# The Summary of Terminal Evaluation

<table>
<tr><td colspan="3">1. Outline of the Project</td></tr>
<tr><td colspan="2">Country: the Social Democratic Republic of Sri Lanka</td><td>Project Title：The Capacity Development Project for Non Revenue Water (NRW) Reduction in Colombo City</td></tr>
<tr><td colspan="2">Issue/Sector：Water Supply</td><td>Cooperation Scheme：Technical Cooperation Project</td></tr>
<tr><td colspan="2">Division in charge：Global Environment Dept.<br>Water Resources Management Division I</td><td>Total Cost：About 310 million Yen</td></tr>
<tr><td rowspan="3">Period of Cooperation</td><td rowspan="3">R/D：April 2009<br>October 2009 to October 2012</td><td>Partner Country’s Implementation Organization:<br>National Water Supply and Drainage Board (NWSDB)</td></tr>
<tr><td>Supporting Organization in Japan : Nihon Suido Consultants Co., Ltd.</td></tr>
<tr><td>Related Cooperation：Ministry of Health, Labour and Welfare</td></tr>
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**Background of the Project**

For the National Water Supply and Drainage Board (NWSDB), which is responsible for water supply and sanitation in the most part of the Democratic Socialist Republic of Sri Lanka, high ratio of Non Revenue Water (NRW) has been a longstanding problem in its operation and management. Especially in Colombo City, where deteriorated pipes still remained in many parts of its distribution system, the NRW rate in 2008 was 54.1%, higher than its nationwide average of 33.0%. To tackle this problem, NWSDB has been working to reduce the rate of NRW in several ways such as leak repair, detection/elimination of illegal connections, removal of public stand posts and converting its users to individual connection, and billing system improvement. However, these measures had not produced satisfactory outcomes. To improve this situation, NWSDB stressed the importance of NRW reduction as one of the most prioritized tasks to be tackled and set a target to reduce NRW in its “Corporate Plan 2007 – 2011.” In order to achieve the target, it was necessary for NWSDB to gainfully utilize external support to improve its capacities of practical implementation in NRW reduction measures. To address these issues, the Government of Sri Lanka (GOSL) requested the Government of Japan (GOJ) for assistance to NWSDB through conducting a technical cooperation project regarding NRW reduction. Based on the above official request by GOSL and information collected through the fact-finding survey, JICA and the officials of Sri Lanka concerned agreed to conduct “the Capacity Development Project for Non Revenue Water Reduction in Colombo City” (hereinafter referred to as “the Project”).

1-1 Project Overview

In Colombo city, technical transfer is conducted through pilot projects to NWSDB’s staff in order to improve the capacity for NRW reduction countermeasures.

(1) Overall Goal

The NRW ratio in Colombo City is reduced.

(2) Project Purpose

NWSDB's capacity to implement NRW reduction activities in Colombo City is strengthened.

(3) Outputs

1) Management capacity of senior officers of the Regional Center (Western-Central) to plan and supervise NRW reduction activities is enhanced.
2) Technical and operational capacity to conduct NRW reduction activities by officers/staff of the Regional Center (Western-Central) is developed.

(4) Input（as of terminal evaluation）

Japanese side：

| | |
|---|---|
| Dispatch of short term experts： | 6 experts：48.62MM（as of January 2012） Position：Chief Advisor/ NRW reduction programming, Deputy Chief Advisor/ NRW reduction monitoring and evaluation, Leak detection Advisor, Arrangement of pipeline drawing and customer data, Service pipe connection advisor, Coordinator |
| Dispatch of overseas training： | Training in Japan: 10 participants, Third Country Training: 6 participants in Jordan, 6 participants in Indonesia (Total Amount 234 day/person) |
| Procurement of Equipment： | JPY37.98 million（About 55.44 million SKL） |
| Local Cost： | First Year：JPY 8.32million<br>Second Year：JPY 10.4 million |

Sri Lankan side：

Counterpart allocation: Assistant General Managers and technicians of maintenance division and NRW countermeasures division are engaged as counterparts

