Federal Capital Territory Administration
Federal Capital Territory Water Board
Federal Republic of Nigeria

THE FEDERAL CAPITAL TERRITORY REDUCTION OF NON-REVENUE WATER PROJECT IN FEDERAL REPUBLIC OF NIGERIA

PROJECT FINAL REPORT (SUPPORTING REPORT, VOL. 1/2)

January 2019

Japan International Cooperation Agency
Yachiyo Engineering Co., Ltd
Yokohama Water Co., Ltd

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ATTACHMENT

ATTACHMENT

Annex 1:

Record of Discussions (R/D)

RECORD OF DISCUSSIONS
ON
FEDERAL CAPITAL TERRITORY
REDUCTION OF NON-REVENUE WATER PROJECT
IN
FEDERAL REPUBLIC OF NIGERIA
AGREED UPON BETWEEN
FEDERAL CAPITAL TERRITORY ADMINISTRATION
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

Abuja, 17 July 2014

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Based on the minutes of meetings on the Detailed Planning Survey on the Federal Capital Territory Reduction of Non-Revenue Water Project (hereinafter referred to as "the Project") signed on on 22nd May, 2014 between Federal Capital Territory Administration of Government of Federal Republic of Nigeria (hereinafter referred to as "FCTA") and the Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA held a series of discussions with Federal Capital Territory Water Board (hereinafter referred to as "FCTWB") which will work as implementation agency under the umbrella of FCTA and relevant organizations to develop a detailed plan of the Project.

Both parties agreed the details of the Project and the main points discussed as described in the Appendix 1 and the Appendix 2 respectively.

Both parties also agreed that FCTA/FCTWB will be responsible for the implementation of the Project in cooperation with JICA, coordinate with other relevant organizations and ensure that the self-reliant operation of the Project is sustained during and after the implementation period in order to contribute toward social and economic development of Federal Republic of Nigeria.

The Project will be implemented within the framework of the Note Verbales exchanged on 12th December 2013 between the Government of Japan (hereinafter referred to as "GOJ") and the Government of Federal Republic of Nigeria.

Appendix 1: Project Description
Appendix 2: Main Points Discussed

Appendix 1

PROJECT DESCRIPTION

Both parties confirmed that there is no major change in the Project Description agreed on in the minutes of meetings on the concerning Preparatory Survey on the Project signed on 22nd May 2014.

I. BACKGROUND

The Government of Federal Republic of Nigeria sets the target of access ratio to improved water sources as 75% by the year of 2015 and 100% by the year of 2020, according to Vision 20:2020 adopted in December 2009. However, the access ratio to improved water sources is decreasing in urban area due to rapid population growth. The improvement of water supply systems in urban areas is acknowledged as one of the most critical issues to achieve the target set by Vision 20:2020.

Federal Capital Territory, Abuja, has approximately 2,150,000 population which is growing at 4.5% a year. The access ratio to improved water sources in Federal Capital Territory is lower than the average ratio of the whole urban areas in Nigeria. Therefore, Federal Capital Territory Water Board (FTCWB), a sole water service provider in the capital, is urgently implementing projects to extend its capacity and service area.

Another problem FCTWB faces is Non-Revenue Water (NRW). Although the NRW ratio is not accurately measured, it is said that almost half of water production is lost without any revenue.

Under these circumstances, the Government of Federal Republic of Nigeria requested JICA for a technical cooperation project to strengthen capacity of FCTWB for reducing NRW in the capital.

II. OUTLINE OF THE PROJECT

Details of the Project are described in the Logical Framework (Project Design Matrix: PDM) (Annex 1-1) and the tentative Plan of Operation (Annex 1-2).

1. Implementation Structure

The Project organization chart is given in the Annex 1-3. The roles and assignments of relevant organizations are as follows:

(1) FCTA
Project Director: Director, Economic Planning, Research and Statistics Department

Project Director will be responsible for overall administration of the Project.

(2) FCTWB

Project Manager: Director

Project Manager will be responsible for the implementation of the Project.

Deputy Project Manager: Head of Administration and Supply Department

Deputy Project manager will support the Project Manager in the implementation of the Project.

Technical Manager (Distribution): Head of Distribution Department

Technical Manager (Commerce): Head of Commerce Department.

Technical Managers will be responsible for technical matters pertaining to the implementation of the Project.

(3) JICA Experts

The JICA experts will give necessary technical guidance, advice and recommendations to FCTWB on any matters pertaining to the implementation of the Project.

(4) Joint Coordinating Committee

Joint Coordinating Committee (hereinafter referred to as "JCC") will be established in order to facilitate inter-organizational coordination. JCC will be convened and presided by the Project Director. JCC will be held at least twice a year and whenever deems it necessary. JCC will approve an annual work plan (annual PO), review overall progress, conduct evaluation of the Project, and exchange opinions on major issues that arise during the implementation of the Project. A list of proposed members of JCC is shown in the Annex 1-4.

2. Project Site(s) and Beneficiaries

(1) Project site

- Federal Capital Territory

(2) Beneficiaries

- Direct beneficiaries: FCTWB and its staff
- Indirect beneficiaries: People living in FCTWB service area

3. Duration

The duration of the Project will be three (3) years and six (6) month from the date when the first expert is dispatched from Japan.

4. Environmental and Social Considerations

(1) FCTA/FCTWB agreed to abide by 'JICA Guidelines for Environmental and Social Considerations' in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Project.

III. UNDERTAKINGS OF FCTA/FCTWB AND THE GOVERNMENT OF FEDERAL REPUBLIC OF NIGERIA

1. FCTA/FCTWB and the Government of Federal Republic of Nigeria will take necessary measures to:

   (1) ensure that the technologies and knowledge acquired by the Federal Republic of Nigeria nationals as a result of Japanese technical cooperation contributes to the economic and social development of Federal Republic of Nigeria, and that the knowledge and experience acquired by the personnel of Federal Republic of Nigeria from technical training as well as the equipment provided by JICA will be utilized effectively in the implementation of the Project; and

   (2) grant privileges, exemptions and benefits to the JICA experts referred to in the Project Design Matrix (PDM) as attached and their families, which are no less favorable than those granted to experts and members of the missions and their families of third countries or international organizations performing similar missions in Federal Republic of Nigeria.

2. FCTA/FCTWB and the Government of Federal Republic of Nigeria will take necessary measures to:

   (1) provide security-related information as well as measures to ensure the safety of the JICA experts;
   (2) permit the JICA experts to enter, leave and sojourn in Republic of Nigeria for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees.

IV. MONITORING AND EVALUATION

JICA and the FCTA/FCTWB will jointly and regularly monitor the progress of the Project through the Monitoring Sheets (Annex 1-5) based on the Project Design Matrix (PDM) and Plan of Operation (PO). The Monitoring Sheets shall be submitted to JICA Nigeria Office every six (6) months.
Also, Project Completion Report shall be drawn up one (1) month before the termination of the Project.

JICA will conduct the following evaluations and surveys to mainly verify sustainability and impact of the Project and draw lessons. The FCTA/FCTWB is required to provide necessary support for them.

1. Post evaluation: three (3) years after the project completion, in principle
2. Follow-up surveys on necessity basis

V. PROMOTION OF PUBLIC SUPPORT

For the purpose of promoting support for the Project, FCTA/FCTWB will take appropriate measures to make the Project widely known to the people of Federal Republic of Nigeria.

VI. MISCONDUCT

If JICA receives information related to suspected corrupt or fraudulent practices in the implementation of the Project, FCTA/FCTWB and relevant organizations shall provide JICA with such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of the Federal Republic of Nigeria.

FCTA/FCTWB and relevant organizations shall not, unfairly or unfavorably treat the person and/or company which provided the information related to suspected corrupt or fraudulent practices in the implementation of the Project.

VII. MUTUAL CONSULTATION

JICA and FCTA/FCTWB will consult each other whenever any major issues arise in the course of Project implementation.

VIII. AMENDMENTS

The record of discussions may be amended by the minutes of meetings between JICA and FCTA.

The minutes of meetings will be signed by authorized persons of each side who may be different from the signers of the record of discussions.

Annex 1-1	Logical Framework (Project Design Matrix: PDM)
Annex 1-2	Tentative Plan of Operation (PO)
Annex 1-3	Project Organization Chart
Annex 1-4	List of Proposed Members of Joint Coordinating Committee
Annex 1-5	Monitoring Sheets

Appendix 2

MAIN POINTS DISCUSSED

During the discussion for formulation of the project outline, the following issues were agreed:

1) Three Pilot Metering Areas (PMAs) will be selected from either part of or whole areas of Jabi Area Office, Garki I Area Office and Gudu Area Office and PMA will be zoned into some Sub Metering Areas (SMAs) after detailed survey by Japanese experts based on the Selection Criteria as attached.
2) Tentative list of personnel assigned for the Project is shown as attached.
3) JICA will provide the machinery and equipment necessary for implementation of the project such as pickup trucks, leakage detection equipment, water flow meters, customer meters and valves.
4) The following expenses will be borne by FCTWB:
   a) Expenses for implementing the project activities such as repair costs for distribution pipes, installation, operation and maintenance costs for machinery and equipment provided by JICA;
   b) Administrative and operational expenses such as electricity, water, communication;
   c) Local traveling costs and daily subsistence allowance (DSA) for Nigerian personnel involved in the Project; and
   d) Others as necessary.
5) Local expertise will be utilized as appropriate.
6) Necessary budget for the Project will be ensured and allocated to FCTWB in the timely manner by FCTA.
7) Proper security measures for Japanese experts should be taken by FCTWB during the project activities in PMAs.
8) Furnished offices for Japanese experts should be provided at HQ and pilot Area Offices of FCTWB from the commencement of the Project.
9) Information sharing seminars for entire FCTWB and FCTA, including kick off and final seminars, will be held once a year.
10) Detailed Plan of Operation (PO) and Annual PO shall be prepared in the beginning of the Project through discussion between Nigerian project personnel and Japanese experts for approval by the first Joint Coordinating Committee, based on the tentative PO attached as Annex 1-2.

Annex 2-1 Selection Criteria
Annex 2-2 Tentative List of Personnel Assigned

Annex 1-1 Project Design Matrix (PDM)

Project Title: "The Federal Capital Territory Reduction of Non-Revenue Water Project"
PDM ver. 1 (day/month/year)
Project Period : Three and a half years from the date when the first Japanese Expert is dispatched (i.e. Day/Month/Year to Day/Month/Year)
Implementing Organization: Federal Capital Territory Administration (FCTA) / Federal Capital Territory Water Board (FCTWB)
Direct beneficiaries: FCTWB, relevant staff of FCTWB Headquarters and pilot Area Offices
Project Site: FCT Pilot Area Offices: Jabi, Garki I and Gudu

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions	Achievement	Remarks
<Overall Goal> Level of Non-Revenue Water (NRW) is reduced at the service area of FCTWB	a: Annual NRW ratio is reduced to X%(*) at the end of the year 2021 Note(*): Target value (X%), which is expected to be determined in the mid-term strategic plan for NRW reduction, shall be tentatively filled when the final draft was approved by the Director of FCTWB, which shall be finalized when the plan is approved by FCTA	a Record of NRW ratio kept by Distribution Department			
<Project Purpose> Capacity of FCTWB for NRW reduction is strengthened	a. The mid-term strategic plan for NRW reduction (2018-2022) is approved by FCTA by the end of the Project. b. NRW reduction operations of the first quarter of 2018 specified in the annual plan of the above plan are carried out according to the plan by FCTWB c. Relevant staff of FCTWB (i.e. members of NRW Management Team and Pilot NRW Action Teams) become equipped with skills and knowledge necessary for NRW reduction according to the criteria set by the Project for each level d. NRW ratio of each PMA in the last quarter of the Project reaches its respective target (**) Note(**): Target for each PMA is expected to be determined by the end of the first quarter of the second year	a. Date of approval of the plan b. Result of monitoring by NRW Management Team c. Results of joint assessment based on the criteria set by the Project d. Record of NRW ratio kept by Distribution Department	A Policy support for NRW reduction is not discontinued B. Natural disaster/ political instability/ economic crisis that affect the service area of FCTWB do not occur C. Activities to implement the mid-tem strategic plan are not discontinued or delayed		
<Outputs> 1. Level of NRW of the service area of FCWTB is monitored regularly	1a Record of monthly NRW ratio is kept by Distribution Department from the third quarter of the first year of the Project 1b Monthly NRW ratio of the service area of FCTWB is reported to its monthly Joint Management Meeting from the third quarter of the first year of the Project 1c Quarterly NRW ratio of the service area of FCTWB is reported to the Board of Directors of FCTWB from the third quarter of the first year of the Project	1a Monthly record of NRW ratio. 1b&1c Material for meetings submitted by the Distribution Department	A Staff of FCTWB (i.e. members of NRW Management Team and Pilot NRW Action Teams) trained through the Project do not leave the office in large numbers		
2. Methods/operational procedures for effective NRW reduction are established through pilot projects at Pilot Metering Areas (PMAs) under pilot Area Offices (*1)	2a Decrease rate of NRW ratio for each Sub Metering Area of a PMA reaches at least 80% of its target at the end of the respective NRW reduction operations 2b Technical manuals for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials, are approved by Head of Department (HoD) for Distribution and HoD for Commerce by the first quarter of the third year of the Project	2aRecord of NRW ratio kept by the Distribution Department 2b Date of approval of the manuals			
3 A mid-term strategic plan of FCTWB for NRW reduction is developed, utilizing the results of Output 1-2 (*2)	3a By October 2017, draft mid-term strategic plan for NRW reduction (2018-2022) is submitted by FCTWB to FCTA for review and approval 3b By October 2017, an annual NRW reduction plan (2018) is incorporated in FCWTB's annual recurrent and capital plan (2018) for submission to FCTA for review and approval 3c A planning manual for NRW reduction is approved by the Director of FCTWB by the end of the Project	3a&3b Date of official letter submitting draft strategic plan and annual recurrent and capital plan 3c Date of approval of the manual			

Note (*1): NRW components targeted by Output 2 are (i) invisible leakage; (ii) customer meter malfunction; and (iii) illegal connection
Note(*2) A mid-term strategic plan is a five-year plan, which may include mid-term target, strategies and actions, timeframe, human resource requirement, on-the-job training mechanism, cost-benefit analysis of NRW reduction, etc. It is noted that NRW components addressed by the strategic plan are not limited to the ones mentioned in (*1) above: they shall be discussed and determined in developing the outline of the strategic plan (through Activity 3-4).

Annex 1-1 Project Design Matrix (PDM)

Activities	Inputs		Pre-Conditions
1-1 Install bulk meters to water treatment plants 1 and 2 1-2 Measure monthly water production of water treatment plants 1, 2 ,3, and 4 1-3 Tally the above water production data monthly 1-4 Calculate the monthly water consumption based on the billing data 1-5 Calculate monthly NRW ratio of the service area of FCTWB using the data obtained from Activity 1-3 and 1-4 ******* 2-1 Review existing NRW reduction operations at each pilot Area Office 2-2 Conduct capacity assessment of the relevant staff of each pilot Area Office 2-3 Identify and select a Pilot Metering Area (PMA) for each pilot Area Office based on the selection criteria of PMA(*3) 2-4 Prepare/update distribution network drawings for each PMA 2-5 Install water flow meters to each PMA and measure in/outflows monthly 2-6 Zone each PMA into Sub Metering Areas (SMA) 2-7 Isolate a SMA by installing valves 2-8 Update the distribution network drawings for each SMA 2-9 Measure an initial level of NRW of each SMA 2-10 Detect target NRW components (i.e. invisible leakage, customer meter malfunction, and illegal connection) of each SMA 2-11 Develop a NRW reduction operation plan of each SMA ,including reduction target, for review by Head of Distribution Department 2-12 Review and approve NRW reduction operation plan of each SMA 2-13 Implement the NRW reduction operations at each SMA 2-14 Monitor the progress of the NRW reduction operations of each SMA 2-15 Measure level of NRW of each SMA at the end of the respective operations 2-16 Prepare a report on pilot projects, covering Activity 2-1~2-15 2-17 Develop manuals for NRW reduction for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials ******** 3-1 Establish a Working Group for NRW planning (*4) 3-2 Review existing plans, implementation structure, on-the-job training mechanism, etc. related to NRW reduction at FCTWB 3-3 Conduct hydraulic and water pressure distribution analyses of the pipeline networks 3-4 Develop outlines of the mid-term strategic plan and its annual NRW reduction plan 3-5 Develop the first mid-term strategic plan (2018-2022) for approval by FCTA 3-6 Develop an annual NRW reduction plan based on the strategic plan as an integral part of an annual recurrent and capital plan of FCTWB for approval by FCTA 3-7 Develop a planning manual for NRW reduction	<Nigerian Side> **Project Personnel** 1. Project Director: Director of Economic Planning, Research and Statistic Department, FCTA 2. Project Manager: Director of FCTWB 3. Deputy Project Manager: HoD for Administration and Supply/FCTWB 4. Technical Managers (Also Leaders of NRW Management Team): HoD for Distribution and HoD for Commerce /FCTWB 5. Members of NRW Management Team (FCTWB): - Head of Special Project Unit of Distribution Department (as Coordinator) - Relevant Head of Unit (HoU) and officers of the Distribution Department, Commerce Department, and Administration and Supply Department 6. Heads of other relevant Departments and Unit of FCTWB: HoD for Finance, HoD for Production, HoU for Planning Research and Statistics (PRS) 7. Members of pilot NRW Action Team: Area Manager, Assistant Area Manager (Distribution), Assistant Area Manager (Commerce), technical officers (Distribution) and meter readers (Commerce) of each pilot Area Office 8. Other personnel mutually agreed upon as necessary **Land, Building and Facilities** 1. Office building and facilities necessary for the implementation of the Project 2. Office spaces and necessary facilities for the Japanese Experts at the FCTWB Headquarters and each Pilot Area Office, including internet connection and air conditioners 3. Other facilities mutually agreed upon as necessary **Local Costs** 1. Cost for installation, operation and maintenance of the provided equipment and cost for pipe repair at PMAs 2. Administration and operational costs, including costs for local travel for the Project Personnel	<Japanese Side> **Japanese Experts** 1. Chief Advisor 2. NRW Reduction 3. NRW Planning 4. Leakage Detection 5. Commercial Loss 6. Hydraulic Analysis 7. Administrative Coordinator 8. Other experts mutually agreed upon as necessary **Equipment** 1. Bulk meters for water treatment plants 2. Water flow meters, valves, and customer meters for SMA 3. Leakage detection equipment for PMA 4. Pipe repair equipment for PMA 5. Vehicles(Pick-ups) 6. Other equipment mutually agreed upon as necessary **Training of the Nigerian Project Personnel in Japan** Four persons mutually agreed upon will be trained in Japan annually	A Natural disaster/ political instability/ economic crisis that affect the project activities do not occur <Pre-Conditions> A Furnished offices for Japanese Expert Team are secured at Headquarters and each Pilot Area Office of FCTWB B Project Personnel is assigned with the finalized list ↑ ↑ **Issues & Counter measures**

Note (*3)Selection criteria of PMA are as follows: (i) Safety for night works is secured in measuring minimum night flow: (ii) Distribution network is separated and it is easy to isolate it in measuring NRW ratio: and (iii) NRW ratio is supposedly high.

Note (*4) Working Group for NRW planning would consist of Project Manager (as chair), Deputy Project Manager, Technical Managers, Head of Finance Dept., Head of Production Dept., Head of PRS Unit, and members of NRW Management Team.

