
- (2) Continuous training for ensuring the staff capacities developed by the Project
 - 1) On the job training on control of the ion-chromatograph for Lab staff members
 - 2) On the job training on the chemical dosing and treatment process for operators
- (3) Appropriate maintenance for equipment provided by the Project and method of spare- parts procurement. Especially regarding ion-chromatograph, it is required to build up the relationship between NWC Lab and the institutes or universities using ion-chromatograph for exchanging the technology and information.
- (4) Immediate set up of Water Supply Management Unit for dissemination of the proper water supply management nationwide.
- (5) Establishment of monitoring method for sustaining and disseminating the project results such as reduction of water loss, production of desirable water, reduction of energy consumption and etc.

3-4-2 Issues to be undertaken after the completion of the Project

For further development of NWC’s capacity, the following things should be conducted by NWC making best use of the knowledge and technique gained through the Project.

- (1) Formulation of the medium-long term management plan and ensuring the budget for;
 - 1) Dissemination of effects of the Project to all over the country
 - 2) Support to and acceleration of the above by introducing incentive system or mechanism to staff members of the NWC.

- (2) To ensure the sustainability and institutionalization of the project activities in the NWC, the training of staff will require a “structured program” for continuous training and monitoring.

3-5 Lessons Learned

- (1) Technical improvement by this project contributed to improve a business efficiency of NWC. It motivated NWC to produce a better output in the project.
- (2) It is required to dispatch experts not only from consulting firms but also local authorities, other private companies, etc for satisfying NWC’s needs.