Local Cost：

- 22.54 million SLK was disbursed from counterpart funds from the Ministry of Finance and Planning in 2010 and 2011. 20 million SLK is supposed to be approved in 2012.
- The following expenses have been borne by NWSDB.
  a. Salaries, remuneration and other allowance for the counterpart personnel when necessary. (Overtime or nighttime works during the course of the project activities)
  b. Expenses for isolation work of pilot areas, repairing of pipe networks after the detection of leakage and civil work for road opening/reinstatement.
  c. Expenses such as electricity, water supply, telephone, and gas

fuel for the Project offices.

d. Expenses for custom, tax, custom procedure, storage and domestic transport necessary for import and procurement of equipment procured and accompanied by JICA
e. Expenses for maintenance of equipment provided by JICA
f. Other contingency expenses related to the Project

Others：
- Office space and facilities necessary for JICA experts at NWSDB
- Venues and necessary facilities for the Project's activities

2. Evaluation Team

Members of Evaluation Team

＜Japanese side＞

| Job title | Name | Position |
|---|---|---|
| Leader/NRW Reduction | Mr. Yoshiki Omura | Senior Advisor (Water Supply Development), JICA |
| Task Manager | Mr. Ryosuke Isobe | Water Resources Management Division I, Water Resources and Disaster Management Group, Global Environment Dept., JICA |
| Cooperation Management | Ms. Tomoko Kashihara | JICA Sri Lanka Office |
| Evaluation Analysis | Ms. Ayako Namura | Consultant, Tekizaitekisho LLC |

＜Sri Lankan side＞

| Job title | Name | Position |
|---|---|---|
| Leader | Mr. K. L. L Premanath | General Manager, NWSDB |
| Member | Mr. S. K. Wijetunga | Additional General Manager (Western), NWSDB |
| Member | Mr. W.B.G. Fernando | Deputy General Manager (Western Central), NWSDB |
| Member | Mr K.W. Premasiri | Assistant General Manager (Development-Western Central), NWSDB |
| Member | Mr. S.G.G. Rajkumar | Assistant General Manager (NRW-Western Central), NWSDB |
| Member | Mr. S.A. Rasheed | Assistant General Manager (O&M-Western Central), NWSDB |

| Period of Evaluation | 25 Jan 2012- 17 Feb 2012 | Type of Evaluation: Terminal Evaluation |
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3. Results of Evaluation

3-1. Confirmation of Achievement

(1) Output 1: Management capacity of senior officers of the Regional Center (Western-Central) to plan and supervise NRW reduction activities is enhanced.

Enhancement of management capacity of senior officers of the Regional Center (Western-Central) to plan and supervise NRW reduction activities was almost achieved.

The NRW Reduction Management Team formulated the fist-year's annual program in May 2010 in cooperation with JICA experts. This Team prepared the second-year's annual program in June 2011 by its own ability. Reviewing the second year's results of the NRW reduction activities, the third annual program will be prepared around May 2012. Based on the result of Mid-term Review which was implemented in February 2011, NWSDB made efforts to allocate resources to project activities. Then in the latter half of the Project period, activities of pilot areas were implemented relatively smoothly. The NRW Reduction Management Team reorganized the six teams into four teams (two teams for each pilot area) and assigned one team for respective pilot areas to concentrate on the project activities in the middle of 2011. Since then, the pilot activities have progressed more smoothly. NWSDB earmarked approximately 200 million LKR for the three-year project activities in 2010 and requested this as a counterpart fund to the Ministry of Finance and Planning. Then the budget was smoothly disbursed for tax payment of the provided equipment from Ministry in 2010 and 2011. Other expenses necessary for the pilot activities including the personnel costs and materials for service pipe replacement and leak repair have been borne by the regular budget of NWSDB. Moreover the themes or topic to be included in the training program (including seminars/workshops) were clearly identified in the first half of the Project and training for the NRW Reduction Team have been implemented.

(2) Output 2: Technical and operational capacity to conduct NRW reduction activities by officers/staff of Regional Center (Western-Central) is developed.

Enhancement of technical and operational capacity to conduct NRW reduction activities by officers/staff of Regional Center was almost achieved.