Tentative Plan of Operation

Version ●

Dated ●●,●●,●●

Project Title: The Federal Capital Territory Reduction of Non-Revenue Water Project

Schedule of Major Japanese Inputs	Year	1st Year				2nd Year				3rd Year				4th Year				5th	6th	7th	Remarks	Monitoring: Issue	Monitoring: Solution
	Qr	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV						
Expert																							
Chierf Advisor		Plan																					
		Actual																					
NRW reduction		Plan																					
		Actual																					
Leakage Detection		Plan																					
		Actual																					
Commerccial Loss		Plan																					
		Actual																					
Hyeraulic Analysis		Plan																					
		Actual																					
Administrative Coordinator		Plan																					
		Actual																					
Equipment																							
Bulk meters for water treatment plants		Plan																					
		Actual																					
Water flow meters, valves, and customer meters for Sub Metering Area		Plan																					
		Actual																					
Leakage detection equipment for Pilot Metering Area (PMA)		Plan																					
		Actual																					
Pipe repair equipment for PMA		Plan																					
		Actual																					
Vehicles(Pick-ups)		Plan																					
		Actual																					
Training in Japan																							
Four persons mutually agreed upon will be trained in Japan annually		Plan																					
		Actual																					

Activities / Sub-Activities	Year	1st Year				2nd Year				3rd Year				4th Year				5th	6th	7th	Responsible Org (Nigeria)	Responsible Person (Nigeria)	Implementors (Nigeria)	Japanese Experts	Other Major Inputs: Japan	Other Major Inputs: Nigeria	Remarks	Achievements	Issue & Countermeasures
	Qr	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV												
Output 1: Level of NRW of the service area of FCWTB is monitored regularlly																					Dist.Dpt	HoD (Dist)		Chief Advisor (CA)					
1.1 Install bulk meters to water treatment plants 1 and 2		Plan																			Dist. Dpt Prod. Dpt	HoU (Pipline)/D	Tech Officers (Pipiline)	CA	Bulk meters	Installation, O&M cost	Prod Dpt will be consulted		
		Actual																											
1.2 Measure monthly water production of water treatment plants 1,2,3, and 4		Plan																			Dist Dpt	HoU (Pipuline)/D	Tech Officers (Pipiline)	CA			If bulks are installed inside the plants, Prod Dept shall measure		
		Actual																			Prod. Dpt	HoU (Prod)/Prod							
1.3 Tally the above water production data monthly		Plan																			Dist Dpt	HoU (Water Monitoring)	HoU(Water Monitoring)	CA					
		Actual																											
1.4 Calculate monthly water consumption based on the billing data		Plan																			Com. Dpt	HoU (Billing)/C	Billing staff	CA	Cost for upgarading software				
		Actual																											
1.5 Calculate montly NRW ratio of the service area of FCTWB using the data obtained from Activity 1-3 and 1-4		Plan																			Dist. Dpt	HoU (Logistics)/D	Logistics officer	CA					
		Actual																											
Output 2: Methods/operational procedures for effective NRW reduction are established through pilot projects at Pilot Metering Area(PMAs) under pilot Area Offices																					Dist. Dpt	HoD (Dist)		CA	Vehicles (Pick ups)	O&M cost			
2.1 Review existing NRW reduction operations at each piilot Area Office		Plan																			Dist. Dpt	HoD (Dist)	AM, AAM (Dist)(Com)						
		Actual																											
2.2 Conduct capacity asssessment of the relevant staff of each pilot Area Office		Plan																			Dist. Dpt	HoD (Dist)	NRW Mgt Team						
		Actual																											
2.3 Identify and select a Pilot Metering Area (PMA) for each pilot Area Office based on the selection criteria of PMA		Plan																			Dist. Dpt	HoD (Dist)	NRW Mgt Team AM, AAM (Dist)(Com)	CA, NRW reducition					
		Actual																											
2.4 Prepare/update distribution network drawings for each PMA		Plan																			Dist Dpt	HoU(Logistics) /D	HoU (Logistics) &officers HoU (GIS) &GIS officers	NRW reduction					
		Actual																											

Annex1-10

Annex 1-2 Tentative Plan of Operation (PO)

Activities / Sub-Activities		Year	1st Year				2nd Year				3rd Year				4th Year				5th	6th	7th	Responsible Org (Nigeria)	Responsible Person (Nigeria)	Implementors (Nigeria)	Japanese Experts	Other Major Inputs		Remarks	Achievements	Issue & Countermeasures
		Qr	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV								Japan	Nigeria			
2.5	Install water flow meters to each PMA and measure in/outflows monthly	Plan			■	■																Area Office	Area Manager (AM)	AAM (Dist) Tech Officers (Dist)	NRW reduction Hydraulic analysis	Water flow meters	Installation and O&M cost			
		Actual																												
2.6	Zone each PMA into Sub Meterinng Areas (SMAs)	Plan		■																		Dist Dpt	HoU (Logistics)/D	AM, AAM (Dist) (Com)	ditto					
		Actual																												
<For each SMA>																														
2.7	Isolate a SMA by installing valves	Plan			■	■		■	■	■		■	■	■								Area Office	AAM (Dist)	Tech Officers (Dist)	NRW reduciton	Valves	Installation and O&M cost			
		Actual																												
2.8	Update the distribution network drawings for each SMA	Plan			■	■		■	■	■		■	■	■								Dist Dpt	HoU (Logistics)	AAM (Dist) Tech Officers (Dist)	NRW reduciton					
		Actual																												
2.9	Measure an initial level of NRW of each SMA	Plan			■	■		■	■	■		■	■	■								Area Office	AM		NRW reduction					
		Actual																												
a	Measure in/outflows	Plan			■	■		■	■	■		■	■	■								ditto	AAM (Dist)	Tech Officers (Dist)						
		Actual																												
b	Survey water consumption	Plan			■	■		■	■	■		■	■	■								ditto	AAM (Com)	Meter Readers						
		Actual																												
c	Calculate NRW ratio	Plan			■	■		■	■	■		■	■	■								Dist Dpt	HoU (Logistics)/D	Logistics Offficer						
		Actual																												
2.10	Detect target NRW components (i.e. invisible leakage, customer meter malfunction, and illegal connection) of each SMA	Plan			■	■		■	■	■		■	■	■								Area Office	AM		NRW reduction					
		Actual																												
a	Detect invisible leakage	Plan			■	■		■	■	■		■	■	■								ditto	AAM (Dist)	Tech Officers(Dist)	Leakage detction	Leakage detection equipment	O&M cost	Staff of Pipeline Unit (Dist) will join		
		Actual																												
b	Detect customer meter malfunction	Plan			■	■		■	■	■		■	■	■								ditto	AAM (Com)	Meter Readers	Com Loss					
		Actual																												
c	Detect illegal connection	Plan			■	■		■	■	■		■	■	■								ditto	AAM (Com)	Meter Readers	Com Loss			Staff of Detection Unit (Com) will join		
		Actual																												
2.11	Develop a NRW reduction operation plan of each SMA ,including reduction target for review by Head of Distribution Department	Plan			■	■		■	■	■		■	■	■								Area Office	AM	AAM (Dist) (Com)	NRW reduction, Lekage detection, Com loss					
		Actual																												
2.12	Review and approve NRW reduction operation plan of each SMA	Plan			■	■		■	■	■		■	■	■								Dist. Dpt	HoD (Dist)	HoD (Dist)	NRW reduction					
		Actual																												
2.13	Implement NRW reduction operations at each SMA	Plan					■	■	■		■	■										Area Office	AM		NRW reduction					
		Actual																												
a	Operation for invisible leakage	Plan					■	■	■		■	■										ditto	AAM (Dist)	Tech Officers (Dist)	Leakage detection, NRW reduction	Pipe repair equipment	Pipe repair cost			
		Actual																												
b	Operation for customer meter malfunction	Plan					■	■	■		■	■										ditto	ditto	ditto	Com loss	Cutomer meters	Instllation, O&M cost			
		Actual																												
c	Operation for illegal connection	Plan					■	■	■		■	■										ditto	AAM (Dist) HoD (Com)	Tech Officers HoU (Billing)/C	Com loss					
		Actual																												
2.14	Monitor the progress of the NRW reduction operations of each SMA	Plan					■	■	■		■	■										Area Office	AM		NRW reduciion					
		Actual																												
a	Operation for invisible leakage	Plan																				AM	AAM (Dist)	Tech Officers (Dist)	NRW reduciton					
		Actual																												
b	Operation for customer meter malfunction	Plan																				AM	ditto	ditto	Com loss					
		Actual																												
c	Operation for Ilegal connection	Plan																				AM	AAM (Dist) HoD (Com)	Tech Officers HoU (Billing)	Com loss					
		Actual																												

Annex 1-2 Tentative Plan of Operation (PO)

Activities / Sub-Activities	Year / Qr	Responsible Org (Nigeria)	Responsible Person (Nigeria)	Implementors (Nigeria)	Japanese Experts	Other Major Inputs: Japan	Other Major Inputs: Nigeria	Remarks	Achievements	Issue & Countermeasures
2.15 Measure level of NRW of each SMA at the end of the respective operations	Plan / Actual	Area Office	AM		NRW reduction					
a Measure in/outflows	Plan / Actual	ditto	AAM (Dist)	Tech Officers (Dist)						
b Survey water consumption	Plan / Actual	ditto	AAM (Com)	Meter Readers						
c Calculate NRW ratio	Plan / Actual	Dist Dpt	HoU (Logistics)/D	Logistics officer						
<Documentation>										
2.16 Prepare a repont on pilot projects, covering Activity 2-1~2-15	Plan (Interim, Final) / Actual	Dist. Dpt	HoD (D)	NRW Mgt Team AM	CA, NRW reduction, Leakage detection, Com loss					
2.17 Develop manuals for NRW reduction for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials	Plan (Draft, Finalization, Modification as needed) / Actual	Dist. Dpt	HoD (D)	NRW Mgt Team, AM, AAM (Dist)((Com)						
Output 3: A mid-term strategic plan of FCTWB for NRW reduction is developed, utilizing the results of Output 1-2		FCTWB	PM		CA					
3.1 Establish a Working Group for NRW planning	Plan / Actual	FCTWB	PM	Working Group	CA, NRW planning					
3.2 Review existing plans, implementation structure, on-the-job training mechanism, etc. related to NRW reduction at FCTWB	Plan / Actual	FCTWB	PM	Working Group	Hydaraulic analysis					
3.3 Conduct hydraulic and water pressure distribution analyses of the pipeline networks	Plan / Actual	Dist. Dpt	HoU (Logistics)/D	HoU (Logistics) & Logistics officer HoU (GIS)& GIS officer	ditto					
3.4 Develop outlines for the mid-term strategic plan and its annual NRW reduction plan (approval by the Director)	Plan / Actual	FCTWB	PM	Working Group	CA, NRW planning					
3.5 Develop the first mid-term strategic plan (2018-2022) for approval by FCTA	Plan / Actual	FCTWB	PM	Working Group	CA, NRW planning,NRW reduction Com loss					
3.6 Develop an annual NRW reduction plan based on the strategic plan as an integral part of an annual recurrent and capital plan of FCTWB for approval by FCTA	Plan / Actual	FCTWB	PM	Working Group	ditto					
3.7 Develop a planning manual for NRW reduction	Plan / Actual	FCTWB	PM	Working Group	ditto					
Duration / Phasing	Plan / Actual									

Project Management and Coordinaiton	Year / Qr	Responsible Org (Nigeria)	Responsible person	Implementors	Japanese Experts	Other Major Inputs: Japan	Other Major Inputs: Nigeria	Remarks	Issue	Solution
Planning, Monitoring, and coordination			PM		CA					
0.1 OrganizeJoint Coordination Committee	Plan / Actual	FCTWB	PM	Dy. PM	CA and other Experts			JCC to discuss APO will be held in November		
0.2 Develop Detailed Plan of Operation (DPO) for review and approval by JCC	Plan / Actual	FCTWB	PM	Dy. PM, NRW Mgt Team, AM	ditto					

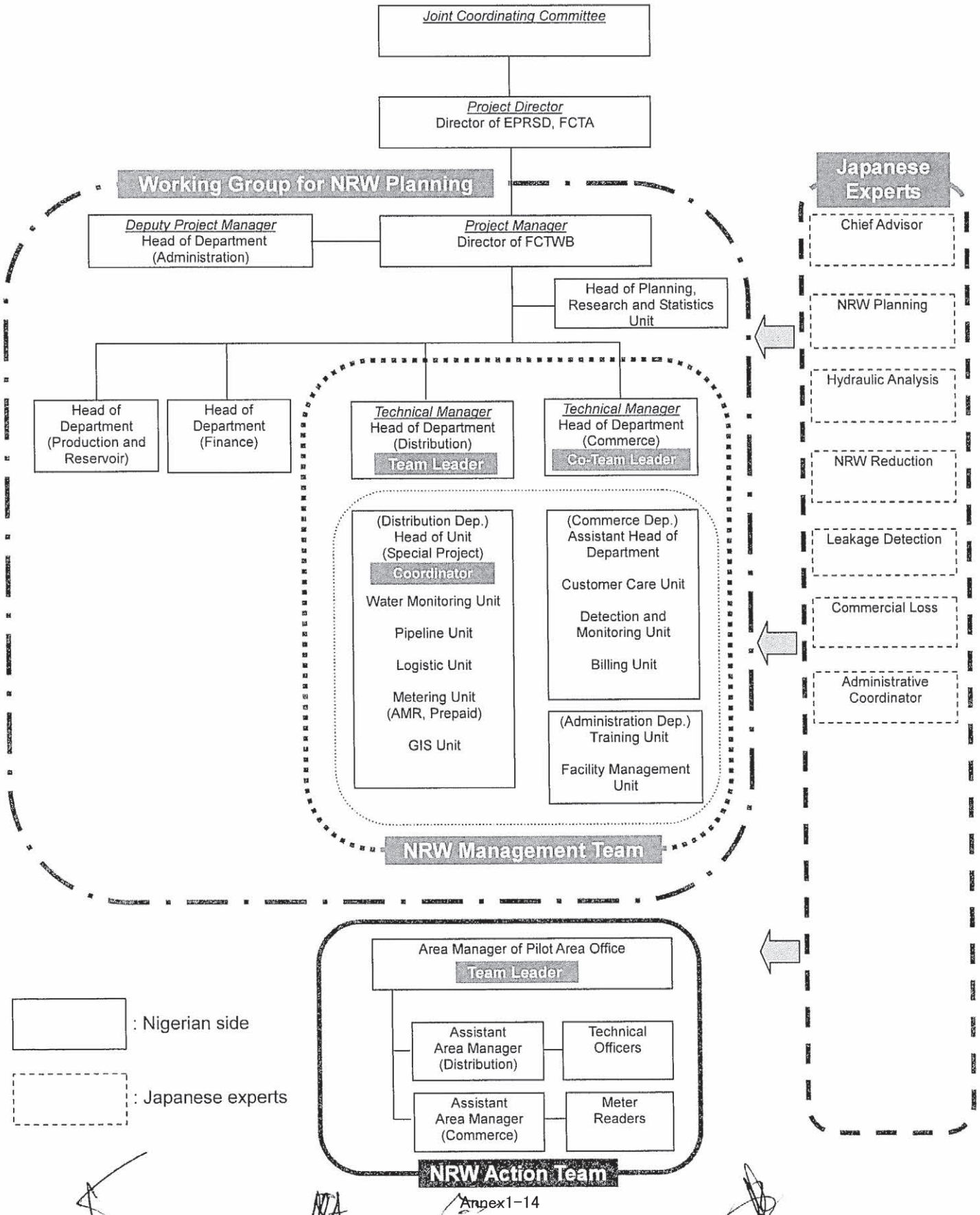
Annex1-12

Annex 1-2 Tentative Plan of Operation (PO)

Activities / Sub-Activities		Year	1st Year				2nd Year				3rd Year				4th Year				5th	6th	7th	Responsible Org (Nigeria)	Responsible Person (Nigeria)	Implementors (Nigeria)	Japanese Experts	Other Major Inputs		Remarks	Achievements	Issue & Countermeasures
		Qr	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV								Japan	Nigeria			
0.3	Develop Annual Plan of Operation (APO) for review and approval by JCC .	Plan																				FCTWB	PM	Dy. PM, NRW Mgt Team, AM	CA and other Experts			APO will be prepared in pararrel with FCTWB's annual recurrent and capital plan		
		Actual																												
0.4	Organize monthly tehchnical meetings	Plan																				Dist. Dpt	NRW Mgt Team Coordinator	NRW Mgt Team, AM	ditto			Progress of previous month and plan for the next month, issues&solutions, etc discussed		
		Actual																												
0.5	Organize quarterly project meeting	Plan																				FCTWB	PM	Dy PM, NRW Mgt Team, AM	ditto			Progress of previous quarter and plan for the next quarter, issues &solutions, etc discussed		
		Actual																												
0.6	Conduct Joint Monitoring semi-annually	Plan																				FCTWB	PM	ditto	ditto			Achievment of PDM and progress of PO monitored		
		Actual																												
0.7	Submit Monitoring Sheet to JICA Nigeria Office semi-annually	Plan																							CA					
		Actual																												
0.8	Monitoring Mission from JICA for Joint Review	Plan																				JICA	JICA HQ	To be determined						
		Actual																												
0.9	Organize information sharing seminars for FCTWB /FCTA, including Area Offices	Plan		Kick Off												Final						FCTWB	PM	Dy. PM	CA, Administrative Coordinator (AC)					
		Actual																												
0.10	Collect and organize data for Indicators of PDM	Plan																				Dist.Dpt	NRW Mgt Team							
		Actual																												
a	Develop criteria for capacity assessment for each level of the relevant staff (i.e. members of NRW Mgt Team and NRW Action Teams)	Plan																				Dist.Dpt	NRW Mgt Team Coordinator	NRW Mgt Team AM	CA and other Experts			Indicator for Project Purpose		
		Actual																												
b	Conduct joint capacity assessment of the relevant staff	Plan																				Dist.Dpt	NRW Mgt Team	NRW Mgt Team AM	CA and other Experts			ditto		
		Actual																												
c	Set reduction target for each PMA (by the first quarter of the second year)	Plan																				Dist.Dpt	NRW Mgt Team	NRW Mgt Team AM	CA and other Experts			ditto		
		Actual																												
d	Collect and orgnize data for Indicators for semi-annual Joint Monitoring	Plan																				Dist.Dpt	NRW Mgt Team Coordinator	NRW Mgt Team AM	CA and other Experts					
		Actual																												
Reports/Documents																														
0.11	Project Completion Report	Plan																				Dist. Dpt	HoD (Dist)	NRW Mgt Team AM	CA and other Experts					
		Actual																												
Public Relations																														
0.12	Develop Project Website	Plan																				Dist. Dpt	NRW Mgt Team coordinator	NRW Mgt Team, AM	CA, AC					
		Actual																												
0.13	Preparation of public relation materials	Plan																				FCTWB	PM	PM	CA, AC			Public Relation Unit under Director (PM) will collaborate		
		Actual																												
Monitoring and Evaluation in the Post-Project period																														
0.13	Post Monitoring by JICA	Plan																	•	•		JICA								
		Actual																												
0.14	Post Evaluation by JICA	Plan																			•	JICA								
		Actual																												

Annex1-19

Project Organization Chart



Annex 1- 4

List of Proposed Members of Joint Coordinating Committee

1. Chairperson: Project Director (Director of Economic Planning, Research and Statistics Department, Federal Capital Territory Administration)

2. Members
   (1) Nigerian side:
      1) Representative(s) of National Planning Commission
      2) Representative(s) of Executive Secretary of Federal Capital Development Authority
      3) Representative(s) of Federal Ministry of Water Resources
      4) Project Manager (Director of Federal Capital Territory Water Board)
      5) Deputy Project Manager (Head of Administration and Supply Department, Federal Capital Territory Water Board)
      6) Technical Manager (Head of Distribution Department, Federal Capital Territory Water Board)
      7) Technical Manager (Head of Commerce Department, Federal Capital Territory Water Board)
      8) Head of Finance Department, Federal Capital Territory Water Board
      9) Head of Production and Reservoir Department, Federal Capital Territory Water Board

   (2) Japanese side:
      1) Chief Advisor
      2) Other experts
      3) Representatives of JICA Nigeria Office
      4) Other personnel as mutually agreed upon

TO CR of JICA NIGERIA OFFICE

PROJECT MONITORING SHEET

Project Title : _____

Version of the Sheet: Ver.●● (Term: Month, Year - Month, Year) _____

Name: _____

Title: Chief Advisor _____

Submission Date: _____

I. Summary

1 Progress

1-1 Progress of Inputs

1-2 Progress of Activities

1-3 Achievement of Output

1-4 Achievement of the Project Purpose

1-5 Changes of Risks and Actions for Mitigation

1-6 Progress of Actions undertaken by JICA

1-7 Progress of Actions undertaken by Gov. of Republic of Nigeria

1-8 Progress of Environmental and Social Considerations (if applicable)

1-9 Progress of Considerations on Gender/Peace Building/Poverty Reduction (if applicable)

1-10 Other remarkable/considerable issues related/affect to the project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs etc.)

2 Delay of Work Schedule and/or Problems (if any)

2-1 Detail

2-2 Cause

2-3 Action to be taken

2-4 Roles of Responsible Persons/Organization (JICA, Gov. of Republic of Nigeria)

3 Modification of the Project Implementation Plan

3-1 PO

3-2 Other modifications on detailed implementation plan

(Remarks: The amendment of R/D and PDM (title of the project, duration, project site(s), target group(s), implementation structure, overall goal, project purpose, outputs, activities, and input) should be authorized by JICA HDQs. If the project team deems it necessary to modify any part of R/D and PDM, the team may propose the draft.)

4 Preparation of Gov. of Republic of Nigeria toward after completion of the Project

II. PDM&PO as Project Monitoring Sheet I & II

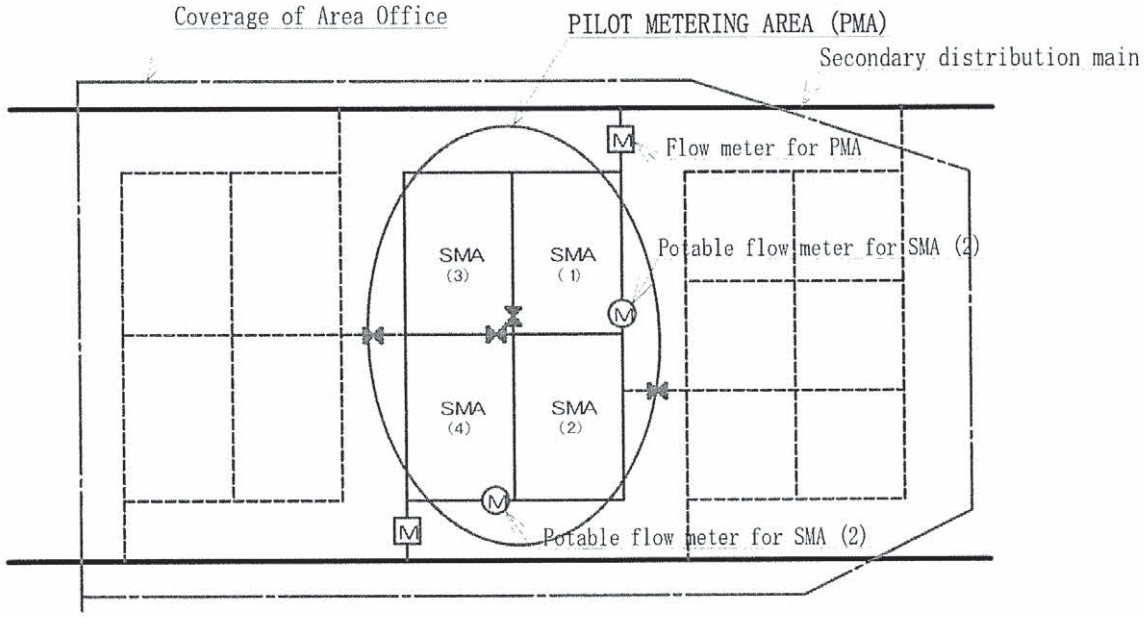
Annex 2-1

Selection criteria

Selection criteria of Pilot Metering Area are as follows:

1) Safety for night works is secured in measuring minimum night flow;
2) Distribution network is separated and it is easy to isolate it in measuring NRW rate; and
3) NRW rate is supposedly high.

Definition of Pilot Metering Area (PMA) and Sub Metering Area (SMA) is as shown below.



Pilot Metering Area is a separated distribution network and covers approximately 1,000-1,500 service connections. Pilot Metering Area is also further divided into several Sub Metering Areas which cover approximately 200-500 service connections each and hydraulically separated for NRW measuring purpose.