NRW Reduction Teams functioned well since they started to be engaged in the pilot activities after 6 teams were reorganized to 4 teams in the middle of 2011. The NRW Reduction Teams prepared the work plan of pilot activities with NRW Reduction Management Team and JICA experts, and they revised the plans several times in accordance with the progress of activities. Until now, the delay of implementation has occurred because the hydraulic isolation work of sub-zones in pilot areas has taken longer time than expected. The situation, such as lack of accurate information on pipeline drawings, unexpected interconnection of pipes, low system pressure and difficulties in valve locating, has caused the counterparts and JICA experts hardship of isolation work in sub-zones. As of terminal evaluation, the hydraulic isolation works were mostly completed in Kotahena and Borella, and the Project will start NRW reduction activities based on the work plan. It is expected that the specific data in all pilot areas will be gained by June 2012.

The members of NWSDB could repair leakage and connect service pipes before. However they had not implemented the method of setting up of NRW reduction activities, making flow chart and proceeding activities checking one by one. Counterparts have learned this systematic method introduced by the Project in seminars, workshops and OJT. Then capacity for executing NRW reduction activities is improved. Also GIS and PR activities which were introduced formally after Mid-term Review are proceeding well.

According to the NRW Reduction Management Team and JICA experts, the remarkable effects of NRW

reduction activities can be observed in Borella where the pipes are relatively in good condition. For example, though NRW ratio in subzone B3 was 84.3% before the activities, it decreased to 28.6% after secondary activities. The data acquired from pilot activities in Kotahena, where pipes are very deteriorated, explains that NRW reduction activities certainly brought some effects but the measures combined with the pipe replacement and other activities would be more effective to reduce NRW ratio. The Project is currently gaining the results of pilot activities, analyzing the conditions that a series of the systematic NRW reduction activities can bring effects toward reducing the NRW.

(3) Achievement of the Project Purpose: NWSDB's capacity to implement NRW reduction activities in Colombo City is strengthened.

NWSDB's capacity to implement NRW reduction activities in Colombo City was strengthened and Project Purpose is likely to be achieved.

The rotation system, which the Project originally planned to implement, has not functioned well even after the Mid-term Review in February 2011. Because of manpower shortage at NWSDB, the rotation team's tasks in their responsible areas could hardly be taken over by the other staff. Instead, NWSDB tried to involve the Area Engineers (AEs), the Officers in Charge (OICs) and EAs of non-pilot areas in the pilot activities and invited them to weekly meetings to share the issues raised in pilot activities. To date, the AE of Colombo City South and the AE and OIC of Colombo City East learned about the systematic methods of NRW reduction by participating in the workshops/seminars, OJT in the pilot areas, and weekly meetings. Then, they have practiced its method in their responsible areas.

According to the Plan of Operations (PO) of the Project, an execution plan will be prepared in the third year of the project implementation. This plan will incorporate the analysis of the results of pilot activities and suggest strategy and effective methods for NRW reduction suitable to the condition in Colombo City along with the cost estimation and required manpower. The NRW Reduction Management Team and JICA experts already obtained some findings from the results of pilot activities and will gain them more and necessary data since the pilot activities will move to next steps after isolation work.

3-2 Summary of Evaluation Results

(1) Relevance

The policy on water supply sector in Sri Lanka has not been changed much since the commencement of the Project and relevance of the Project is high. "Sri Lanka, the Emerging Wonder of Asia, the Mahinda Chinthana, Vision for the Future 2010 – the development policy framework, government of Sri Lanka[4]"clearly specifies the province wise development targets with respect to safe water supply. The overall target to be achieved is 44% piped water connected coverage by 2015 and 60% by 2020. The safe water supply coverage target specified therein is 94% by 2015 and 100% by 2020. The document also addresses the sustainable safe drinking water for all at an affordable price and identifies the specific actions to be taken, such as implementation of non-revenue water (NRW) reduction program to minimize

[4] This document was issued in 2010 by the Department of National Planning, Ministry of Finance and Planning.

the NRW rate up to 20 % by 2020. Colombo City had suffered from high NRW ratio of 54.1%, higher than its nationwide average of 33.0%, as recognized at the stage of project formulation in 2008. NWSDB prepared the draft version of "Cooperate Plan 2012-2016," in which the NRW reduction remains among the goals to achieve by 2016. It addressed the target of "reducing NRW by 9.4 % in Colombo City during the period of 2012 - 2016 and achieving a 26 % national average in 2016." NWSDB still has strong needs of enhancing the capacity of NRW reduction to meet this target; therefore, the components of the Project have been along with the needs of NWSDB. Country Assistance Program for the Democratic Socialist Republic of Sri Lanka formulated in April 2004 includes improvement of water supply service as priority areas for assistance and contents of the Project accord to the policy of Government of Japan.

(2) Effectiveness

The Project is assessed as effective. To pursue the effective NRW reduction, capacity enhancement at both technical and management level is very crucial. To date, the Project has enhanced NWSDB's capacity to implement NRW reduction activities in Colombo City at both levels. NWSDB officers/staff engaged in pilot activities has acquired the practical and systematic techniques for effective NRW reduction. The NRW Management Team has gained a lot of findings on what methods would bring more effects on NRW reduction through project activities. The Project still have nine months to complete the cooperation period and will present more tangible effects on NRW reduction in the remaining period. It is, especially, expected that the specific data on the pilot activities such as system input volume, MNF, pressure, billed/unbilled authorized consumption, illegal use and metering inaccuracies, will be compiled and utilized to identify the most effective options for NRW reduction activities in Colombo City and necessary budget and human resources to implement them. Then an execution plan will be drafted.

(3) Efficiency

The Project is assessed as partly efficient. Although some of the project activities are behind schedule and there are some causes which influenced the progress of the Project (Refer to 3-3 Factors that promoted realization of effects / Factors that impeded realization of effects), various activities have been carried out by NWSDB and JICA experts and the Project Outputs are supposed to be achieved by the end of the Project. The positive aspect is that the overseas training programs promoted the participants' motivation toward NRW reduction, and the participants also encouraged their staff to promote NRW reduction. The technical exchange programs in Jordan and Indonesia gave the participants confidence in the NRW reduction activities which they have been practicing through project activities, by observing the similar methods applied in other countries. In addition, the quality and the quantity of inputs were mostly appropriate and the inputs were fully utilized for project activities to date.

(4) Impact

The Overall Goal of the Project is "the NWR ratio in Colombo City is reduced." NRW ratios are reduced in the pilot projects and overall goal is likely to be achieved. The Project will prepare an execution plan, which suggests strategy and effective methods of NRW reduction activities suitable in Colombo City

along with the cost estimation and required manpower. When the NRW reduction activities are continued by NWSDB based on the execution plan with high commitment of NWSDB's executives, it is expected that the results of the Project will contribute to NRW reduction in Colombo City in the future. Since the Project has involved several AEs or OICs of non-pilot areas in project activities, NWSDB now has a certain level of foothold in extending NRW reduction activities. If every AEs and OICs/EAs in Colombo city will gain systematic way of NRW reduction, knowledge, technique and experience by participating in pilot activities in the remaining cooperation period, the possibility of realizing NRW reduction will be further promoted. As generally recognized, the combination of soft-measures, such as leakage detection/ repair, detection of illegal connection, reduction of stand posts, and hard-measures of pile replacement are very effective to reduce NRW. It is necessary for the budget and equipment for NRW reduction activities and renewal of deteriorated pipes to be secured.

(5) Sustainability

Sustainability of the Project is considered to be secured if the conditions below are satisfied.

■ Policy and Institutional Aspects

The policy environment is still likely to be favorable for NWSDB. The GOSL keeps the improvement of water supply services among its prioritized areas, addressing the sustainable safe drinking water for all at an affordable price and identifying the specific actions to be taken, such as implementation of non-revenue water (NRW) reduction program to minimize the NRW rate up to 20 % by 2020.

■ Financial Aspects

While it is difficult to identify the allocated amount for NRW reduction activities at NWSDB, a certain amount of budget has been allocated and disbursed for NRW related activities. The amount for the repairs and maintenance for water service was 461.4 million LKR in 2009,[5] and this partially include the amount allocated for NRW reduction activities.[6] At NWSDB, the cost associated with O&M is currently covered by water charge. The financial statement in NWSDB Annual Plan of 2009 indicated that the sales of water exceeded the direct cost,[7] while the financial condition of NWSDB was overall in deficit in 2009 due to the large amount of financial cost.[8] In addition, NRW Reduction Management Team mentioned that the budget for NRW reduction is not sufficient but the budget is certainly allocated. Therefore, it can be judged that a certain amount of budget will be continuously allocated when the executives admit the effectiveness of NRW reduction activities and commit to its implementation. The cost of the pilot projects is born by NWSDB and it is estimated that NRW Reduction Management Team and NRW Reduction Teams will exist.