Annex2-2

Tentative List of Personnel assigned for the Project

(1) Project Director: Mr. Ari Isa Muhammad, Director of Economic Planning Research and Statistics Department, FCTA

(2) Project Manager: Mr. M.O.Adebayo, Director of FCTWB

(3) Deputy Project Manager: Mr. S.T Bello, Head of Administration and Supply Department, FCTWB

(4) Technical Manager: Engr. A. A. Nahuche, Head of Distribution Department, FCTWB

: Mr. Hudu Bello, Head of Commerce Department, FCTWB

(5) Members of NRW Management Team

(a) Distribution Department

	Name of staff	Position in FCTWB	Remarks
1	Abolade. R. Lawal	Head of Special Project Unit	Coordinator of NRW Management Team
2	Yetunde Olaniyan	Head of Water Monitoring Unit	
3	A.O. Akande	Head of Metering Unit (AMR Meter)	
4	Abdullahi Masaud	Head of Metering Unit (pre-paid Meter)	
5	Musa Dikko	Head of pipeline Unit	
6	Mohammed Dauda	Technical Officer , Pipeline Unit	
7	Moh. KabiruRabiu	Head of Logistic Unit	
8	AbubakarUbale Abubakar	Civil Engr. II, Logistic Unit,	
9	Shehu Suleiman	Head of GIS Unit	
10	Ezeh Hilary	Surveyor, GIS Unit	

(b) Commerce Department

	Name of staff	Position in FCTWB	Remarks
1	Adis Mohammed	Assistant Director	
2	Isaac O. Owolabi	Head of Customer Care Unit	
3	Danjumalsah	Head of Monitoring and Detection Unit	
4	TaiwoAdeyemi	Monitoring staff,Monitoring and Detection Unit	
5	Rose Akpan	Head of BillingUnit	
6	SulemanAgbawn	Billing Officer,Billing Unit	

(c) Administration and Supply Department

	Name of staff	Position in FCTWB	Remarks
1	Francisca Samuel	Head of Training/ Welfare Unit	
2	Bakare Christopher Imafidon	Technical Officer, Facility Unit	

(6)Head of other relevant Departments and Unit

	Name of staff	Position in FCTWB	Remarks
1	Hafsat Ahmed Lawi	Head of Financial Department	
2	Aliyu Usman	Head of Reservoir Department	
3	BunmiOlowookere	Head of Planning, Research and Statistics Unit	

(7)Member of Pilot NRW Action Team

(a) Jabi

	Name of staff	Position in FCTWB	Remarks
1	Muhammed A.S. Ramat	Area Manager (Distribution)	
2	Abawonse J.K	Assistant Area Manager (Commerce)	
3	Sadiq Salihu	Assistant Area Manager (Distribution)	
4	Aliyu Ibrahim	Senior Works Superintendent (Distribution)	
5	Mahmud Muhammed	Foreman (Distribution)	
6	Abubakar Danladi	Foreman (Distribution)	
7	Jummai Ugbodaga	Senior Commercial Officer (Commerce)	
8	Mohammed Moh'd	Planning Officer (Commerce)	
9	Raliat Zubairu	Higher Trade Officer (Commerce)	

(b) Gudu

	Name of staff	Position in FCTWB	Remarks
1	Kenneth N. Azih	Area Manager (Distribution)	
2	Ogbu O. Williams	Assistant Area Manager (Commerce)	
3	Abdul Ozumi	Assistant Area Manager (Distribution)	
4	Adamulsmaila	Unit Head (Commerce)	
5	Umar I. Adamu	Assistant Tech. Officer (Commerce)	
6	Kotangora Mohammed	Assistant Unit Head (Distribution)	
7	Salisu Mohammed	Plumber (Distribution)	

(b) Garki 1

	Name of staff	Position in FCTWB	Remarks
1	SulemanAminat Mohammed	Area Manager (Commerce)	
2	Umar Ibrahim	Assistant Area Manager (Commerce)	
3	Mohammed Gana	Assistant Area Manager (Distribution)	
4	Olusegun Rose	Senior Trade Office (Commerce)	
5	Abdulahi Ibrahim	Assistant Tech. Officer (Commerce)	
6	IliyaGaladima	Higher Works Superintendent (Distribution)	
7	Raymond Olowookere	Forman (Distribution)	
8	Ibrahim Yelwa	Forman (Distribution)	
9	Hassan Abubakar	Commerce Officer (Commerce)	
10	Shehu Isa	Craftsman (Distribution)	

Annex 2:

Minutes of Meetings of JCC (M/M)
and
PDM Revision

MINUTES OF MEETING
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
FEDERAL CAPITAL TERRITORY ADMINISTRATION
FEDERAL REPUBLIC OF NIGERIA
ON
THE JAPANESE TECHNICAL COOPERATION
FOR
THE FEDERAL CAPITAL TERRITORY
REDUCTION OF NON-REVENUE WATER PROJECT

Based on the Record of Discussion signed on 17th July 2014(hereinafter referred to as "the R/D"), the mission of Japan International Cooperation Agency (hereinafter referred to as "JICA") visited the Federal Republic of Nigeria (hereinafter referred to as "Nigeria") to officially commence the Federal Capital Territory Reduction of Non-Revenue Water Project (hereinafter referred to as "the Project") with the JICA Expert Team who will cooperate with the Federal Capital Territory Water Board (hereinafter referred to as "FCTWB") for implementation of the Project, and had a series of discussions with the Federal Capital Territory Administration (hereinafter referred to as "FCTA") and FCTWB.

As a result of discussions, both Nigerian and Japanese sides confirmed the matters referred to in the document attached hereto.

Abuja, 6th November 2014

Mr. OMURA Yoshiki
Leader,
Monitoring Mission Team,
Japan International Cooperation Agency
Japan

Mr. Ari, Isa Muhammad
Director,
Economic Planning, Research and Statistics Department,
Federal Capital Territory Administration,
Federal Republic of Nigeria

Mr. MIYOSHI Akinori
Chief Advisor,
JICA Expert Team

Mr. Hudu Bello
Director,
Federal Capital Territory Water Board,
Federal Capital Territory Administration,
Federal Republic of Nigeria

ATTACHED DOCUMENT

1. Work Plan

Nigerian side understood the overview of draft Work Plan as attached and agreed that the Work Plan will be finalized through discussions between the JICA Expert Team and FCTWB and approved by the first Joint Coordinating Committee (hereinafter referred to as "1st JCC") to be held at the beginning of December 2014.

Both Nigerian and Japanese sides agreed that Monitoring Sheet Ver. 1 shall be used to regularly monitor the Project as attached. Both sides also agreed that the quantities and specifications of necessary equipment to be purchased by JICA will be decided through discussions between the JICA Expert Team and FCTWB based on the tentative equipment list as attached, and will be approved by 1st JCC.

2. Project Members

Based on the tentative list attached on the R/D, the personnel participating in the Project were assigned by Project Manager as attached and will be approved by 1st JCC. The responsible person for each activity was assigned from both Nigerian and Japanese sides as shown in Monitoring Sheet Ver. 1.

3. Project Budget

FCTWB explained that 2015 budget necessary for implementing the Project was proposed to FCTA and assured that the budget will be operational without any problem for the project implementation.

4. Office Space and Facilities

Both Nigerian and Japanese sides confirmed that the office space and necessary facilities for the JICA Expert Team at FCTWB Head Office was properly prepared by FCTWB. However, the office space at each pilot Area Office was found unprepared. FCTWB assured that the office space, store room and necessary facilities including electricity at each pilot Area Office shall be ready by the end of April 2015 before the commencement of pilot project.

(End of document)

Appendix 1: Overview of draft Work Plan
Appendix 2: Monitoring Sheet Ver. 1
Appendix 3: Tentative List of equipment for the Project
Appendix 4: List of personnel assigned for the Project

Japan International Cooperation Agency
Federal Capital Territory Administration
Federal Capital Territory Water Board

The Federal Capital Territory
Reduction of Non-Revenue Water Project

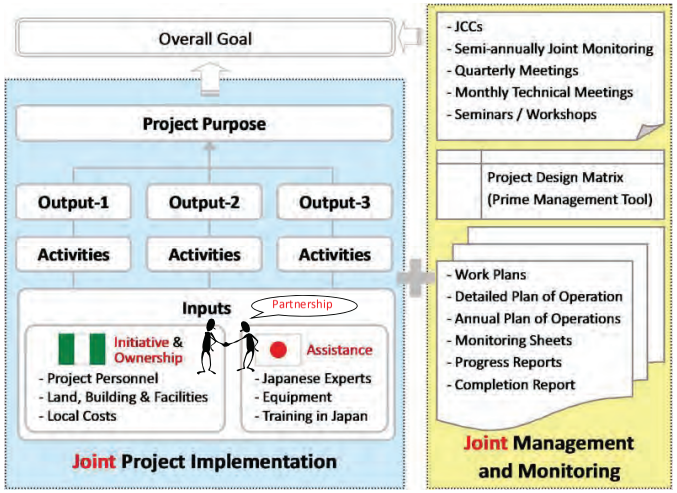
Overview of
Draft Work Plan

November 2014

JICA Expert Team

Contents

1. Principle of the Project



2. Outline of the Project

Project Period

Phase-1: October 2014 to December 2016

Phase-2: January 2017 to March 2018

Overall Goal, Project Purpose and three Outputs

See the page 5&6

Project Areas

Federal Capital Territory (FCT)

Pilot Areas: Garki I, Gudu and Jabi

Organizations concerned (Counterparts) in Nigeria Side

Federal Capital Territory Administration (FCTA)

Federal Capital Territory Water Board (FCTWB)

Project Implementing Structure

See the page 7

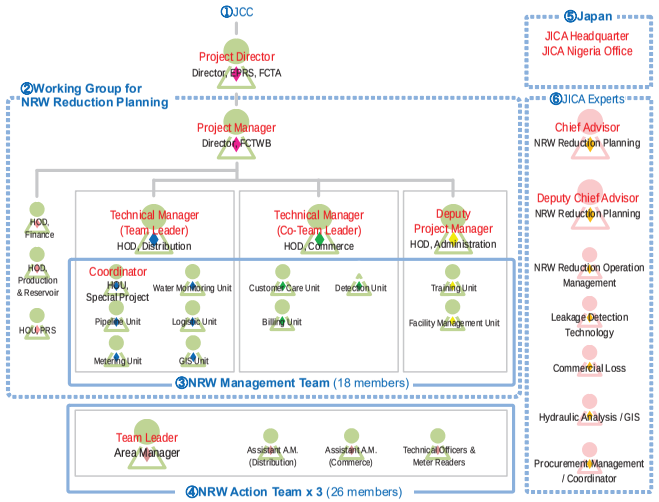
Overall Goal, Project Purpose and Three Outputs

Overall Goal	**Level of Non-Revenue Water (NRW) is reduced at the service area of FCTWB.**
Indicator	a. Annual NRW ratio is reduced to X% at the end of the year 2021
Project Purpose	**Capacity of FCTWB for NRW reduction is strengthened.**
Indicator	a. The medium-term strategic plan (2018-2022) is approved by FCTA.
	b. NRW reduction operations of the first quarter of 2018 are carried out.
	c. Relevant staff become equipped with skills and knowledge necessary for NRW reduction.
	d. NRW ratio of each PMA in the last quarter of the Project reaches its respective target.

Overall Goal, Project Purpose and Three Outputs (Continued)

Output-1	**Level of NRW of the service area of FCTWB is monitored regularly.**
Indicator	1a: Record of monthly NRW ratio is kept.
	1b: Monthly NRW ratio is reported.
	1c: Quarterly NRW ratio is reported.
Output-2	**Methods/operational procedures for effective NRW reduction are established though pilot projects at Pilot Metering Areas (PMAs) under pilot Area Offices.**
Indicator	2a: Decrease rate of NRW ratio for each Sub Metering Area reaches at least 80% of its target.
	2b: Technical manuals are approved.
Output-3	**A medium-term strategic plan of FCTWB for NRW reduction is developed, utilizing the results of Output 1-2.**
Indicator	3a: Draft medium-term strategic plan (2018-2022) is submitted by FCTWB to FCTA
	3b: An annual NRW reduction plan (2018) is incorporated in FCTWB's annual recurrent and capital plan (2018).
	3c: A planning manual for NRW reduction is approved.

Project Implementing Structure



Relationship Matrix between Nigerian Counterparts and JICA Experts in terms of their major roles in the Project Implementation

Nigerian Counterparts / JICA Experts	Working Group for NRW Reduction Planning						NRW Management Team													NRW Action Team				
	Project Director / Director, EPRS, FCTA	Project Manager Director, FCTWB	Deputy P.M. HOD, Administration	HOD, Finance	HOD, Production	HOU, PRS	Technical Manager HOD, Distribution	Technical Manager HOD, Commerce	Coordinator / HOU, Special Project Unit	Pipeline Unit	Metering Unit	W. Monitoring Unit	Logistics Unit	GIS Unit	Cust. Care Unit	Billing Unit	Detection Unit	Training Unit	Facility Mngmt. Unit	Area Manager	Assistant A.M. (Dist.)	Assistant A.M. (Com.)	Technical Officers	Meter Readers
Chief Advisor / NRW Reduction Planning	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
Deputy Chief Advisor / NRW Reduction Planning	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
NRW Reduction Operation Management							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Leakage Detection Technology							■		■	■	■	■								■	■		■	
Commercial Loss								■	■		■	■			■	■	■			■	■	■		■
Hydraulic Analysis / GIS							■		■	■				■						■	■			
Procurement Mngmt. / Coordinator			■				■	■	■				■											

3. Current Status & Issues of Water Supply in Federal Capital City

1. Strengthening of Management and Organization

Future independence, inefficient personnel

2. Improvement in Financial Situation

Depression in tariff collection ratio, weak financial management, etc.

3. Increase in Water Service Coverage

Delay in development and construction, facility deterioration, etc.

Our Project !

4. NRW Reduction

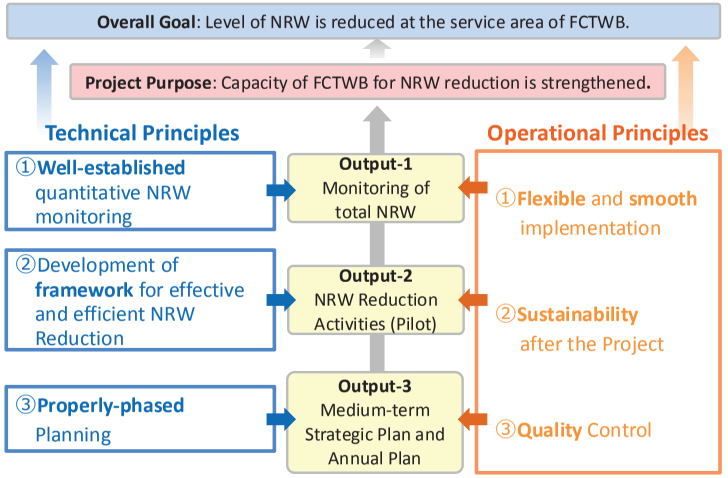
Absence of planning, shortage of skilled manpower, absence of quantitative monitoring system by bulk flow meters, passive leakage detection, etc.

4. Expected Impact of NRW Reduction

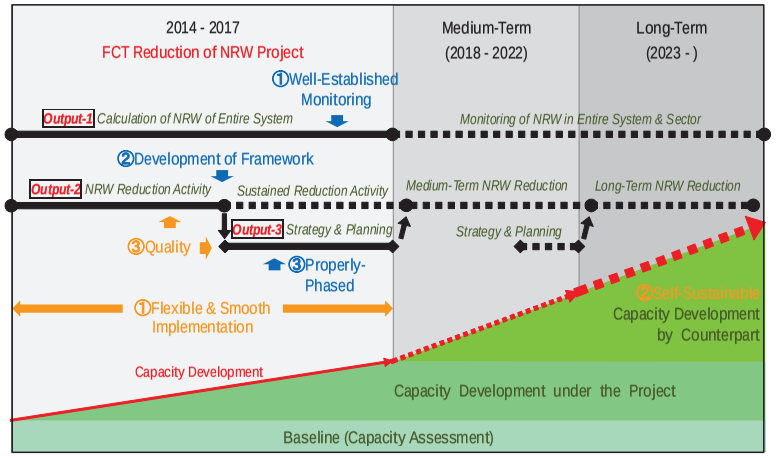
Items	NRW:38% (currently estimated)	NRW:20% (Tentative Target)	Impact	Calculation Conditions
Population to be served	1.96 mill	2.53 mill	Additional 0.57 mill	Supply Capacity: estimated 624,000m³/day, Per-Capita Consumption: 197LCD
Demand exceeds Supply (When new WTP is needed.)	2017	2024	7 years postponed	Population projection until 2050 by FCTWB
Daily Water Consumption (Billed water)	162,400m³	209,600m³	47,000m³	Actual daily supply: 262,000m³
Annual Revenue	N4.74bln	N6.12bln	N1.38bln	Water tariff (domestic): N80/m³
Cost saving of WTP (Rough estimate)	-	-	N16.8bln	47,000m³/day x N3,600/m³/day

Source: JICA Detailed Planning Survey, 2014

5. Principles of the Project Implementation

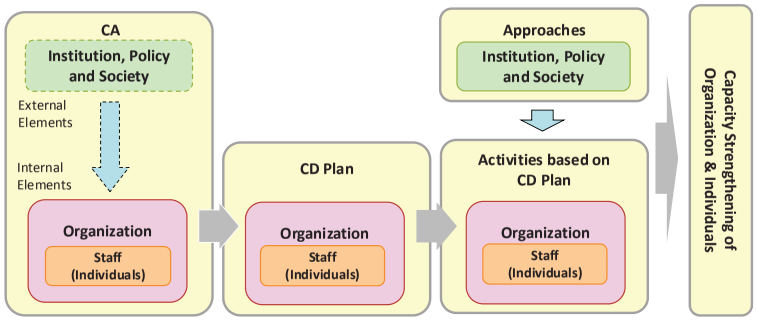


Relationship in Timeframe between Principles and the Project Flow



6. Capacity Assessment and Capacity Development Plan

CA and CP plan are for both **Organization** and **Individuals** with approaches to **Institution, Policy and Society**, as a triadic component.



* CA and CD Planning by **jointly** the JICA Expert Team and the Management of FCTWB.
* **Interim assessments** of organization and individuals will be conducted **annually**.

7. Capacity Development for Individuals

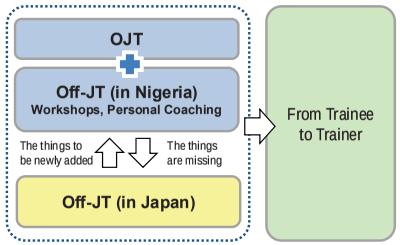
- **Expansion** of transferred skills and knowledge into the **whole** FCC water supply services and other Area Offices after the Project. (Trainee to Trainer)
- Technical meetings and workshops organized under **the initiative of FCTWB staff** with support of the JICA Expert Team.

Trainings in Japan

1. 1st Training for the NRW Management Team in charge of Output-1 to 3 (in 2015)
2. 2nd Training for the NRW Action Team in charge of Output-2 (in 2016)
3. 3rd Training for the Working Group for NRW Reduction Planning in charge of Outpu-3 (in 2017)

**Supposedly in Yokohama City.*

Capacity Development for Individuals



8. Activities for Output-1

1-1	**Install bulk meters to water treatment plants 1 and 2.** ** Four ultrasonic flow meters, chamber and monitoring room if needed (to be constructed by FCTWB).*
1-2	**Measure monthly water production of water treatment plants 1, 2, 3, and 4.**
1-3	**Tally the above water production data monthly.**
1-4	**Calculate the monthly water consumption based on the billing data.** **Modification of programme of billing and collection system.*
1-5	**Calculate monthly NRW ratio of the service area of FCTWB using the data obtained from Activity 1-3 and 1-4.**

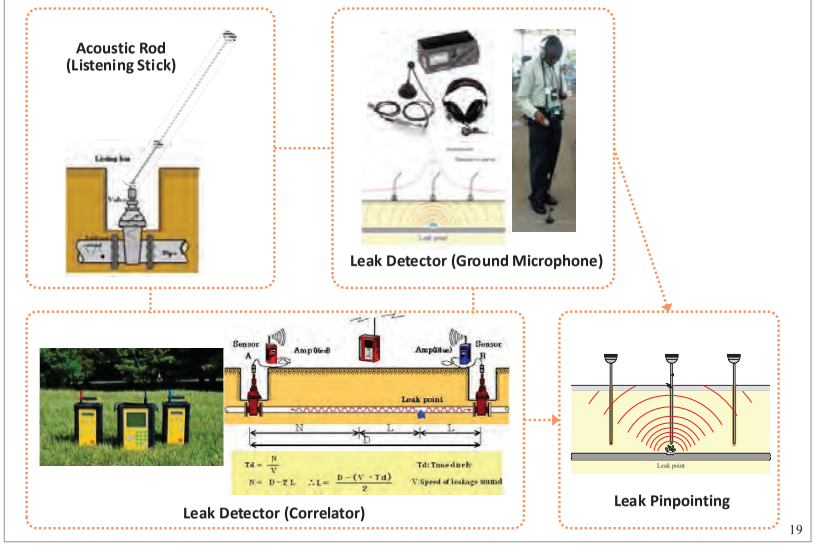
9. Activities for Output-2

2-1	**Review existing NRW reduction operations at each pilot Area Office.**
2-2	Conduct capacity assessment of the relevant staff of each pilot Area Office.
2-3	**Identify and select a Pilot Metering Area (PMA) for each pilot Area Office based on the selection criteria of PMA.**
2-4	Prepare/update distribution network drawings for each PMA. ** GIS software, Mesh management, comprehensive mapping system, GIS & database training*
2-5	**Install water flow meters to each PMA and measure in/outflows monthly.**
2-6	Zone each PMA into Sub Metering Areas (SMA).
2-7	**Isolate a SMA by installing valves.**
2-8	**Update the distribution network drawings for each SMA.**
2-9	**Measure an initial level of NRW of each SMA.** ** Water balance analysis (IWA)*
2-10	**Detect target NRW components (i.e. invisible leakage, customer meter malfunction, and illegal connection) of each SMA.** ** Minimum Night Flow survey, step test, leakage detector, correlator, etc*

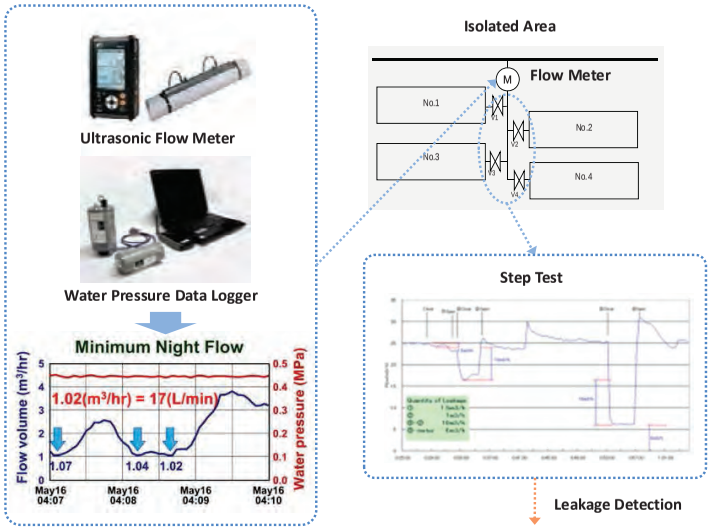
9. Activities for Output-2 (Continued)

2-11	Develop a NRW reduction operation plan of each SMA, including reduction target, for review by Head of Distribution Department.
2-12	Review and approve NRW reduction operation plan of each SMA.
2-13	Implement the NRW reduction operations at each SMA. ** Leakage repair, legalization/disconnection of illegal connections, replacement/ installation of water meters*
2-14	Monitor the progress of the NRW reduction operations of each SMA.
2-15	Measure level of NRW of each SMA at the end of the respective operations. ** Minimum Night Flow survey and Water balance analysis (IWA)*
2-16	Prepare a report on pilot projects, covering Activity 2-1 to 2-15. ** Leakage density by mesh coloring*
2-17	Develop manuals for NRW reduction for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials. ** To be developed by jointly the JICA Expert Team and FCTWB. Audio visual materials by using widely-used software for continuous revision and creation by FCTWB.*

Basic Flow of Detection of Invisible Leakage



Basic Flow of Detection of Invisible Leakage (Prioritization)



10. Activities for Output-3

3-1	Establish a Working Group for NRW planning.
3-2	Review existing plans, implementation structure, on-the-job training mechanism, etc. related to NRW reduction at FCTWB. **Future establishment of specialized unit or task force*
3-3	Conduct hydraulic and water pressure distribution analyses of the pipeline networks. ** EPANET supposedly*
3-4	Develop outlines of the medium-term strategic plan and its annual NRW reduction plan. ** See the page 21*
3-5	Develop the first medium-term strategic plan (2018-2022) for approval by FCTA. ** See the page 22*
3-6	Develop an annual NRW reduction plan based on the strategic plan as an integral part of an annual recurrent and capital plan of FCTWB for approval by FCTA. ** See the page 21*
3-7	Develop a planning manual for NRW reduction.