[5] According to the NWSDB Annual Reports in 2009.
[6] Annual Report 2009 reported that 50 million LKR was allocated in 2009 for Northern Central, 15 million each for Central, North Central and North Western, 5 million for Northern, 62 million for 2010 for Southern, Uva Sabaraganuwa &Eastern Provinces to reduce UFW.
[7] The direct cost includes personnel cost, pumping/chemical costs, repair & maintenance
[8] Mostly financial cost is repayment for donor funds.

■ Technical Aspects

The counterpart personnel has well accepted the knowledge and techniques introduced by the Project and recognized the usefulness of the systematic technologies of NRW reduction. Especially, the AEs and OICs/EAs in pilot and non-pilot areas have learned about the systematic techniques to pursue the NRW reduction activities and gained sufficient experiences. Since the counterpart personnel originally had basic knowledge and techniques on NRW reduction, it would not be difficult to sustain their techniques learned from the Project. To ensure the technical sustainability in Colombo City, it is important to consider how the systematic methods of NRW reduction to be proposed in an execution plan will be disseminated to other areas.[9] Since the rotation system, which was a proposed mechanism to disseminate the technologies to non-pilot areas, has not functioned well, it is important to provide opportunities for AEs and OICs/EAs in non-pilot areas to participate in pilot activities and weekly meetings in the remaining cooperation period.

The counterpart personnel has tried to store and maintain the provided equipment with the utmost care. In this respect, the equipment provided by the Project will be maintained after the project cooperation is terminated. On the other hand, it should be noted that some of the equipment, especially electronic products, were foreign products, and NWSDB may need to contact the overseas manufacturers through email when those of equipment have problems.

3-3 Factors that promoted realization of effects

(1) Factors concerning the planning

Nothing special.

(2) Factors concerning the implementation process

- NRW reduction management team showed the strong commitment to NRW reduction measures and executed leadership in promoting project activity (factor to promote effect of the project)
- In the technical exchange programs counterparts learned that the NRW reduction activities which they have been practicing through project activities are implemented and have good effect, which promoted the understanding of the project activities (factor to promote project implementation).

3-4 Factors that impeded realization of effects

(1) Factors concerning the planning

Nothing special

(2) Factors concerning the implementation process

- It took time to get approval from concerned organizations, for example permission of digging the roads. Also it takes time for procedure to apply inside NWSDB.
- It took time to coordinate within NWSDB. For example necessary vehicles and drivers are not

[9] The Project found that the systematic isolation work may not be very effective in Colombo City due to the unique feature in the city. The Project is now considering other better options to isolate areas, measure the water flow and extent the NRW activities.

always allocated which influenced project activities.

- It took more time for isolation in subzone in pilot activities than expected, since as built drawing was not collect, distribution pipes are connected in unexpected places, low water pressure and difficult finding location of valves.
- Counterparts had not only project activities but also ordinary work. Therefore they frequently couldn't concentrate on the project activities. In addition to ordinary work, there were urgent task of emergency pipes replacement which was highly prioritized. Therefore they sometimes couldn't participate at pilot activities.
- While JICA experts were absent, problems sometimes occurred for example, the vehicle and/or heavy equipment were not allocated. Therefore activities slumbered.

3-5 Conclusion

The Project is likely to achieve its intended target to a large extent when all planned activities are completed as scheduled in the remaining cooperation period. Therefore the Project should be terminated as scheduled.

Although the delay of pilot activities has occurred, NWSDB and the JICA experts made lots of effort to minimize its delay. To date, the technical capacity of the counterpart personnel has been enhanced as planned. In coming nine months, the Project will analyze the results of pilot activities, identify the effective methods of systematic NRW reduction suitable in Colombo City, and incorporate the ideas in the execution plan on NRW reduction. The process of discussion to find the effective and appropriate techniques of NRW reduction will be a good opportunity for NWSDB to gain more findings on NRW reduction methods. Therefore, by the end of the cooperation period, the management and technical capacity of NWSDB will be further enhanced. The Terminal Evaluation Team regarded the Project as worth implementing judging from the relevance. The effectiveness was also at the good level. On the other hand, the Project was assessed as partly efficient due to several causes affecting the project implementation. The strong commitment and determination of NWSDB's executives toward the implementation and extension of the systematic NRW reduction activities will increase the possibility to ensure the impact and the sustainability of the Project.