Outlines of the Medium-term Strategic Plan and Annual NRW Reduction Plan (Tentative)

Medium-term Strategic Plan for NRW Reduction (5-year plan)	Annual NRW Reduction Plan
A. Introduction to NRW and approaches (e.g. PDCA) B. Target and indicator C. Staffing plan and their responsibilities D. HRD plan E. Summary of results of pilot projects F. Causes of NRW and their patterns by features of areas G. Flow of NRW reduction H. NRW reduction operation plan - Network drawings and data - Design and creation of DMA or equivalent (such as PMA and SMA) - Prioritization in NRW reduction - Replacement plan of existing pipelines - Field examination of existing valves, etc - Installation of flow meter - Measurement of Minimum Night Flow - Leakage detection - Repair of leaks and recording - Customer listing - Identification of illegal connections and meter inaccuracy - Data collection of billed consumption before/after NRW reduction - Measures against illegal connections and meter inaccuracy - Water balance analysis after NRW reduction operations - Safety measures I. Implementation schedule J. Estimation of total and annual costs K. Estimation of total and annual benefits L. Recommendations M. Manual for equipment	a. Relation with medium-term strategic plan for NRW reduction b. Review of target and indicator c. Staffing plan d. Flow of NRW reduction operations e. NRW reduction operations f. Implementation schedule g. Estimation of annual cost h. Estimation of annual benefit i. Reporting and workshops

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Annex2-8

Flow from Preparation of Outline to Development of The Medium-term Strategic Plan

Technical Managers with support of the JICA Expert Team should take on **leading roles** to develop the first medium-term strategic plan and make it **feasible** in consideration of **cost and budget allocation**, based on the **results of pilot projects** in the Phase-1.

Period	Flow	Members in charge in FCTWB
February 2017 -	Draft Outline and Time-line	◆ Project Manager, Deputy Project Manager
March 2017 -	Draft Contents	◆ Project Manager, Deputy Project Manager ◆ NRW Management Team Leaders
April 2017 -	Nomination of members in charge of planning	◆ Project Manager, Deputy Project Manager ◆ NRW Management Team Leaders
May 2017 -	Finalization of Outline and Contents	◆ Project Manager, Deputy Project Manager ◆ NRW Management Team Leaders ◆ Nominated Team Members
May 2017 -	Development of Draft Medium-term Strategic Plan	◆ Project Manager, Deputy Project Manager ◆ NRW Management Team Leaders ◆ Nominated Team Members

22

11. Members of the JICA Expert Team

Akinori MIYOSHI (Mr.)
Chief Advisor /
NRW Reduction Planning

Takuji OKUBO (Mr.)
Commercial Loss

Taketoshi FUJIYAMA (Mr.)
Deputy Chief Advisor /
NRW Reduction Planning

Shinta SEGAWA (Mr.)
Hydraulic Analysis / GIS

Toru TOYODA (Mr.)
NRW Reduction Operations Management

Kazuhiro ISHIURA (Mr.)
Procurement Management / Coordinator

Kiyoshi KIYAMA (Mr.)
Leakage Detection Technology

23

To Chief Representative of JICA Nigeria Office

PROJECT MONITORING SHEETS

Project Title : The Federal Capital Territory Reduction of Non-Revenue Water Project
Version of the Sheet: Ver. 1（Term: October, 2014 - March, 2018）

Name: Akinori Miyoshi
Title: Chief Advisor
Submission Date: 6 November 2014

I. Summary

1 Progress

1-1 Progress of Inputs

1-2 Progress of Activities

1-3 Achievement of Output

1-4 Achievement of the Project Purpose

1-5 Changes of Risks and Actions for Mitigation

1-6 Progress of Actions undertaken by JICA

1-7 Progress of Actions undertaken by Nigerian side

1-8 Other remarkable/considerable issues related/affect to the project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs etc.)

2 Delay of Work Schedule and/or Problems (if any)

2-1 Detail

2-2 Cause

2-3 Action to be taken

2-4 Roles of Responsible Persons/Organization

3 Modification of the Project Implementation Plan

3-1 PO

3-2 Other modifications on detailed implementation plan

(Remarks: The amendment of R/D and PDM (title of the project, duration, project site(s), target group(s), implementation structure, overall goal, project purpose, outputs, activities, and input) should be authorized by JICA HQ. If the project team deems it necessary to modify any part of R/D and PDM, the team may propose the draft.)

4 Preparation by Nigerian side toward after completion of the Project

II. Project Monitoring Sheet I & II (as attached)

Project Monitoring Sheet I (Revision of Project Design Matrix)

Project Title: **The Federal Capital Territory Reduction of Non-Revenue Water Project** **Version** **1**
Project Period: **October 2014 to March 2018** **Dated** **6 Nov. 2014**
Implementing Organization: **Federal Capital Territory Administration (FCTA) / Federal Capital Territory Water Board (FCTWB)**
Dicrect Beneficiaries: **FCTWB, relevant staff of FCTWB Headquarters and pilot Area Offices**
Project Site: FCT **Pilot Area Offices: Jabi, Garki I and Gudu**

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
<Overall Goal> Level of Non-Revenue Water (NRW) is reduced at the service area of FCTWB	a: Annual NRW ratio is reduced to X%(*) at the end of the year 2021 Note(*): Target value (X%), which is expected to be determined in the medium-term strategic plan for NRW reduction, shall be tentatively filled when the final draft was approved by the Director of FCTWB, which shall be finalized when the plan is approved by FCTA	a. Record of NRW ratio kept by Distribution Department			
<Project Purpose> Capacity of FCTWB for NRW reduction is strengthened	a. The medium-term strategic plan for NRW reduction (2018-2022) is approved by FCTA by the end of the Project. b. NRW reduction operations of the first quarter of 2018 specified in the annual plan of the above plan are carried out according to the plan by FCTWB c. Relevant staff of FCTWB (i.e. members of NRW Management Team and Pilot NRW Action Teams) become equipped with skills and knowledge necessary for NRW reduction according to the criteria set by the Project for each level d. NRW ratio of each PMA in the last quarter of the Project reaches its respective target (**) Note(**): Target for each PMA is expected to be determined by the end of the first quarter of the second year	a. Date of approval of the plan b. Result of monitoring by NRW Management Team c. Results of joint assessment based on the criteria set by the Project d. Record of NRW ratio kept by Distribution Department	A. Policy support for NRW reduction is not discontinued Policy support for NRW reduction is not discontinued B. Natural disaster/ political instability/ economic crisis that affect the service area of FCTWB do not occur C. Activities to implement the medium-tem strategic plan are not discontinued or delayed		
<Outputs>					
1. Level of NRW of the service area of FCWTB is monitored regularly	1a. Record of monthly NRW ratio is kept by Distribution Department from the third quarter of the first year of the Project 1b. Monthly NRW ratio of the service area of FCTWB is reported to its monthly Joint Management Meeting from the third quarter of the first year of the Project 1c. Quarterly NRW ratio of the service area of FCTWB is reported to the Board of Directors of FCTWB from the third quarter of the first year of the Project	1a. Monthly record of NRW ratio. 1b&1c. Material for meetings submitted by the Distribution Department	A. Staff of FCTWB (i.e. members of NRW Management Team and Pilot NRW Action Teams) trained through the Project do not leave the office in large numbers		
2. Methods/operational procedures for effective NRW reduction are established through pilot projects at Pilot Metering Areas (PMAs) under pilot Area Offices (*1)	2a. Decrease rate of NRW ratio for each Sub Metering Area of a PMA reaches at least 80% of its target at the end of the respective NRW reduction operations 2b. Technical manuals for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials, are approved by Head of Department (HoD) for Distribution and HoD for Commerce by the first quarter of the third year of the Project	2a. Record of NRW ratio kept by the Distribution Department 2b. Date of approval of the manuals			
3. A medium-term strategic plan of FCTWB for NRW reduction is developed, utilizing the results of Output 1-2 (*2)	3a. By October 2017, draft medium-term strategic plan for NRW reduction (2018-2022) is submitted by FCTWB to FCTA for review and approval 3b. By October 2017, an annual NRW reduction plan (2018) is incorporated in FCWTB's annual recurrent and capital plan (2018) for submission to FCTA for review and approval 3c. A planning manual for NRW reduction is approved by the Director of FCTWB by the end of the Project	3a&3b. Date of official letter submitting draft strategic plan and annual recurrent and capital plan 3c. Date of approval of the manual			

Annex2-6

Note (*1): NRW components targeted by Output 2 are (i) invisible leakage; (ii) customer meter malfunction; and (iii) illegal connection
Note (*2): A medium-term strategic plan is a five-year plan, which may include medium-term target, strategies and actions, timeframe, human resource requirement, on-the-job training mechanism, cost-benefit analysis of NRW reduction, etc. It is noted that NRW components addressed by the strategic plan are not limited to the ones mentioned in (*1) above: they shall be discussed and determined in developing the outline of the strategic plan (through Activity 3-4).

Activities	Inputs		Important Assumption
	The Nigerian Side	**The Japanese Side**	A Natural disaster/political/ instability/economic crisis that affect the project activities do not occur
1-1 Install bulk meters to water treatment plants 1 and 2 1-2 Measure monthly water production of water treatment plants 1, 2 ,3, and 4 1-3 Tally the above water production data monthly 1-4 Calculate the monthly water consumption based on the billing data 1-5 Calculate monthly NRW ratio of the service area of FCTWB using the data obtained from Activity 1-3 and 1-4	**Project Personnel** 1. Project Director: Director of Economic Planning, Research and Statistic Department, FCTA 2. Project Manager: Director of FCTWB 3. Deputy Project Manager: HoD for Administration and Supply/FCTWB 4. Technical Managers (Also Leaders of NRW Management Team): HoD for Distribution and HoD for Commerce /FCTWB 5. Members of NRW Management Team (FCTWB): - Head of Special Project Unit of Distribution Department (as Coordinator) - Relevant Head of Unit (HoU) and officers of the Distribution Department, Commerce Department, and Administration and Supply Department 6. Heads of other relevant Departments and Unit of FCTWB: HoD for Finance, HoD for Production, HoU for Planning Research and Statistics (PRS) 7. Members of NRW Action Team: Area Manager, Assistant Area Manager (Distribution), Assistant Area Manager (Commerce), technical officers (Distribution) and meter readers (Commerce) of each pilot Area Office 8. Other personnel mutually agreed upon as necessary **Land, Building and Facilities** 1. Office building and facilities necessary for the implementation of the Project 2. Office spaces and necessary facilities for the Japanese Experts at the FCTWB Headquarters and each Pilot Area Office, including internet connection and air conditioners 3. Other facilities mutually agreed upon as necessary **Local Costs** 1. Cost for installation, operation and maintenance of the provided equipment and cost for pipe repair at PMAs 2. Administration and operational costs, including costs for local travel for the Project Personnel	**Japanese Experts** 1. Chief Advisor / NRW Reduction Planning 2. Deputy Chief Advisor / NRW Reduction Planning 3. NRW Reduction Operations Management 4. Leakage Detection Technology 5. Commercial Loss 6. Hydraulic Analysis / GIS 7. Procurement Management / Coordinator 8. Other experts mutually agreed upon as necessary **Equipment** 1. Bulk meters for water treatment plants 2. Water flow meters, valves, and customer meters for SMA 3. Leakage detection equipment for PMA 4. Pipe repair equipment for PMA 5. Vehicles(Pick-ups) 6. Other equipment mutually agreed upon as necessary **Training of the Nigerian Project Personnel in Japan** Four persons mutually agreed upon will be trained in Japan annually	**Pre-Conditions** A Furnished offices for Japanese Expert Team are secured at Headquarters and each Pilot Area Office of FCTWB B Project Personnel is assigned with the finalized list
2-1 Review existing NRW reduction operations at each pilot Area Office 2-2 Conduct capacity assessment of the relevant staff of each pilot Area Office 2-3 Identify and select a Pilot Metering Area (PMA) for each pilot Area Office based on the selection criteria of PMA(*3) 2-4 Prepare/update distribution network drawings for each PMA 2-5 Install water flow meters to each PMA and measure in/outflows monthly 2-6 Zone each PMA into Sub Metering Areas (SMA) 2-7 Isolate a SMA by installing valves 2-8 Update the distribution network drawings for each SMA 2-9 Measure an initial level of NRW of each SMA 2-10 Detect target NRW components (i.e. invisible leakage, customer meter malfunction, and illegal connection) of each SMA 2-11 Develop a NRW reduction operation plan of each SMA ,including reduction target, for review by Head of Distribution Department 2-12 Review and approve NRW reduction operation plan of each SMA 2-13 Implement the NRW reduction operations at each SMA 2-14 Monitor the progress of the NRW reduction operations of each SMA 2-15 Measure level of NRW of each SMA at the end of the respective operations 2-16 Prepare a report on pilot projects, covering Activity 2-1~2-15 2-17 Develop manuals for NRW reduction for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials			**Issues & Countermesures**
3-1 Establish a Working Group for NRW planning (*4) 3-2 Review existing plans, implementation structure, on-the-job training mechanism, etc. related to NRW reduction at FCTWB 3-3 Conduct hydraulic and water pressure distribution analyses of the pipeline networks 3-4 Develop outlines of the medium-term strategic plan and its annual NRW reduction plan 3-5 Develop the first medium-term strategic plan (2018-2022) for approval by FCTA 3-6 Develop an annual NRW reduction plan based on the strategic plan as an integral part of an annual recurrent and capital plan of FCTWB for approval by FCTA 3-7 Develop a planning manual for NRW reduction			

Note (*3) Selection criteria of PMA are as follows: (i) Safety for night works is secured in measuring minimum night flow: (ii) Distribution network is separated and it is easy to isolate it in measuring NRW ratio: and (iii) NRW ratio is supposedly high.
Note (*4) Working Group for NRW planning would consist of Project Manager (as chair), Deputy Project Manager, Technical Managers, Head of Finance Dept., Head of Production Dept., Head of PRS Unit, and members of NRW Management Team.

Project Monitoring Sheet II (Revision of Plan of Operation)

Plan of Schedule and Actual Work Period

Project Title: The Federal Capital Territory Reduction of Non-Revenue Water Project

Version 1
Dated 6 Nov. 2014

Activities				2014 Oct. 1	Nov 2	Dec 3	Jan 4	Feb 5	Mar 6	Apr 7	May 8	Jun 9	Jul 10	Aug 11	Sep 12	Oct 13	Nov 14	Dec 15	2015 Jan 16	Feb 17	Mar 18	Apr 19	May 20	Jun 21	Jul 22	Aug 23	Sep 24	Oct 25	Nov 26	Dec 27	2016 Jan 28	Feb 29	Mar 30	Apr 31	May 32	Jun 33	Jul 34	Aug 35	Sep 36	Oct 37	Nov 38	Dec 39	2017 Jan 40	Feb 41	Mar 42	Remarks	Monitoring Achievement	Issue & Countermeasures
Output-1																																														
Level of NRW of the service area of FCTWB is monitored regularly	1-1	Install bulk meters to water treatment plants 1 and 2	R/D																																												
			WP		Survey			Installation																																							
	1-2	Measure monthly water production of water treatment plants 1, 2, 3, and 4	R/D																																												
			WP																																											
	1-3	Tally the above water production data monthly	R/D																																												
			WP																																											
	1-4	Calculate the monthly water consumption based on the billing data	R/D																																											
			WP		Review			System Modification																																							
	1-5	Calculate monthly NRW ratio of the service area of FCTWB using the data obtained from Activity 1-3 and 1-4	R/D																																											
			WP																																											
Output-2																																														
Methods/operational procedures for effective NRW reduction are established through pilot projects at Pilot Metering Areas (PMAs) under pilot Area Offices	2-1	Review existing NRW reduction operations at each pilot Area Office	R/D																																											
			WP																																											
	2-2	Conduct capacity assessment of organization and the relevant staff	R/D																																											
			WP		Baseline															Interim-1											Interim-2													Final				
	2-3	Identify and select a Pilot Metering Area (PMA) for each Pilot Area Office based on the selection criteria of PMA	R/D																																											
			WP																																											
	2-4	Prepare/update distribution network drawings for each PMA	R/D																																											
			WP																																											
	2-5	Install water flow meters to each PMA and measure in/outflows monthly	R/D																																										
			WP																																											
	2-6	Zone each PMA into Sub Metering Areas (SMA)	R/D																																										
			WP																																											
	2-7	Isolate a SMA by installing valves	R/D																																											
			WP																																											
	2-8	Update the distribution network drawings for each SMA	R/D																																											
			WP																																											
	2-9	Measure an initial level of NRW of each SMA	R/D																																										
			WP																																											
		Measure in/outflows																																												
		Survey water consumption																																												
		Calculate NRW ratio																																											
	2-10	Detect target NRW components (i.e. invisible leakage, customer meter malfunction, and illegal connection) of each SMA	R/D																																										
			WP																																											
		Detect invisible leakage																																											
		Detect customer meter malfunction																																											
		Detect illegal connection																																											
Each SMA	2-11	Develop a NRW reduction operation plan of each SMA, including reduction target for review by Head of Distribution Department	R/D																																										
			WP																																											
	2-12	Review and approve NRW reduction operation plan of each SMA	R/D																																										
			WP																																											
	2-13	Implement NRW reduction operations at each SMA	R/D																																										
			WP																																											
		Operation for invisible leakage																																												
		Operation for customer meter																																												
		Operation for illegal connection																																												
	2-14	Monitor the progress of the NRW reduction operations of each SMA	R/D																																										
			WP																																											
		Operation for invisible leakage																																												
		Operation for customer meter																																												
		Operation for illegal connection																																												
	2-15	Measure level of NRW of each SMA at the end of the respective operations	R/D																																										
			WP																																											
		Measure in/outflows																																												
		Survey water consumption																																												
		Calculate NRW ratio																																											
	2-16	Prepare a report on pilot projects, covering Activity 2-1~2-15	R/D													Interim											Final																			
			WP												Interim											Final																			
	2-17	Develop manuals for NRW reduction for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials	R/D																			Draft					Finalization															Modification			
			WP																					Draft			Finalization															Modification			
Output-3																																														
A medium-term strategic plan of FCTWB for NRW reduction is developed, utilizing the results of Output-1&2	3-1	Establish a Working Group for NRW reduction planning	R/D																																											
			WP																																											
	3-2	Review existing plans, implementation structure, on-the-job training mechanism, etc. related to NRW reduction at FCTWB	R/D																																										
			WP																																											
	3-3	Conduct hydraulic and water pressure distribution analyses of the pipeline networks	R/D																																											
			WP																																											
	3-4	Develop outlines of the medium-term strategic plan and its annual NRW reduction plan (approval by the Director)	R/D																																										
			WP																																											
	3-5	Develop the first medium-term strategic plan (2018-2022) for approval by FCTA	R/D																																										
			WP																																											
	3-6	Develop an annual NRW reduction plan based on the strategic plan as an integral part of an annual recurrent and capital plan of FCTWB for approval by FCTA	R/D																																										
			WP																																											
	3-7	Develop a planning manual for NRW reduction	R/D																																											
			WP																																											

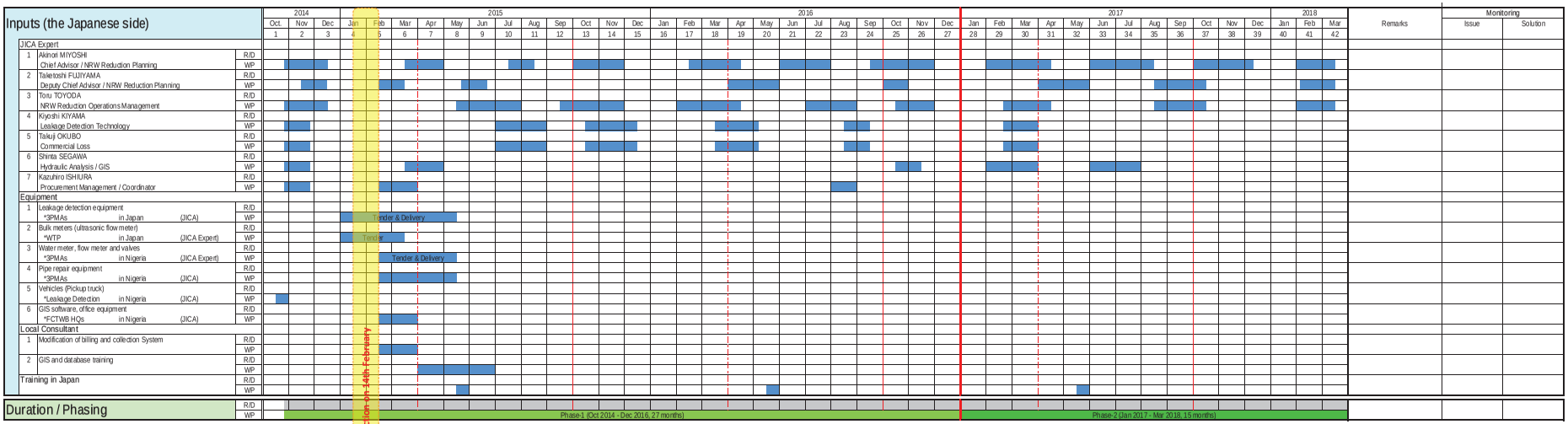
One month before Presidential Election on 14th February

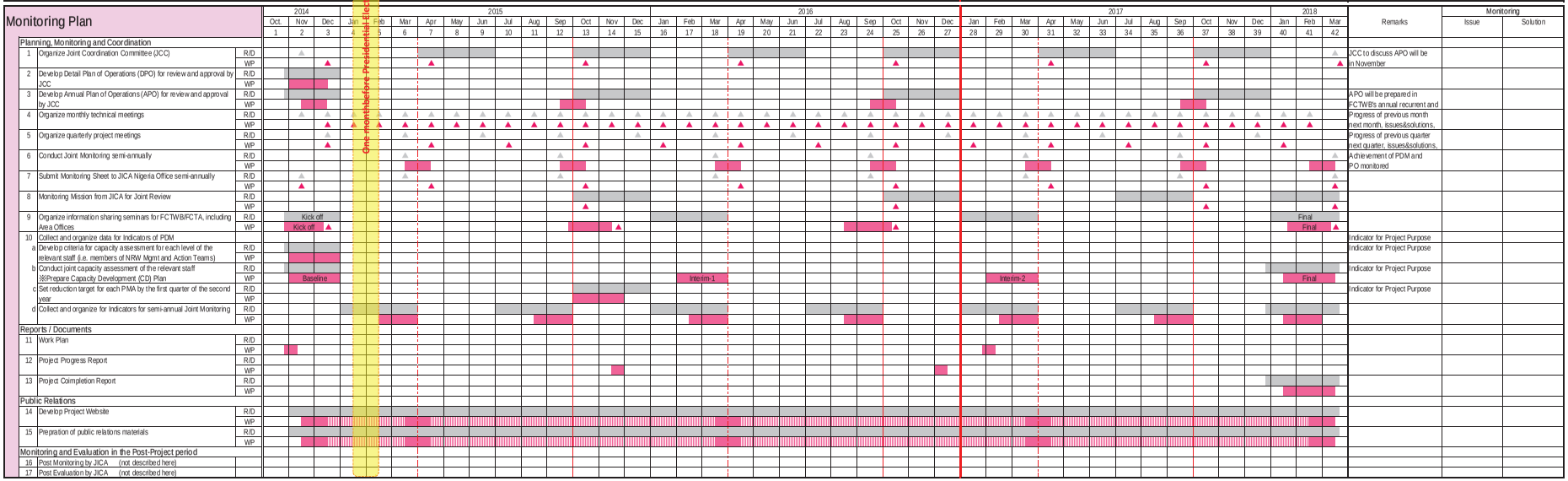
Project Monitoring Sheet II (Revision of Plan of Operation)

Plan of Schedule and Actual Work Period

Project Title: **The Federal Capital Territory Reduction of Non-Revenue Water Project**

Version 1
Dated 6 Nov. 2014





Project Monitoring Sheet II (Revision of Plan of Operation)

Responsibility of Members

Project Title: The Federal Capital Territory Reduction of Non-Revenue Water Project

Version 1
Dated 6 Nov. 2014

Activities				Responsible Organization (Nigeria)	Responsible Person (Nigeria)	Implementors (Nigeria)	JICA Experts	Other Major Input		Remarks
								Japan	Nigeria	
Output-1				Dist. Dpt	HoD(Dist)		Chief Advisor (CA), Dy.CA			
Level of NRW of the service area of FCTWB is monitored regularly	1-1	Install bulk meters to water treatment plants 1 and 2	R/D WP	Dist. Dpt Prod. Dpt	HoU(Pipeline)/D HoU(Metering)/D	Tech Officers (Pipeline)	CA, Dy.CA	Bulk meters	Installation, O&M cost	Prod Dpt will be consulted
	1-2	Measure monthly water production of water treatment plants 1, 2, 3, and 4	R/D WP	Dist. Dpt Prod. Dpt	HoU(Pipeline)/D HoU(Prod)/Prod	Tech Officers (Pipeline) Tech Officers (Prod)	CA, Dy.CA			If bulks are installed inside the plants, Prod Dept shall measure.
	1-3	Tally the above water production data monthly	R/D WP	Dist. Dpt	HoU(Water Monitoring)	HoU(Water Monitoring)	CA, Dy.CA			
	1-4	Calculate the monthly water consumption based on the billing data	R/D WP	Com Dpt	HoU(Billing)/C	Billing staff	CA, Dy.CA	Cost for software		
	1-5	Calculate monthly NRW ratio of the service area of FCTWB using the data obtained from Activity 1-3 and 1-4	R/D WP	Dist. Dpt	HoU(Logistics)/D	Logistics officer	CA, Dy.CA			
Output-2				Dist. Dpt, Com. Dept	HoD(Dist)(Com)		CA and other Experts	Vehicles	O&M cost	
Methods/operational procedures for effective NRW reduction are established through pilot projects at Pilot Metering Areas (PMAs) under pilot Area Offices	2-1	Review existing NRW reduction operations at each pilot Area Office	R/D WP	Dist. Dpt, Com. Dpt	HoD(Dist)(Com)	AM, AAM (Dist)(Com)	CA, Dy.CA, NRW reduction			
	2-2	Conduct capacity assessment of organization and the relevant staff	R/D WP	Dist. Dpt, Com. Dpt	HoD(Dist)(Com)	NRW Mgt Team	CA and other Experts			
	2-3	Identify and select a Pilot Metering Area (PMA) for each Pilot Area Office based on the selection criteria of PMA	R/D WP	Dist. Dpt, Com. Dpt	HoD(Dist)(Com)	NRW Mgt Team AM, AAM (Dist)(Com)	CA, Dy.CA, NRW reduction			
	2-4	Prepare/update distribution network drawings for each PMA	R/D WP	Dist. Dpt	HoD(Dist)	HoU(Logistics)&officers HoU(GIS)&officers	NRW reduction, Hydraulic analysis			
	2-5	Install water flow meters to each PMA and measure in/outflows monthly	R/D WP	Dist. Dpt	Area Manager(AM)	AAM(Dist) Tech Officers(Dist)	NRW reduction, Hydraulic analysis	Water flow meters	Installation and O&M cost	
	2-6	Zone each PMA into Sub Metering Areas (SMA)	R/D WP	Dist. Dpt	HoU(Logistics)/D HoU(Metering)/D	AM, AAM(Dist)(Com) HoU(GIS)&officers	NRW reduction, Hydraulic analysis			
Each SMA	2-7	Isolate a SMA by installing valves	R/D WP	Dist. Dpt	AM	Tech Officers(Dist) AAM(Dist)	NRW reduction	Valves	Installation and O&M cost	
	2-8	Update the distribution network drawings for each SMA	R/D WP	Dist. Dpt	HoU(Logistics)/D	AAM(Dist),HoU(GIS)&officers HoU(Logistics)&officers	NRW reduction, Hydraulic analysis			
	2-9	Measure an initial level of NRW of each SMA	R/D WP	Dist. Dpt	HoD(Dist)		NRW reduction			
		Measure in/outflows		Area Office	AAM(Dist)	Tech Officers(Dist)	NRW reduction			
		Survey water consumption		Area Office	AAM(Com)	Meter Readers(Com)	NRW reduction			
		Calculate NRW ratio		Dist Dpt	HOU(Logstics)/D	Logistics Officer	NRW reduction			
	2-10	Detect target NRW components (i.e. invisible leakage, customer meter malfunction, and illegal connection) of each SMA	R/D WP	Dist. Dpt, Com. Dpt	AM		NRW reduction			
		Detect invisible leakage		Dist. Dpt	AAM(Dist)	Tech Officers(Dist)	Leakage detection	Detection equip.	O&M cost	Staff of Pipeline Unit (Dist) will join.
		Detect customer meter malfunction		Com. Dpt	AAM(Com), HoU(Metering)/D	Meter Readers(Com)	Com Loss			
		Detect illegal connection		Dist. Dpt, Com. Dpt	AAM(Dist)(Com),HoU(Detec)/C	Meter Readers(Com)	Com Loss			Staff of Detection Unit (Com) will join.
	2-11	Develop a NRW reduction operation plan of each SMA, including reduction target for review by Head of Distribution Department	R/D WP	Dist. Dpt	AM	AAM (Dist)(Com)	NRW reduction, Leakage detection, Com Loss			
	2-12	Review and approve NRW reduction operation plan of each SMA	R/D WP	Dist Dpt	HoD(Dist)	Relevant HoUs	NRW reduction			
	2-13	Implement NRW reduction operations at each SMA	R/D WP	Dist. Dpt, Com. Dpt	AM		NRW reduction			
		Operation for invisible leakage		Dist. Dpt	AAM(Dist)	Tech Officers(Dist)	Leakage detection	Repair equip.	Repair cost	
		Operation for customer meter		Com. Dpt	AAM(Com), HoU(Metering)/D	AAM(Com), HoU(Metering)/D	Com Loss	Cust. Meters	Install, O&M cost	
		Operation for illegal connection		Dist. Dpt, Com. Dpt	AAM(Dist)(Com),HoU(Detec)/C	AAM(Dist)(Com),HoU(Detec)/C	Com Loss			
	2-14	Monitor the progress of the NRW reduction operations of each SMA	R/D WP	Area Office	AM		NRW reduction			
		Operation for invisible leakage		Dist. Dpt	AAM(Dist)	Tech Officers(Dist)	Leakage detection			
		Operation for customer meter		Com. Dpt	AAM(Com), HoU(Metering)/D	AAM(Com), HoU(Metering)/D	Com Loss			
		Operation for illegal connection		Dist. Dpt, Com. Dpt	AAM(Dist)(Com),HoU(Detec)/C	AAM(Dist)(Com),HoU(Detec)/C	Com Loss			
	2-15	Measure level of NRW of each SMA at the end of the respective operations	R/D WP	Area Office	AM		NRW reduction			
		Measure in/outflows		Area Office	AAM(Dist)	Tech Officers(Dist)	NRW reduction			
		Survey water consumption		Area Office	AAM(Com)	Meter Readers(Com)	NRW reduction			
		Calculate NRW ratio		Dist Dpt	HOU(Logstics)/D	Logistics Officer	NRW reduction			
	2-16	Prepare a report on pilot projects, covering Activity 2-1~2-15	R/D WP	Dist. Dpt, Com. Dpt	HoD(Dist)(Com)	NRW Mgt Team, AM,	CA, Dy.CA, NRW reduction, Leakage detection, Com loss			
	2-17	Develop manuals for NRW reduction for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials	R/D WP	Dist. Dpt, Com. Dpt	HoD(Dist)(Com)	NRW Mgt Team, AM, AAM (Dist)(Com)	CA, Dy.CA, NRW reduction, Leakage detection, Com Coordinator			
Output-3				FCTWB	PM		CA, Dy.CA			
A medium-term strategic plan of FCTWB for NRW reduction is developed, utilizing the results of Output-1&2	3-1	Establish a Working Group for NRW reduction planning	R/D WP	FCTWB	PM	Working Group	CA, Dy.CA, NRW reduction			
	3-2	Review existing plans, implementation structure, on-the-job training mechanism, etc. related to NRW reduction at FCTWB	R/D WP	FCTWB	PM	Working Group	CA, Dy.CA, NRW reduction			
	3-3	Conduct hydraulic and water pressure distribution analyses of the pipeline networks	R/D WP	Dist Dpt	HoU(Logistics)/D HoU(Pipeline)/D	HoU(Logistics)&officers HoU(GIS)&officers HoU(Pipeline)&officers	Hydraulic analysis			
	3-4	Develop outlines of the medium-term strategic plan and its annual NRW reduction plan (approval by the Director)	R/D WP	FCTWB	PM	Working Group	CA, Dy.CA, NRW reduction			
	3-5	Develop the first medium-term strategic plan (2018-2022) for approval by FCTA	R/D WP	FCTWB	PM	Working Group	CA, Dy.CA, NRW reduction			
	3-6	Develop an annual NRW reduction plan based on the strategic plan as an integral part of an annual recurrent and capital plan of FCTWB for approval by FCTA	R/D WP	FCTWB	PM	Working Group	CA, Dy.CA, NRW reduction			
	3-7	Develop a planning manual for NRW reduction	R/D WP	FCTWB	PM	Working Group	CA, Dy.CA, NRW reduction			

Project Monitoring Sheet II (Revision of Plan of Operation)

Responsibility of Members

Project Title: **The Federal Capital Territory Reduction of Non-Revenue Water Project**

Version 1
Dated 6 Nov. 2014

Inputs (the Japanese side)			Remarks
JICA Expert			
1	Akinori MIYOSHI	R/D	
	Chief Advisor / NRW Reduction Planning	WP	
2	Taketoshi FUJIYAMA	R/D	
	Deputy Chief Advisor / NRW Reduction Planning	WP	
3	Toru TOYODA	R/D	
	NRW Reduction Operations Management	WP	
4	Kiyoshi KIYAMA	R/D	
	Leakage Detection Technology	WP	
5	Takuji OKUBO	R/D	
	Commercial Loss	WP	
6	Shinta SEGAWA	R/D	
	Hydraulic Analysis / GIS	WP	
7	Kazuhiro ISHIURA	R/D	
	Procurement Management / Coordinator	WP	
Equipment			
1	Leakage detection equipment	R/D	
	*3PMAs in Japan (JICA)	WP	
2	Bulk meters (ultrasonic flow meter)	R/D	
	*WTP in Japan (JICA Expert)	WP	
3	Water meter, flow meter and valves	R/D	
	*3PMAs in Nigeria (JICA Expert)	WP	
4	Pipe repair equipment	R/D	
	*3PMAs in Nigeria (JICA)	WP	
5	Vehicles (Pickup truck)	R/D	
	*Leakage Detection in Nigeria (JICA)	WP	
6	GIS software, office equipment	R/D	
	*FCTWB HQs in Nigeria (JICA)	WP	
Local Consultant			
1	Modification of billing and collection System	R/D	
		WP	
2	GIS and database training	R/D	
		WP	
Training in Japan		R/D	
		WP	

Duration / Phasing									
		R/D							
		WP							

Monitoring Plan			Responsible Organization (Nigeria)	Responsible Person (Nigeria)	Implementors (Nigeria)	JICA Experts	Other Major Input		Remarks
							Japan	Nigeria	
Planning, Monitoring and Coordination									
1	Organize Joint Coordination Committee (JCC)	R/D	FCTWB	PM	Dy. PM	CA and other Experts			
		WP							
2	Develop Detail Plan of Operations (DPO) for review and approval by JCC	R/D	FCTWB	PM	Dy. PM, NRW Mgt Team, AM	CA and other Experts			
		WP							
3	Develop Annual Plan of Operations (APO) for review and approval by JCC	R/D	FCTWB	PM	Dy. PM, NRW Mgt Team, AM	CA and other Experts			
		WP							
4	Organize monthly technical meetings	R/D	Dist. Dpt, Com. Dpt	NRW Mgt Team Coordinator	NRW Mgt Team, AM	CA and other Experts			
		WP							
5	Organize quarterly project meetings	R/D	FCTWB	PM	Dy. PM, NRW Mgt Team, AM	CA and other Experts			
		WP							
6	Conduct Joint Monitoring semi-annually	R/D	FCTWB	PM	Dy. PM, NRW Mgt Team, AM	CA and other Experts			
		WP							
7	Submit Monitoring Sheet to JICA Nigeria Office semi-annually	R/D				CA, Dy.CA			
		WP							
8	Monitoring Mission from JICA for Joint Review	R/D	JICA	JICA HQ	To be determined				
		WP							
9	Organize information sharing seminars for FCTWB/FCTA, including Area Offices	R/D	FCTWB	PM	Dy.PM	CA and other Experts			
		WP							
10	Collect and organize data for Indicators of PDM		Dist. Dpt, Com. Dpt	NRW Mgt Team's Coordinator	NRW Mgt Team, AM	CA and other Experts			
a	Develop criteria for capacity assessment for each level of the relevant staff (i.e. members of NRW Mgmt and Action Teams)	R/D	Dist. Dpt, Com. Dpt	NRW Mgt Team's Coordinator	NRW Mgt Team, AM	CA and other Experts			
		WP							
b	Conduct joint capacity assessment of the relevant staff ※Prepare Capacity Development (CD) Plan	R/D	Dist. Dpt, Com. Dpt	NRW Mgt Team's Coordinator	NRW Mgt Team, AM	CA and other Experts			
		WP							
c	Set reduction target for each PMA by the first quarter of the second year	R/D	Dist. Dpt, Com. Dpt	NRW Mgt Team's Coordinator	NRW Mgt Team, AM	CA and other Experts			
		WP							
d	Collect and organize for Indicators for semi-annual Joint Monitoring	R/D	Dist. Dpt, Com. Dpt	NRW Mgt Team's Coordinator	NRW Mgt Team, AM	CA and other Experts			
		WP							
Reports / Documents									
11	Work Plan	R/D	FCTWB	PM	Dy. PM, NRW Mgt Team				
		WP							
12	Project Progress Report	R/D	FCTWB	PM	Dy. PM, NRW Mgt Team				
		WP							
13	Project Coimpletion Report	R/D	FCTWB	PM	Dy. PM, NRW Mgt Team	CA and other Experts			
		WP							
Public Relations									
14	Develop Project Website	R/D	FCTWB	PM	NRW Mgt Team, HoU(PR)	CA, Dy.CA, Coordinator			
		WP							
15	Prepration of public relations materials	R/D	FCTWB	PM	NRW Mgt Team, HoU(PR)	CA, Dy.CA, Coordinator			Public Relation Unit under Director(PM) will collaborate
		WP							
Monitoring and Evaluation in the Post-Project period									
16	Post Monitoring by JICA (not described here)		JICA						
17	Post Evaluation by JICA (not described here)		JICA						

Appendix 3

Tentative List of Equipment for the Project

No.	Equipment	Specification	County to Purchase		Assumed Quantity	Remarks
			Japan	Nigeria		
For Activity 1-2						
1	Ultrasonic flow meter	fixed type, including cable	●		4	
2	Data logger		●		4	
For Activity 2-4 and 2-8						
1	GIS software			●	2	
2	Plotter (A0)	A0		●	1	
3	GPS terminal	Handset		●	2	
4	Personal computer	Desktop type		●	2	
5	Anti-virus software			●	2	
For Activity 2-5						
1	Flow meter			●	-	The quantity will be decided after Activity 2-4
For Activity 2-7						
1	Sluice valve			●	-	The quantity will be decided after Activity 2-4
For Activity 2-10						
1	Ultrasonic flow meter	Portable type	●		6	
2	Water pressure data logger	2ch	●		6	
3	Water leak detector	Leak noise correlator	●		2	
4	Water leak detector	Acoustic type	●		6	
5	Non-metal pipe locator		●		3	
6	Metal locator		●		3	
7	Time integral water leakage detector		●		3	
8	Acoustic rod		●		9	
9	Distance meter		●		3	
10	Hammer drill		●		3	
11	Boring bar	1.0m	●		3	
12	Drill bit	Dia.19×800mm	●		9	
13	Residual chlorine analyzer	Portable type	●		3	
14	Metal pipe and cable locator		●		3	
15	Reference meter		●		3	for checking customer meters
For Activity 2-13						
1	Generator	200V		●	3	
2	Asphalt cutter			●	3	
3	Concrete breaker			●	3	
4	Small-sized dewatering pump			●	3	
5	Small-sized tamper			●	3	
6	Electric drum			●	3	
7	Customer meter			●	-	The quantity will be decided after Activity 2-4
For Output 2						
1	Pickup truck for pilot sites			●	2	
For Operation of the Project						
1	Laser printer	A4		●	1	
2	Inkjet printer	A3		●	1	
3	Multifunction copier			●	1	
4	UPS			●	3	
5	Graphic/movie editing software			●	1	

Appendix 4

List of Personnel assigned for the Project

(1) Project Director: Mr. Ari, Isa Muhammad, Director of Economic Planning, Research and Statistics Department, FCTA

(2) Project Manager: Mr. Hudu Bello, Director of FCTWB

(3) Deputy Project Manager: Mr. S.T Bello, Head of Administration and Supply Department, FCTWB

(4) Technical Manager: Engr. A. A. Nahuche, Head of Distribution Department, FCTWB

: Mr. Adis S. Muhammad, Head of Commerce Department, FCTWB

(5) Members of NRW Management Team

(a) Distribution Department

	Name of staff	Position in FCTWB	Remarks
1	Abolade. R. Lawal	Head of Special Project Unit	Coordinator of NRW Management Team
2	Moh. Kabir Rabiu	Head of Logistic Unit	
3	Musa Dikko	Head of pipeline Unit	
4	Shehu Suleiman	Head of GIS Unit	
5	Douglas E. Oloton	Head of Metering General	
6	A.O. Akande	Head of Metering Unit (AMR Meter)	
7	Yetunde Olaniyan	Head of Water Monitoring Unit	
8	Abdullahi Masaud	Head of Metering Unit (pre-paid Meter)	
9	Abubakar Ubale Abubakar	Civil Engr. II, Logistic Unit,	
10	Mohammed Dauda	Technical Officer , Pipeline Unit	
11	Ezeh Hilary	Surveyor, GIS Unit	

(b) Commerce Department

	Name of staff	Position in FCTWB	Remarks
1	Isaac O. Owolabi	Head of Customer Care Unit	
2	Danjuma Isah	Head of Monitoring and Detection Unit	
3	Taiwo Adeyemi	Monitoring staff, Monitoring and Detection Unit	
4	Aliyu Maradun	Head Major Consumers	
5	Rose Akpan	Head of Billing Unit	
6	Suleman Agbawn	Billing Officer,Billing Unit	