3-6 Recommendations

(1) Dissemination of systematic approach of NRW reduction

This project is supposed to terminate in October 2012. In future NRW reduction measures need to be implemented not only in Kotahena and Borella but also whole Colombo City. To do so, NRW Reduction Management Team will draft an execution plan by the end of the project. At the same time for disseminating methods of NRW reduction, it is recommended that at least the AEs and OICs/ EAs from all OIC areas participate in both the weekly meetings and pilot activities.

(2) Replacement of deteriorated pipeline

After Mid-term review, NWSDB determined to implement the pipe replacement by utilizing foreign fund

of Water Sector Development Project (I) – Greater Colombo Water Rehabilitation Project. The result of this work is very crucial to pursue a comparative analysis originally planned in the Project. Since the Project will be completed in nine months, the pipe replacement work in Kotahena needs to be completed by June 2012. Therefore, NWSDB should proceed with the pipe replacement work as early as possible.

(3) Smooth implementation of internal procedure

While NWSDB has made lots of efforts to increase the number of vehicles and cadre of O&M sections, some difficulties in internal arrangement still have been observed. Time matters for the Project since only nine months remain until the cooperation period is completed. Therefore, the Team recommended that NWSDB arrange the following points to promote the further smooth implementation and ensure the attainment of the Project:

- Allocation for the vehicles for GPS team and PR activities
- Review the working efficiency of GIS operators to promote the data input on GIS to ensure data input completion by the end of cooperation period

(4) Budget and human resources for NRW reduction measures

To ensure the sustainability of NRW reduction activities, sufficient budget and human resources for NRW reduction measures should be secured, even after the Project completion.

(5) Utilization of experienced staff

Staff of NRW reduction in Kotahena and Borella acquired knowledge of NRW reduction through the project activities. The NRW reduction activities will be implemented based on the execution plan which will be supposed to be drafted in 2012. It is strongly recommended to utilize NWSDB's already available human resources of Kotahena and Borella in other areas.

(6) Implementation of updating pipe networks information in routine work and effective utilization of the information

NWSDB should practice updating pipe information with collected data such as pipe locating survey during NRW activities, as-built drawings after installation works, and field data after repair works. NWSDB is recommended to extend such practice to its whole service area.

(7) Establishing GIS and its utilization

GIS was introduced after the Mid-term review as an effective measure for supporting NRW reduction activities. Now data of Kotahena and Borella is being put into GIS database. However the effect of GIS will be limited unless input data are sufficient, precise and always updated. It is recommended therefore to continue GIS activities and utilize it for planning and daily operations.

(8) Coordination with M/P by JICA and other projects

Currently updating M/P of Colombo City is being worked utilizing Yen Loan including the component of

the NRW reduction. Also ADB shows interest in NRW reduction of Colombo City. Therefore NWSDB is recommended to coordinate M/P updating by JICA and other related projects, if any, with the Project to utilize its outputs as written in the Minutes of the Meeting.

(9) Leakage control of distribution main

NWSDB considers that distribution mains connected to the pilot project areas also have substantial leakage. Therefore, it is recommended to apply the currently available equipment to the specific local conditions.

(10)Benefit/Cost analysis of NRW reduction

It is recommended to analyze benefit and cost of NRW reduction activities for presenting financial impact of the activities.

3-7 Lessons Learned

(1) Physical loss contributed to the major losses

The major cause of NRW in the pilot project areas is physical loss (leakage). Since situations of NRW are different from area to area, countermeasures should be selected from wide range of solutions accordingly.

(2) Replaced pipe to be removed or disconnected

During field work, NRW teams found several secondary distribution mains and service pipes, both recorded and unrecorded, were hardly recognized as being in service or abandoned. For future replacement of pipeline, distinctly different color or color coding should be introduced instead of the existing ones such as grey. In addition to coloring, when pipes are installed for replacing purposes, existing pipes should be removed or disconnected properly in order to reduce NRW.