(c) Administration and Supply Department

	Name of staff	Position in FCTWB	Remarks
1	Francisca Samuel	Head of Training/ Welfare Unit	
2	Akudike Ike D.	Head, Facility Management Unit	

(6) Head of other relevant Departments and Unit

	Name of staff	Position in FCTWB	Remarks
1	Hafsat Ahmed Lawi	Head of Financial Department	
2	Aliyu Usman	Head of Reservoir Department	
3	Bunmi Olowookere	Head of Planning, Research and Statistics Unit	
4	Abbas A. Ahmed	Head of Public Relations Unit	
5	Vincent Obeh	Head of MIS Unit	

(7) Members of NRW Action Team

(a) Jabi

	Name of staff	Position in FCTWB	Remarks
1	Muhammed A. S. Ramat	Area Manager (Distribution)	
2	Sadiq Salihu	Assistant Area Manager (Distribution)	
3	Abawonse J. K	Assistant Area Manager (Commerce)	
4	Jummai Ugbodaga	Senior Commercial Officer (Commerce)	
5	Mohammed Moh'd	Planning Officer (Commerce)	
6	Aliyu Ibrahim	Senior Works Superintendent	
7	Abubakar Danladi	Foreman (Distribution)	
8	Raliat Zubairu	Higher Trade Officer (Commerce)	
9	Mahmud Muhammed	Forman (Distribution)	
10	Hassan Yelwa	STA (Commerce)	

(b) Gudu

	Name of staff	Position in FCTWB	Remarks
1	Abdurrahaman U. Sanda	Area Manager (Distribution)	
2	Ogbu O. Williams	Assistant Area Manager (Commerce)	
3	Abdul Ozumi	Assistant Area Manager (Distribution)	
4	Adamu Ismaila	Unit Head (Commerce)	
5	Umar I. Adamu	Assistant Tech. Officer (Commerce)	
6	Kotangora Mohammed	Assistant Unit Head (Distribution)	
7	Salisu Mohammed	Plumber (Distribution)	

(c) Garki I

	Name of staff	Position in FCTWB	Remarks
1	Adesoji Adenuga	Area Manager (Commerce)	
2	Umar Ibrahim	Assistant Area Manager (Commerce)	
3	Mohammed Gana	Assistant Area Manager (Distribution)	
4	Olusegun Rose	Senior Trade Office (Commerce)	
5	Abdulahi Ibrahim	Assistant Tech. Officer (Commerce)	
6	Iliya Galadima	HigherWorks Super intendant (Distribution)	
7	Raymond Olowookere	Forman (Distribution)	
8	Ibrahim Yelwa	Forman (Distribution)	
9	Hassan Abubakar	Commerce Officer (Commerce)	
10	Shehu Isa	Craftsman (Distribution)	

MINUTES OF MEETING
ON
THE FIRST JOINT COORDINATING COMMITTEE
FOR
THE FEDERAL CAPITAL TERRITORY
REDUCTION OF NON-REVENUE WATER PROJECT

HELD IN
THE OFFICE OF DIRECTOR, ECONOMIC PLANNING RESEARCH AND STATISTICS,
FEDERAL CAPITAL TERRITORY ADMINISTRATION

2nd December 2014

Mr. Ari, Isa Muhammad
Project Director,
Director, Economic Planning, Research and Statistics Department,
Federal Capital Territory Administration,
Federal Republic of Nigeria

Mr. Akinori Miyoshi
Chief Advisor for
FCT Reduction of NRW Project
Japan International Cooperation Agency (JICA)

Mr. Hudu Bello
Project Manager,
Director, Federal Capital Territory Water Board,
Federal Republic of Nigeria

Mr. Tetsuo Seki
Chief Representative,
JICA Nigeria Office

Attached Document

In the early stage of Phase-1 of the Federal Capital Territory Reduction of Non-Revenue Water Project (hereinafter referred to as "the Project"), the first meeting of Joint Coordinating Committee (hereinafter referred to as "JCC") was held on 2nd December 2014.

Implementation of the Project is divided into two phases; Phase-1 scheduled from October 2014 to December 2016 and Phase-2 scheduled from January 2017 to March 2018.

1. Opening and Closing Remarks

Mr. Ari Isa Muhammad, Project Director of the Project, gave welcome remarks and chaired the JCC.

Mr. Tetsuo Seki, Chief Representative of Japan International Cooperation Agency (hereinafter referred to as "JICA") Nigeria Office gave remarks addressing his expectations on successful implementation of the Project and request for improvement in office environment for JICA Expert Team, such as stable power supply.

Mr. Akinori Miyoshi, Chief Advisor of JICA Expert Team made a presentation of Work Plan (Phase-1), Detail Plan of Operation, Annual Plan of Operation and proposed members of Working Group for Non-Revenue Water (hereinafter referred to as "NRW") Reduction Planning.

At the end of meeting after discussions, Mr. Hudu Bello, Project Manager of the Project, gave closing remarks and mentioned that counterpart fund has been approved.

2. Main Points Discussed

As a result of discussions, all JCC members confirmed the matters mentioned below.

2.1 Work Plan (Phase-1), Detail Plan of Operation and Annual Plan of Operation

Federal Capital Territory Water Board (hereinafter referred to as "FCTWB") raised concerns that the currently proposed pilot project areas do not necessarily represent the characteristics of respective zones and suggested expanding pilot areas. However, Economic Planning, Research and Statistics Department of Federal Capital Territory Administration (hereinafter referred to as "FCTA(EPRS)") regarded it as impractical at this time due to the scope of works agreed by both governments.

Federal Capital Development Authority (hereinafter referred to as "FCDA") suggested setting clear target ratio of NRW including annual target and overall goal at the end of the year 2021. JICA Expert Team said that the figure will be finalized after collection and analysis of quantitative and reliable data, and then it will be approved in the future JCC. FCDA understood it. Details are as per the Appendix 3 to 6.

All JCC members finally approved Work Plan (Phase-1), Detail Plan of Operation and Annual Plan of Operation.

2.2 Establishment of Working Group for NRW Reduction Planning

FCDA suggested that two representatives from FCDA should be added to Working Group for NRW Reduction Planning. All JCC members agreed to it and approved establishment of Working Group for NRW Reduction Planning. Details are as per the Appendix 7.

2.3 Security issues in the field activities

JICA Expert Team addressed the possibility of installation of flow meter beside Headquarters of Defense in the pilot area "Garki I" and requested FCTA(EPRS) for special arrangement for smooth implementation without obstacles. FCTA(EPRS) and FCTWB promised to take necessary arrangement such as issuance of official letter and explanation to Headquarters of Defense.

3. Newsletter No.1

FCTA(EPRS) suggested adding explanation about JCC members on the last page of Newsletter No.1. JICA Expert Team agreed and will add it.

Appendix

Appendix 1: Programme/Agenda
Appendix 2: Attendance List
Appendix 3: Overview of Work Plan (Phase-1)
Appendix 4: Work Plan (Phase-1)
Appendix 5: Detail Plan of Operation
Appendix 6: Annual Plan of Operation
Appendix 7: Member List of Working Group for NRW Reduction Planning
Appendix 8: Newsletter No.1

Appendix 1: Programme/Agenda

Federal Capital Territory Administration (FCTA)
Federal Capital Territory Water Board (FCTWB)
assisted by
Japan International Cooperation Agency (JICA)

THE FEDERAL CAPITAL TERRITORY REDUCTION OF NON-REVENUE WATER PROJECT

PROGRAMME/AGENDA FOR 1ST JOINT COORDINATING COMMITTEE

Venue: Conference Room, EPRS, FCT Administration, Abuja
Date: Tuesday, 2nd December 2014

15:00 - 15:05 Opening Prayer

15:05 - 15:10 Introduction of JCC Members

15:10 - 15:20 Welcome Remarks by Project Director, Mr. Ari, Isa MUHAMMAD (Director, EPRS, FCTA)

15:20 - 15:30 Address by Chief Representative, Mr. Tetsuo SEKI (JICA Nigeria Office)

15:30 - 16:00 Explanation of Work Plan, Detailed Plan of Operation, Annual Plan of Operation and Establishment of Working Group for NRW Reduction Planning

16:00 - 16:15 Questions, Answers and Discussions

16:15 - 16:20 Approval of Work Plan, Detailed Plan of Operation, Annual Plan of Operation and Members of Working Group for NRW Reduction Planning

16:20 - 16:25 Closing Remarks by Project Manager, Mr. Hudu BELLO (Director, FCTWB)

16:25 - 16:30 Closing Prayer

Appendix 2: Attendance List

ATTENDANCE LIST

Project: The Federal Capital Territory Reduction of Non-Revenue Water Project

Meeting: 1st Joint Coordinating Committee

Date: 2nd December 2014

Venue: Conference room, EPRS, FCTA

No	Name	Position in the Project	Organization	Remarks
1	Mr. Ari, Isa Muhammad	Project Director	FCTA(EPRS)	Director
2	Mr. Tetsuo Seki		JICA Nigeria	Chief Representative
3	Mr. Usman A. Ahmed		FCTA(EPRS)	
4	Mr. Hudu Bello	Project Manager	FCTWB	Director
5	Mr. S. T. Bello	Deputy Project Manager	FCTWB	HoD, Admin&Supply
6	Engr. A. A. Nahuche	Technical Manager	FCTWB	HoD, Distribution
7	Mr. M. S. Adis	Technical Manager	FCTWB	HoD, Commerce
8	Mr. Abbas A. Ahmed		FCTWB	
9	Mr. Akinori Miyoshi	Chief Advisor	JICA Expert	
10	Mr. Taketoshi Fujiyama		JICA Expert	
11	Mr. Toru Toyoda		JICA Expert	
12	Mr. Kazuhiro Ishiura		JICA Expert	
13	Mr. E. Anyadiegwu		NPC	
14	Mr. Adetunji Idowu		FMWR	Deputy Director
15	Engr. Ben Ukpong		FCDA	Engr. Services
16	Engr. Tauheed Amusan		FCDA	Engr. Services
17	Ms. Chie Shimodaira		JICA Nigeria	
18	Mr. Chikara Yoshimura		EOJ	First Secretary
19	Mr. Imoh Benjamin		EOJ	

Appendix 3: Overview of Work Plan (Phase-1)

Japan International Cooperation Agency
Federal Capital Territory Administration
Federal Capital Territory Water Board

The Federal Capital Territory
Reduction of Non-Revenue Water Project

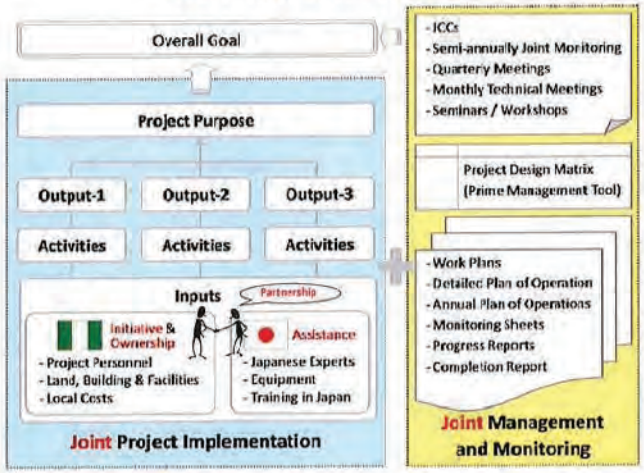
Overview of Work Plan

December 2014

JICA Expert Team

Contents

1. Principle of the Project



2. Outline of the Project

Project Period

Phase-1: October 2014 to December 2016

Phase-2: January 2017 to March 2018

Overall Goal, Project Purpose and three Outputs

See the page 5&6

Project Areas

Federal Capital Territory (FCT)

Pilot Areas: Garki I, Gudu and Jabi

Organizations concerned (Counterparts) in Nigeria Side

Federal Capital Territory Administration (FCTA)

Federal Capital Territory Water Board (FCTWB)

Project Implementing Structure

See the page 7

Overall Goal, Project Purpose and Three Outputs

Overall Goal	**Level of Non-Revenue Water (NRW) is reduced at the service area of FCTWB.**
Indicator	a. Annual NRW ratio is reduced to X% at the end of the year 2021
Project Purpose	**Capacity of FCTWB for NRW reduction is strengthened.**
Indicator	a. The medium-term strategic plan (2018-2022) is approved by FCTA.
	b. NRW reduction operations of the first quarter of 2018 are carried out.
	c. Relevant staff become equipped with skills and knowledge necessary for NRW reduction.
	d. NRW ratio of each PMA in the last quarter of the Project reaches its respective target.

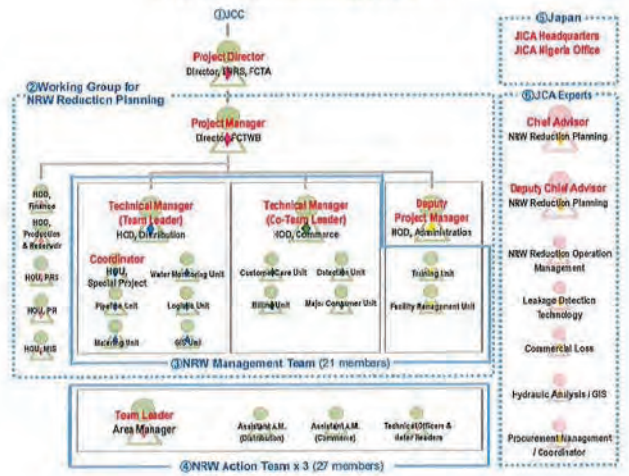
5

Overall Goal, Project Purpose and Three Outputs (Continued)

Output-1	**Level of NRW of the service area of FCTWB is monitored regularly.**
Indicator	1a: Record of monthly NRW ratio is kept.
	1b: Monthly NRW ratio is reported.
	1c: Quarterly NRW ratio is reported.
Output-2	**Methods/operational procedures for effective NRW reduction are established though pilot projects at Pilot Metering Areas (PMAs) under pilot Area Offices.**
Indicator	2a: Decrease rate of NRW ratio for each Sub Metering Area reaches at least 80% of its target.
	2b: Technical manuals are approved.
Output-3	**A medium-term strategic plan of FCTWB for NRW reduction is developed, utilizing the results of Output 1-2.**
Indicator	3a: Draft medium-term strategic plan (2018-2022) is submitted by FCTWB to FCTA
	3b: An annual NRW reduction plan (2018) is incorporated in FCTWB's annual recurrent and capital plan (2018).
	3c: A planning manual for NRW reduction is approved.

6

Project Implementing Structure



7

Relationship Matrix between Nigerian Counterparts and JICA Experts in terms of their major roles in the Project Implementation

JICA Experts \ Nigerian Counterparts	Working Group for NRW Reduction Planning								NRW Management Team											NRW Action Team				
	Project Director / Director, DPRS, FCTA	Project Manager Director, FCTWB	Deputy P.M. HOD, Administration	HOD, Finance	HOD, Production	HOU, PRS	HOU, PR	HOU, MIS	Technical Manager HOD, Distribution	Technical Manager HOD, Commerce	Coordinator / HOU, Special Project Unit	Pipeline Unit	Metering Unit	W. Monitoring Unit	Logistics Unit	GIS Unit	Cust. Care Unit	Billing Unit	Detection Unit	Training Unit	Facility Mngmt. Unit	Area Manager	Assistant A.M. (Dist.)	Assistant A.M. (Com.)	Technical Officers	Meter Readers
Chief Advisor / NRW Reduction Planning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
Deputy Chief Advisor / NRW Reduction Planning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
NRW Reduction Operation Management									●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Leakage Detection Technology									●		●	●	●	●	●							●	●		●	
Commercial Loss										●	●		●	●		●	●	●	●			●	●	●		●
Hydraulic Analysis / GIS									●		●	●			●	●						●	●			
Procurement Mngmt. / Coordinator			●						●	●	●															

8

3. Current Status & Issues of Water Supply in Federal Capital City

1. Strengthening of Management and Organization

Future independence, inefficient personnel

2. Improvement in Financial Situation

Depression in tariff collection ratio, weak financial management, etc.

3. Increase in Water Service Coverage

Delay in development and construction, facility deterioration, etc.

Our Project !

4. NRW Reduction

Absence of planning, shortage of skilled manpower, absence of quantitative monitoring system by bulk flow meters, passive leakage detection, etc.

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4. Expected Impact of NRW Reduction

Items	NRW:38% (current/estimated)	NRW:20% (Tentative Target)	Impact	Calculation Conditions
Population to be served	1.96 mill	2.53 mill	Additional 0.57 mil	Supply Capacity: estimated 624,000m³/day Per-Capita Consumption: 197LCD
Demand exceeds Supply (When new WTP is needed)	2017	2024	7 years postponed	Population projection until 2050 by FCTWB
Daily Water Consumption (Billed water)	162,400m³	209,600m³	47,000m³	Actual daily supply: 262,000m³
Annual Revenue	N4.74bln	N6.12bln	N1.38bln	Water tariff (domestic): N80/m³
Cost saving of WTP (Rough estimate)	-	-	N16.8bln	47,000m³/day x N3,600/m³/day

Source: JICA Detailed Planning Survey, 2014

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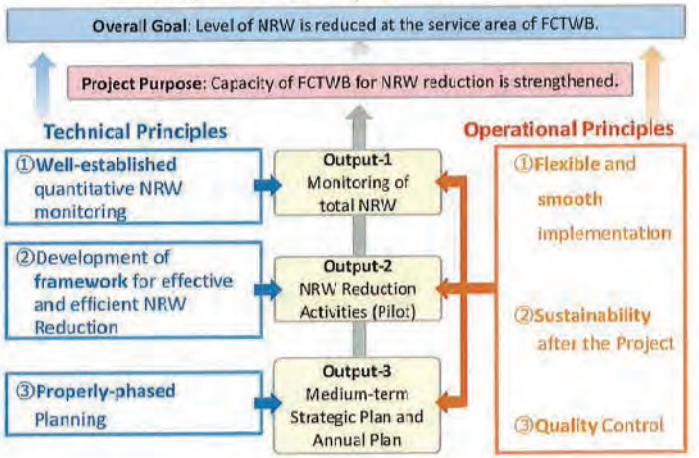
5. Principles of the Project Implementation



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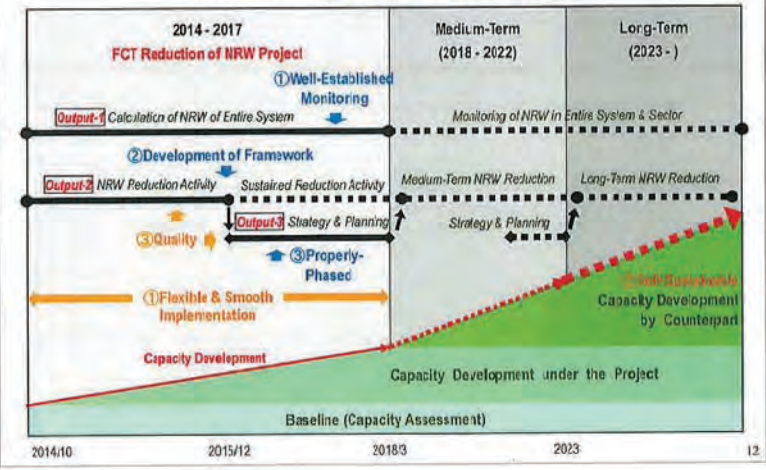
Relationship in Timeframe between Principles and the Project Flow



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6. Capacity Assessment and Capacity Development Plan

CA and CP plan are for both **Organization** and **Individuals** with approaches to **Institution, Policy and Society**, as a triadic component.

* CA and CD Planning by **jointly** the JICA Expert Team and the Management of FCTWB.
* **Interim assessments** of organization and individuals will be conducted **annually**.

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7. Capacity Development for Individuals

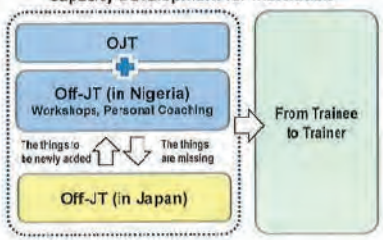
- **Expansion** of transferred skills and knowledge into the **whole** FCC water supply services and other Area Offices after the Project. (Trainee to Trainer)
- Technical meetings and workshops organized under **the initiative of FCTWB staff** with support of the JICA Expert Team.

Trainings in Japan

1. 1st Training for the NRW Management Team in charge of Output-1 to 3 (in 2015)
2. 2nd Training for the NRW Action Team in charge of Output-2 (in 2016)
3. 3rd Training for the Working Group for NRW Reduction Planning in charge of Outpu-3 (in 2017)

*Supposedly in Yokohama City.

Capacity Development for Individuals



14

8. Activities for Output-1

1-1	Install bulk meters to water treatment plants 1 and 2. ** Four ultrasonic flow meters, chamber and monitoring room if needed (to be constructed by FCTWB)*
1-2	Measure monthly water production of water treatment plants 1, 2, 3, and 4.
1-3	Tally the above water production data monthly.
1-4	Calculate the monthly water consumption based on the billing data. **Modification of programme of billing and collection system*
1-5	Calculate monthly NRW ratio of the service area of FCTWB using the data obtained from Activity 1-3 and 1-4.

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9. Activities for Output-2

2-1	Review existing NRW reduction operations at each pilot Area Office.
2-2	Conduct capacity assessment of the relevant staff of each pilot Area Office.
2-3	Identify and select a Pilot Metering Area (PMA) for each pilot Area Office based on the selection criteria of PMA.
2-4	Prepare/update distribution network drawings for each PMA. ** GIS software, Mesh management, comprehensive mapping system, GIS & database training*
2-5	Install water flow meters to each PMA and measure in/outflows monthly.
2-6	Zone each PMA into Sub Metering Areas (SMA).
2-7	Isolate a SMA by installing valves.
2-8	Update the distribution network drawings for each SMA.
2-9	Measure an initial level of NRW of each SMA. ** Water balance analysis (IWA)*
2-10	Detect target NRW components (i.e. invisible leakage, customer meter malfunction, and illegal connection) of each SMA. ** Minimum Night Flow survey, step test, leakage detector, correlator, etc*

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9. Activities for Output-2 (Continued)

2-11	Develop a NRW reduction operation plan of each SMA, including reduction target, for review by Head of Distribution Department.
2-12	Review and approve NRW reduction operation plan of each SMA.
2-13	Implement the NRW reduction operations at each SMA. ** Leakage repair, legalization/disconnection of illegal connections, replacement/ installation of water meters*
2-14	Monitor the progress of the NRW reduction operations of each SMA.
2-15	Measure level of NRW of each SMA at the end of the respective operations. ** Minimum Night Flow survey and Water balance analysis (IWA)*
2-16	Prepare a report on pilot projects, covering Activity 2-1 to 2-15. ** Leakage density by mesh coloring*
2-17	Develop manuals for NRW reduction for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials. ** To be developed by jointly the JICA Expert Team and FCTWB. Audio visual materials by using widely-used software for continuous revision and creation by FCTWB.*

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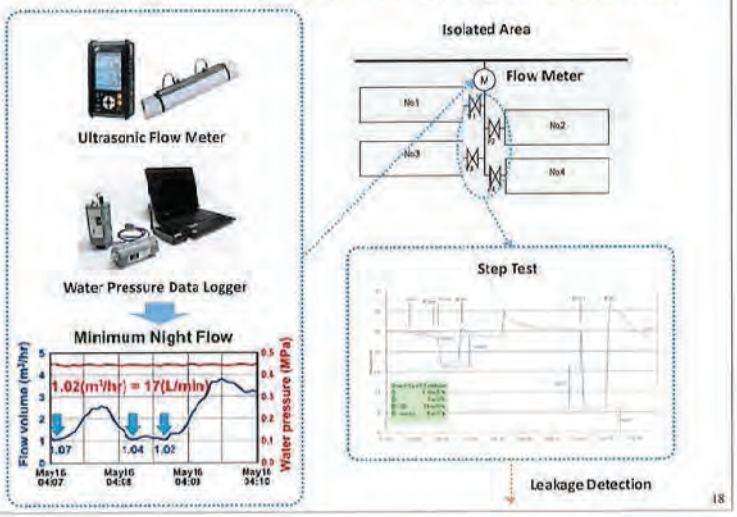
Basic Flow of Detection of Invisible Leakage (Prioritization)



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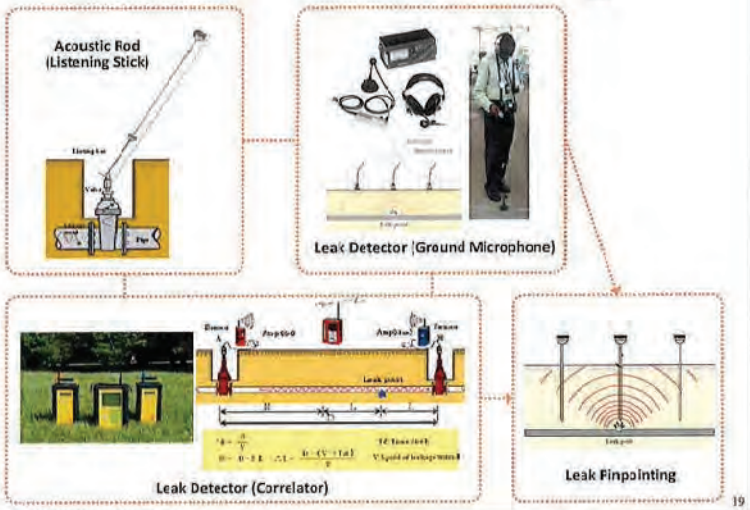
Basic Flow of Detection of Invisible Leakage



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10. Activities for Output-3

3-1	Establish a Working Group for NRW planning.
3-2	Review existing plans, implementation structure, on-the-job training mechanism, etc. related to NRW reduction at FCTWB. **Future establishment of specialized unit or task force*
3-3	Conduct hydraulic and water pressure distribution analyses of the pipeline networks. ** EPANET supposedly*
3-4	Develop outlines of the medium-term strategic plan and its annual NRW reduction plan. ** See the page 21*
3-5	Develop the first medium-term strategic plan (2018-2022) for approval by FCTA. ** See the page 22*
3-6	Develop an annual NRW reduction plan based on the strategic plan as an integral part of an annual recurrent and capital plan of FCTWB for approval by FCTA. ** See the page 21*
3-7	Develop a planning manual for NRW reduction.

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Outlines of the Medium-term Strategic Plan and Annual NRW Reduction Plan (Tentative)

Medium-term Strategic Plan for NRW Reduction (5-year plan)	Annual NRW Reduction Plan
A. Introduction to NRW and approaches (e.g. PDCA) B. Target and indicator C. Staffing plan and their responsibilities D. HRD plan E. Summary of results of pilot projects F. Causes of NRW and their patterns by features of areas G. Flow of NRW reduction H. NRW reduction operation plan - Network drawings and data - Design and creation of DMA or equivalent (such as PMA and SMA) - Prioritization in NRW reduction - Replacement plan of existing pipelines - Field examination of existing valves, etc - Installation of flow meter - Measurement of Minimum Night Flow - Leakage detection - Repair of leaks and recording - Customer listing - Identification of illegal connections and meter inaccuracy - Data collection of billed consumption before/after NRW reduction - Measures against illegal connections and meter inaccuracy - Water balance analysis after NRW reduction operations - Safety measures I. Implementation schedule J. Estimation of total and annual costs K. Estimation of total and annual benefits L. Recommendations M. Manual for equipment	a. Relation with medium-term strategic plan for NRW reduction b. Review of target and indicator c. Staffing plan d. Flow of NRW reduction operations e. NRW reduction operations f. Implementation schedule g. Estimation of annual cost h. Estimation of annual benefit i. Reporting and workshops

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Flow from Preparation of Outline to Development of The Medium-term Strategic Plan

Technical Managers with support of the JICA Expert Team should take on **leading roles** to develop the first medium-term strategic plan and make it **feasible** in consideration of **cost and budget allocation**, based on the **results of pilot projects** in the Phase-1.

Period	Flow	Members in charge in FCTWB
February 2017 -	Draft Outline and Time-line	◆Project Manager, Deputy Project Manager
March 2017 -	Draft Contents	◆Project Manager, Deputy Project Manager ◆NRW Management Team Leaders
April 2017 -	Nomination of members in charge of planning	◆Project Manager, Deputy Project Manager ◆NRW Management Team Leaders
May 2017 -	Finalization of Outline and Contents	◆Project Manager, Deputy Project Manager ◆NRW Management Team Leaders ◆Nominated Team Members
May 2017 -	Development of Draft Medium-term Strategic Plan	◆Project Manager, Deputy Project Manager ◆NRW Management Team Leaders ◆Nominated Team Members

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11. Members of the JICA Expert Team

Akinori MIYOSHI (Mr.)
Chief Advisor /
NRW Reduction Planning

Takuji OKUBO (Mr.)
Commercial Loss

Taketoshi FUJIYAMA (Mr.)
Deputy Chief Advisor /
NRW Reduction Planning

Shinta SEGAWA (Mr.)
Hydraulic Analysis / GIS

Toru TOYODA (Mr.)
NRW Reduction Operations
Management

Kazuhiro ISHIURA (Mr.)
Procurement Management /
Coordinator

Kiyoshi KIYAMA (Mr.)
Leakage Detection Technology

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Appendix 4: Work Plan (Phase-1)

Japan International Cooperation Agency

Federal Capital Territory Administration
Federal Republic of Nigeria

The Federal Capital Territory
Reduction of Non-Revenue Water Project

Work Plan
(Phase-1)

December 2014

JICA Expert Team

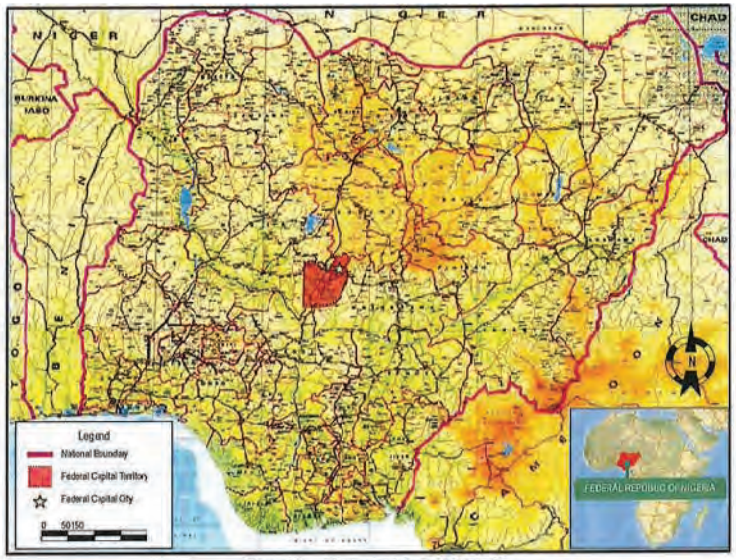
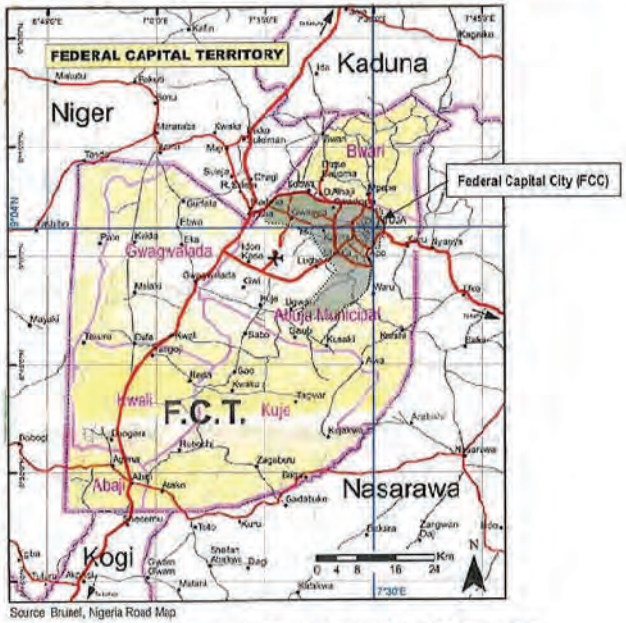


Figure 1 National Map of Nigeria



Source Brunel, Nigeria Road Map

Figure 2 Federal Capital Territory (FCT) and Federal Capital City (FCC)

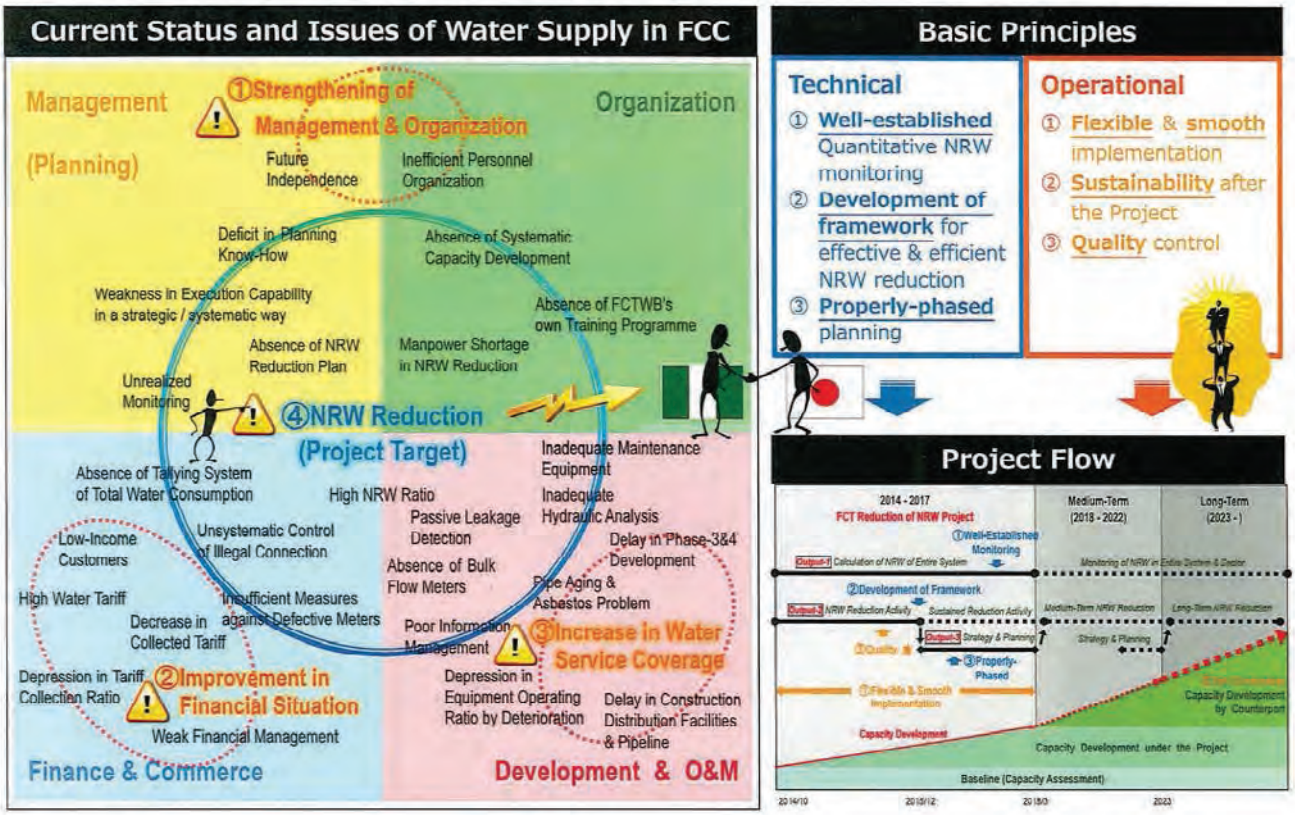


Figure 4 Project Conceptual Diagram

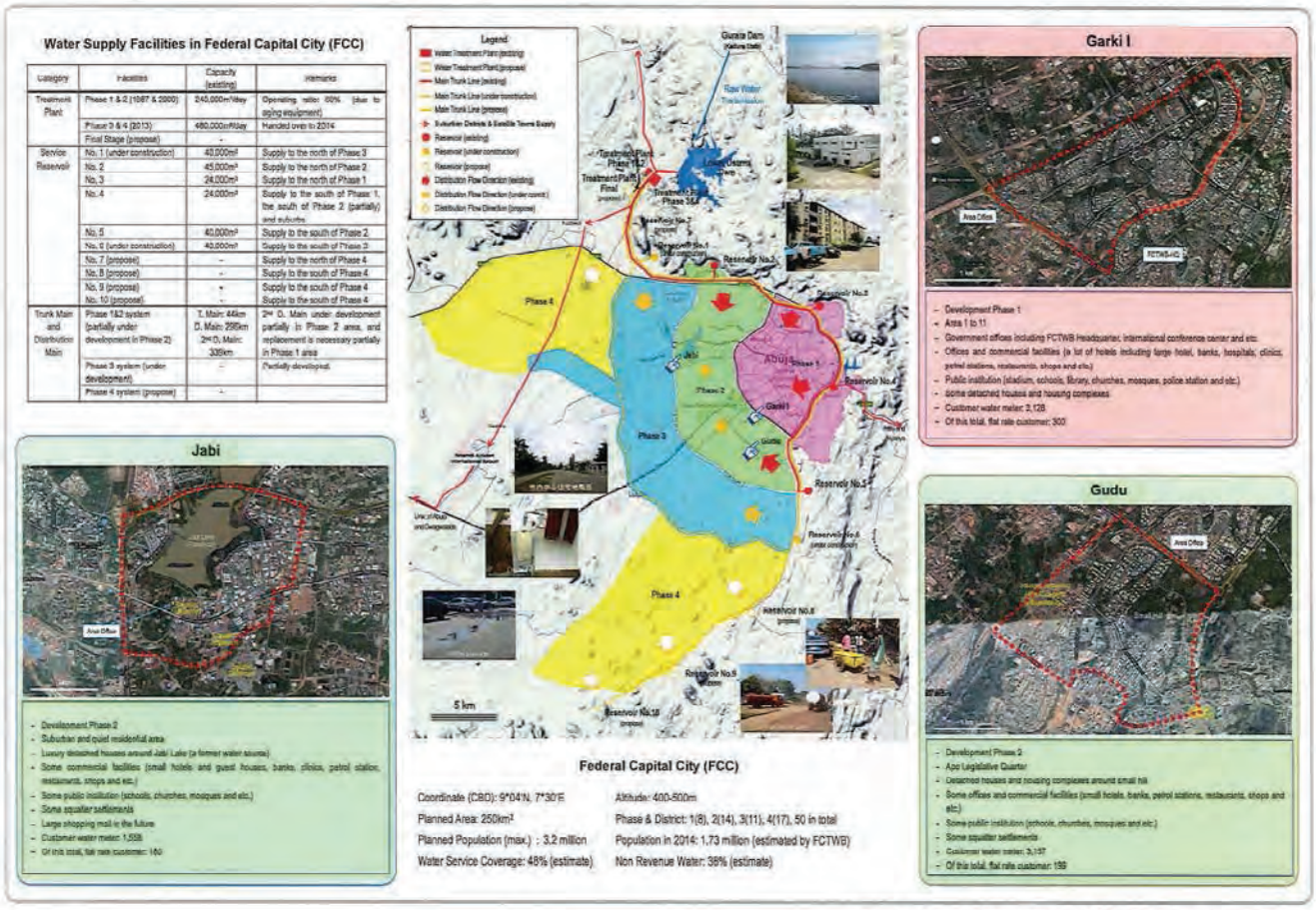


Figure 3 Location of Water Supply Facilities and Features of Pilot Areas

Federal Republic of Nigeria
The Federal Capital Territory Reduction of Non-Revenue Water Project
Work Plan (Phase-1)

TABLE OF CONTENTS

ABBREVIATION

AC	Asbestos Cement (pipe)
AfDB	African Development Bank
AGIS	Abuja Geographic Information Systems
CA	Capacity Assessment
CBD	Central Business District
CD	Capacity Development
C/P	Counterpart
DI	Ductile Iron (Pipe)
DMA	District-Metered Area
E/N	Exchange of Notes
FCC	Federal Capital City (Abuja)
EPRS	Economic Planning, Research and Statistics (a Department of FCTA)
FCDA	Federal Capital Development Agency
FCT	Federal Capital Territory
FCTA	Federal Capital Territory Administration
FCTWB	Federal Capital Territory Water Board
FMWR	Federal Ministry of Water Resources
F/R	Final Report
FRN	Federal Republic of Nigeria
GI	Galvanized Steel (pipe)
GIS	Geographical Information System
GRP	Glassfiber Reinforced Plastic (pipe)
HOD	Head of Department
HOU	Head of Unit
HQ	Headquarters
HRD	Human Resource Development
IWA	International Water Association
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
LCC	Life Cycle Cost
LCD	Liter per Capita per Day
M/P	Master Plan
M/M	Minutes of Meeting
MIS	Management Information System
MNF	Minimum Night Flow
NPC	National Population Commission
NRW	Non-Revenue Water
NUWSRP	National Urban Water Sector Reform Project
NWRI	National Water Resources Institute
Off-JT	Off the Job Training
OJT	On the Job Training
O&M	Operation and Maintenance
PDCA	Plan-Do-Check-Action (Cycle)
PDM	Project Design Matrix
PE	Polyethylene (pipe)
PI	Performance Index
PMA	Pilot Metering Area
PO	Plan of Operation
PR/R	Progress Report
PRS	Planning, Research and Statistics (a Unit of FCTWB)
R/D	Record of Discussions
SMA	Sub Metering Area
uPVC	Unplasticized Polyvinyl Chloride (pipe)
WTP	Water Treatment Plant

Chapter 1 Principles of Project Implementation

1.1 Background of the Project

In the Abuja Federal Capital City (FCC) located in the north-east of the Federal Capital Territory (FCT), the Federal Republic of Nigeria, water supply facilities have been developed based on water supply master plan prepared in 1980. Although new water treatment plants were recently constructed to meet increasing water demand by mass-migration and urbanization, distribution facilities such as service reservoir and network have lagged behind in development. On the subject of non-revenue water (NRW) in FCC, the Detail Planning Survey by Japan International Cooperation Agency (JICA) estimated it at 38% in 2014, and the strategic plan for 2011-2015 of the Federal Capital Territory Administration (FCTA) sets its target level at 25%. However, the Federal Capital Territory Water Board (FCTWB) in charge of operation and maintenance has not taken effective actions against NRW because of its shortage of experience, knowledge and qualified personnel on planning and execution of NRW reduction. Improvement in NRW is a key issue in water supply services.

Under the circumstance, the Government of the Federal Republic of Nigeria (FRN) requested technical cooperation to the Government of Japan in order to strengthen NRW reduction capacity of the FCTWB, then JICA conducted preliminary survey in August 2013 and the Detail Planning Survey in May 2014. Both Governments finally concluded the Record of Discussions (R/D) on 4th July 2014 (see Annex 1) to implement the Federal Capital Territory Reduction of Non-Revenue Water Project (the Project).

Then, based on the R/D, both Governments discussed to confirm the matters and officially launched the Project. See the Minutes of Meeting (M/M) on 6th November 2014 (Annex 2).

1.2 Outline of the Project

1.2.1 Project Period

The Projects is divided into two phases as follows:

Phase-1: October 2014 to December 2016 (27 months) *Official launching in November 2014
Phase-2: January 2017 to March 2018 (15 months)

1.2.2 Overall goal, project purpose, outputs and indicators

Table 1 shows outline of the Project comprised of purposes, outputs and indicators. See the Project Design Matrix (PDM) in Annex 3 and the Plan of Operation (PO) in Annex 4 for details such as activities and inputs.

Table 1 Outline of the Project

Overall Goal	**Level of Non-Revenue Water (NRW) is reduced at the service area of FCTWB.**
Indicator	a. Annual NRW ratio is reduced to X%(*) at the end of the year 2021 Note (*): Target value (X%), which is expected to be determined in the medium-term strategic plan for NRW reduction, shall be tentatively filled when the final draft was approved by the Director of FCTWB, which shall be finalized when the plan is approved by FCTA
Project Purpose	**Capacity of FCTWB for NRW reduction is strengthened.**
Indicator	a. The medium-term strategic plan for NRW reduction (2018-2022) is approved by FCTA by the end of the Project. b. NRW reduction operations of the first quarter of 2018 specified in the annual plan of the above plan are carried out according to the plan by FCTWB. c. Relevant staff of FCTWB (i.e. members of NRW Management Team and pilot NRW Action Teams) become equipped with skills and knowledge necessary for NRW reduction according to the criteria set by the Project for each level. d. NRW ratio of each PMA in the last quarter of the Project reaches its respective target (**). Note (**): Target for each PMA is expected to be determined by the end of the first quarter of the second year.
Output-1	**Level of NRW of the service area of FCTWB is monitored regularly.**
Indicator	1a: Record of monthly NRW ratio is kept by Distribution Department from the third quarter of the first year of the Project. 1b: Monthly NRW ratio of the service area of FCTWB is reported to its monthly Joint Management Meeting from the third quarter of the first year of the Project. 1c: Quarterly NRW ratio of the service area of FCTWB is reported to the Board of Directors of FCTWB from the third quarter of the first year of the Project.
Output-2	**Methods/operational procedures for effective NRW reduction are established though pilot projects at Pilot Metering Areas (PMAs) under pilot Area Offices (*1)**
Indicator	2a: Decrease rate of NRW ratio for each Sub Metering Area of a PMA reaches at least 80% of its target at the end of the respective NRW reduction operations. 2b: Technical manuals for Area Office managers and field operators (i.e. technical officers and meter readers), including audio visual materials, are approved by Head of Department (HoD) for Distribution and HoD for Commerce by the first quarter of the third year of the Project.
Output-3	**A medium-term strategic plan of FCTWB for NRW reduction is developed, utilizing Output-1 and -2.**
Indicator	3a: By October 2017, draft medium-term strategic plan for NRW reduction (2018-2022) is submitted by FCTWB to FCTA for review and approval. 3b: By October 2017, an annual NRW reduction plan (2018) is incorporated in FCTWB's annual recurrent and capital plan (2018) for submission to FCTA for review and approval 3c: A planning manual for NRW reduction is approved by the Director of FCTWB by the end of the Project.

Source: Record of Discussions

The target value of indicator for Overall Goal will be set according to results, such as NRW ratio after NRW reduction operations, to be obtained through pilot projects for three Pilot Metering Areas (PMA) in the Phase-1, described below.

1.2.3 Project Area

- Federal Capital Territory (FCT)
- Pilot Areas: Garki I, Gudu and Jabi

1.2.4 Organizations concerned (Counterpart) of the Nigerian Side

- Federal Capital Territory Administration (FCTA)
- Federal Capital Territory Water Board (FCTWB)

Figure 5 shows the new organogram of FCTWB. Currently, FCTWB consists of headquarters and 16 Area Offices located in water supply service area of FCC, in particular, 11 offices in FCC (Phases 1 and 2) and remaining five in the suburbs or satellite towns. As of August 2013, FCTWB has totally 1,180 staffs comprised of 537 senior staffs, 343 junior staffs and 300 casual staffs.

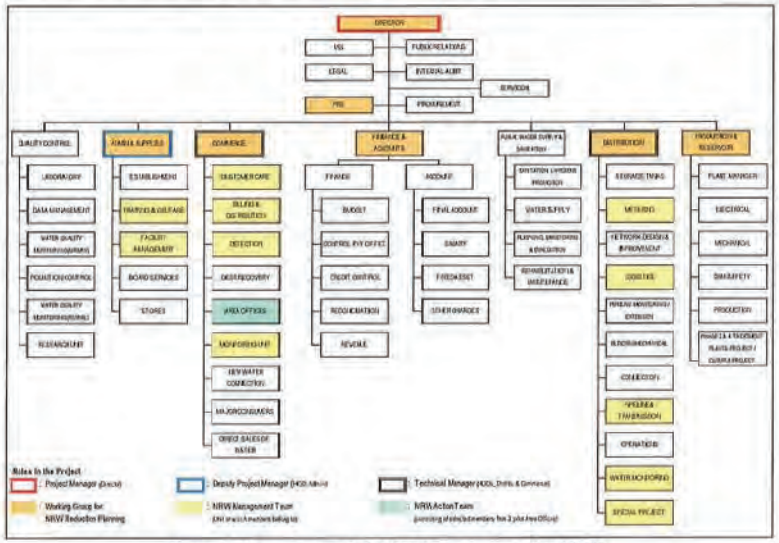


Figure 5 Organogram of FCTWB (to be approved by FCTA)

1.2.5 Project Implementing Structure

Figure 6 shows project implementing structure consisting of the following committee, group and teams.

Project Implementing Structure

① Joint Coordinating Committee (JCC), of which Project Director is Director of Economic Planning, Research and Statistics of FCTA
② Working Group for NRW Reduction Planning, of which Project Manager is Director of FCTWB and Deputy Project Manager is Head of Department (HoD) of Administration
③ NRW Management Team, of which Technical Manger (Team Leader) is HoD of Distribution of FCTWB and another Technical Manager (Co-Team Leader) is HoD of Commerce, consisting of 18 staffs of FCTWB Headquarters
④ NRW Action Team, of which Team Leader is each pilot Area Office Manager of FCTWB, consisting of 26 staffs of three pilot Area Offices
⑤ JICA Headquarters and Nigeria Office
⑥ JICA Expert Team, of which Team Leader is responsible for NRW Reduction Planning, consisting of seven members

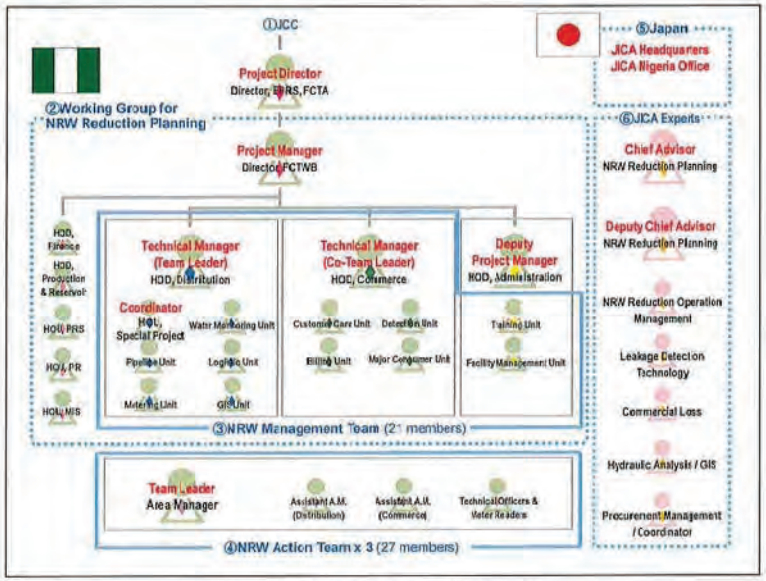


Figure 6 Project Implementing Structure

Table 2 shows relationship between Nigerian Counterparts and JICA Experts in terms of their major roles in the Project Implementation.

Table 2 Relationship Matrix between Nigerian Counterparts and JICA Experts

Nigerian Counterparts / JICA Experts	Working Group for NRW Reduction Planning								NRW Management Team													NRW Action Team				
	Project Director / Director, EPRS, FCTA	Project Manager Director, FCTWB	Deputy P.M. HOD, Administration	HOD, Finance	HOD, Production	HOU, PRS	HOU, PR	HOU, MIS	Technical Manager HOD, Distribution	Technical Manager HOD, Commerce	Coordinator / HOU, Special Project Unit	Pipeline Unit	Metering Unit	W. Monitoring Unit	Logistic Unit	GIS Unit	Cust. Care Unit	Billing Unit	Detection Unit	Training Unit	Facility Mngmt. Unit	Area Manager	Assistant A.M. (Dist.)	Assistant A.M. (Com.)	Technical Officers	Meter Readers
Chief Advisor / NRW Reduction Planning																										
Deputy Chief Advisor / NRW Reduction Planning																										
NRW Reduction Operation Management																										
Leakage Detection Technology																										
Commercial Loss																										
Hydraulic Analysis / GIS																										
Procurement Mngmt. / Coordinator																										

1.3 Current status and issues related to NRW

FCTWB has not a framework dealing with NRW, and has not measured and monitored it regularly. In fact, there are few bulk flow meters at pivotal points such as outlets from water treatment plants and service reservoirs and branching points of distribution mains, and there is no system to calculate monthly water consumption based on the billing data. As mentioned above, current leakage control is not being implemented actively and systematically. Accordingly, fact finding, identification through pilot activities and water balance analysis based on actual measured/observed values should be done.

In order to reduce NRW efficiently and effectively in large area, 47 bulk flow meters proposed in Review of Water Supply Master Plan (2010) should be installed as soon as possible, which enable water supply system to be monitored across the board.

The JICA Detail Planning Survey estimated the entire NRW ratio at 38%, by deduction of per-day revenue water 163,000m^3/day calculated by billed water amount in March 2014 and tariff from daily average supply 262,000m^3/day from water treatment plants.

The Survey concluded that reduction of NRW ratio from 38% to 20%, which Water Supply Master Plan conditions as NRW ratio for water demand projection (strategic plan of FCTA targets 25% in 2015), can bring about the following impacts supposedly shown in Table 3.

NRW reduction is one of the greatest contribution to FCC water supply services, however its necessity and importance should be widely recognized. Planning with scientific basis, securing budget, appropriate technology transfer and its diffusion inside organization can conduce to continuousness and self-sustainable development of FCTWB.

Table 3 Expected Impact by NRW Reduction

Items	NRW:38%	NRW:20%	Impact	Calculation Conditions
Population to be served	1.96 mill	2.53 mill	**Additional 0.57 mill**	Supply Capacity: estimated 624,000m^3/day, Per-Capita Consumption: 197LCD
Demand exceeds Supply (When new WTP is needed.)	2017	2024	**7 years postponed**	Population projection until 2050 by FCTWB
Daily Water Consumption (Billed water)	162,400m^3	209,600m^3	**47,000m^3**	Actual daily supply: 262,000m^3/day
Annual Revenue	N4.74bln	N6.12bln	**N1.38bln**	Water tariff (comestic): N80/m^3
Cost saving of WTP (Rough estimate)	-	-	**N16.8bln**	47,000m^3/day x N3,600/m^3/day

Source: JICA Detail Planning Survey Report July 2014

1.4 Principles of the Project implementation

The JICA Expert Team classifies aspects of current water supply by FCTWB into four key issues as follows:

① **Strengthening of Management & Organization**
Future independence, inefficient personnel

② **Improvement in Financial Situation**
Depression in tariff collection ratio, weak financial management, etc.

③ **Increase in Water Service Coverage**
Delay in development and construction, facility deterioration, etc.

④ **NRW Reduction**
Absence of planning, shortage of skilled manpower, absence of quantitative monitoring system by bulk flow meters, passive leakage detection, etc.

The Project focuses on NRW reduction out of them. FCTWB has a responsibility of operation and maintenance and ensuring water supply to customers, even further distribution facilities are constructed in the future. So as to empower FCTWB technically and financially, significant challenges such as NRW reduction are expected to increase revenue water.

The Project will be implemented in accordance with the enclosed technical and operational principles.

Figure 8 is conceptual scheme showing relationship in timeframe between the principles and the Project flow.

Principles of the Project Implementation

Technical	① Well-established quantitative NRW monitoring ② Development of framework for effective and efficient NRW reduction ③ Properly-phased planning
Operational	① Flexible and smooth implementation ② Sustainability after the Project ③ Quality control

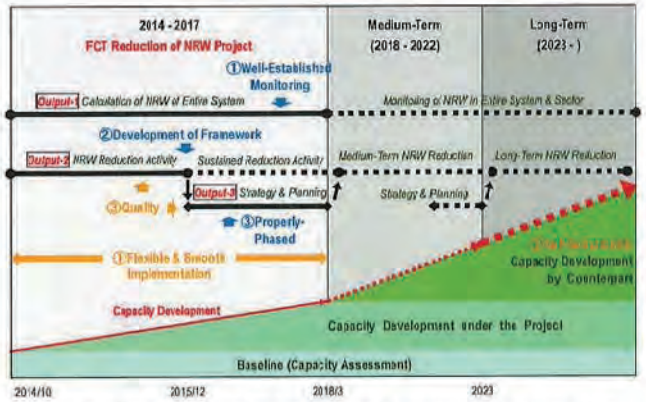


Figure 8 Relationship in Timeframe between Principles and the Project Flow

1.4.1 Technical-1: Well-established quantitative NRW monitoring

The Project, particularly the Output-1, realizes quantitative NRW monitoring, which consists of installation of bulk flow meter at each outlet of water treatment plants and modification of billing system for calculation of monthly water consumption data.

However, overall measurement of flows has been absence because of very few existing bulk flow meters at service reservoirs and along trunk mains and distribution mains, that is, supply-zone-based NRW cannot be calculated. This fact makes it impossible to reduce NRW efficiently in large water supply service area of FCC, then will cause an unfavorable effect on strategic planning of NRW reduction.

In addition, the JICA Expert Team encourages FCTWB to install 47 bulk flow meters proposed in "Unaccounted for Water and System Analysis of the Abuja Network (2009)" as soon as possible, and also to establish overall measurement and monitoring of NRW in a quantitative manner.

1.4.2 Technical-2: Development of framework for effective and efficient NRW reduction

FCTWB has not executed NRW reduction operations systematically. As the Output-2, the JICA Expert Team demonstrates effects, cost-effectiveness and importance of NRW reduction through pilot projects, as well as develops a framework covering command and communication system among managers and staffs in charge, practical procedures and methods of reduction measures, data measurement, recording and check, water balance analysis, feedback and so on.

The JICA Expert Team assist FCTWB to identify causes of NRW in Pilot Metering Areas (PMAs) and examine an approach of NRW reduction appropriate to area characteristics, then these will allow recommendation of effective and efficient NRW reduction in strategic planning.

Categorization of area or district by the factors mentioned here may be useful to examine an approach .

Factors of Categorization (example)
- Pipeline length, diameter and material
- Water pressure
- Pipeline installation year (deterioration)
- Total water consumption
- Number of customers by type
- Number of flat-rate customers
- Number of connections per km
- Land use (including squatters)
- Population density
- Number of past repairs
- Number of past illegal connections
- Past O&M expenses, etc

1.4.3 Technical-3: Properly-phased planning

For the Output-3 to which both the Output-1 and the Output-2 are of use, the Technical Managers play key roles in preparation of the first medium-term strategic plan (2018-2022) and annual NRW reduction plan, under the direction of the top members of Working Group for NRW Reduction Planning. These plans should be properly phased with careful consideration of reasonable cost estimation, budget drafting and allocation.

Content of the strategic plan to be examined among the Working Group members will supposedly include a

strategy for dissemination of NRW reduction throughout the whole FCC, medium-term implementation plan with targets, system strengthening and human resource development (HRD) plans on NRW reduction, and a pipeline replacement plan if necessary. Furthermore, it is expected that new department (or cross-organizational taskforce) on NRW reduction as a successor to the NRW Management Team and/or Action Team is formed after the Project in order to execute NRW reduction operations routinely and sustainably.

In order to have budget for enhancement of NRW reduction allocated certainly, which includes equipment, materials, fuel, public relation (PR) cost, additional personnel cost and so forth, FCTWB and the JICA Expert Team make all kinds of efforts to foster solid understanding by relevant organizations including FCTA.

1.4.4 Operational-1: Flexible and smooth implementation

For successful implementation of the Project, framework of activities, that is, the PDM may be modified flexibly according to political and security situations, changes in counterpart's structure, its performance and result of cause identification of NRW. Thus, as monitoring of the Project, the JICA Expert Team recognizes cases early, which may impact on the Project, and seeks solution through close information sharing and coordination with FCTWB, smooth communication with JICA and effective use of regular meetings. In particular, the JICA Expert Team develops timely various approaches and supports to organizations concerned by securing efficient communication channels. Successful and fruitful JCC and regular meetings, nominating the right person in the right position, budget allocation to the Project and procurement and customs clearance of equipment in a timely manner; these will influence smooth implementation of the Project. The JICA Expert Team regards the enclosed items as assumptions for achievement of the Project Purpose, above all, both budget allocation of FCTWB and procurement of equipment are critical for practical implementation of the Project activities to be wisely dealt with.

External Conditions concerned
- Budget of FCTWB for the Project
- Customs clearance and period of equipment to be handed over
- Leaving of the FCTWB staffs trained through the Project
- Establishment of autonomous FCTWB

(1) Securing budget allocation

Allocation and reliable use of budget is quite essential for smooth implementation of the Project. In the beginning of the Project, the JICA Expert Team confirms the following and takes an appropriate response if necessary.

- Costs of chamber construction, ancillary works and installation in relation to installation of bulk flow meters at the outlets of water treatment plant in the early stage of the Project, supposedly in February to April 2015
- Recurrent costs of preparatory works and NRW reduction operations in PMAs from supposedly May 2015

The JICA Expert Team assists FCTWB in reliable and timely budget use to the extent that the Team can. Table 4 shows the items to be done at the expense of FCTWB, matters of concern and responses.

Table 4 Items to be done at expense of FCTWB (tentative)

FCTWB's expense		Matters of Concern and Reponses
General	Customs fee, inland transport cost	Follow-up is necessary due to delay in customs clearance
Output-1	Costs of chamber construction and installation of bulk flow meters	Necessity of tender, budget, schedule
Output-2	Repair cost of leakage (pipes, fittings)	Recurrent cost for routine maintenance or not
	Replacement cost of water meters	Ownership of water meter, liability for cost
	Fuel cost and personnel cost for driver	Budget for a project vehicle
	PR cost (water-saving campaign, flyers for water outage)	PR activities depending on budget

(2) Procurement of equipment

The JICA Expert Team and FCTWB should operate the Project so that equipment and materials can be procured timely according to the Project activities and schedule. In the selection of them, the JICA Expert Team assists JICA and FCTWB. As to customs clearance which normally takes time by troublesome procedures, the JICA Expert Team follows up it for smooth flow including prompt domestic transport to the extent possible. Once the equipment and materials are procured, they should be immediately handed over to FCTWB. Then department, unit, area offices and person in charge should make sure of safekeeping to avoid troubles in equipment and materials for the Project implementation.

Specifications and quantities of equipment and materials to be procured will be finalized based on results of fact findings and discussions between FCTWB and JICA.

1.4.5 Operational-2: Sustainability after the Project

In light of independence of FCTWB, expansion of water supply service area and population growth in the future, strengthening of personnel and organization as well as approaches to institutional, policy and social aspects are essential. After completion of the Project, it is quite important for concerned organizations to keep developing NRW reduction in the medium and long term. In other words, the framework should be established, by which NRW is quantitatively measured and monitored in total and also NRW reduction operations are expanded into the whole water supply service area (all Area Offices), with required capacity of organization and individuals. The JICA Expert Team, hence, encourages initiatives of FCTWB and conducts capacity development in coordination with direction of organizational strengthening and human

resource development (HRD).

Capacity Assessment (CA), Capacity Development (CD) plan, capacity development of individuals, which form the basis of the Project operation, are described below:

(1) Capacity Assessment (CA) and Capacity Development (CD) Plan

To strengthen capacity of organization and its staff (individuals), it is necessary to find out their baselines at which level they are currently and then conduct appropriate capacity development and training matching needs. In addition, the JICA Expert Team considers external elements such as institution, policy and society surrounding FCTWB.

In view of this, CA in the Project covers organization, individuals and institutional and social system surrounding them. Based on baseline and results of CA, the JICA Expert Team together with the management and the department of FCTWB in charge of HRD prepares CD plan for organization and individuals, which specifies improvement and targets to be achieved and presents directions of the Project activities. The JICA Expert Team, besides, takes approaches to factors which may boost the capacity strengthening of organization and individuals from the viewpoint of institutional, policy and social aspects. Table 5 describes principles of CA and CD Plan, and Figure 9 shows process of capacity strengthening.

Remarks: The numbers ① to ⑥ in this figure correspond to the numbers in the following Table 5.

Figure 9 Process of Capacity Strengthening of Organization and Individuals

Table 5 Principles of CA and CD Plan

Category			Principles
①	Organization	CA	The Project will implemented CA according to the **"Handbook for Capacity Assessment of Urban Water Sector and Water Supply Body in Developing Country, June 2010, JICA"** (hereinafter, the Handbook). CA for the organization is composed of the analysis of Performance Index (PI) and the outline analysis of water supply body. The analysis of PI is implemented for the items of reduction of NRW based on **"Basic tool No.1: PI"** in the Handbook. The outline analysis of water supply body is based on **"Basic tool No.4: Basic check list for water supply body"** in the Handbook. It should be noted that some items in **"Basic tool No.5: Detail check list for water supply body"** would be included if necessary because Outputs, Activities and Important Assumptions of PDM will be reviewed through the Project.
②		CD Plan	After the baseline is indentified, the Project makes a CD plan for the organization based on this baseline. The attention point for making a CD plan is to set the annual goals. These goals can allow to confirm changes of capacity clearly and to understand outputs of the Project in time series. They are also effective to modify a CD plan during the period of the Project.
③	Staffs (Individuals)	CA	The target staffs are the leader class and working level members of NRW Management Team in FCTWB; and the members of NRW Action Team composed of the staff of Area Offices. The important points for CA are to identify the baseline of the individual capacity according to the results of questionnaire, short test, interview, practice validation, and self-report; and to show Capacity Needs to each target staff clearly. It is necessary for making questionnaire and short test to use the same standards every year in order to implement the intermediate evaluation.
④		CD Plan	After the baseline is decided, the Project makes a CD plan for the staff based on this baseline. In this case, the Project makes the goals for each staff and for the time series and shows them effectively in order that staff can understand their CD easily. For example, visualization of CD by a radar chart can increase motivation of the staff (promotion of self-development). Regarding to the evaluation indexes (criteria), the Project plans not to make the common Criteria, but to stipulate specifically because Capacity Needs are different and various among the target members.
⑤	Institutional and social system surrounding FCTWB	Assessment	According to **"Basic tool No.5: Detail check list for water supply body"** in the Handbook, the Project extracts the items, which have organizational impacts on FCTWB, and implements the assessment for these items. The target of this assessment includes the Project and supports by other development partners as external elements having organizational impacts.
⑥		Approaches	Institutional and social system surrounding FCTWB is closely related to the organizational and individual CD. However, it is difficult to handle all external elements only by the Project. Therefore, the Project plans to share the information and achievements obtained through the pilot projects among related organizations such as FCTA and FMWR, and to make proposals as much as possible in order to promote the organizational and individual CD.

(2) Capacity development for individuals

Table 6 describes methods of capacity development for individuals. The JICA Expert Team encourages organization concerned to expand transferred knowledge and skills into the whole FCC water supply

services and other Area Offices after the Project, by the staffs trained through on-the-job training (OJT) and off-the-job training (Off-JT), such as workshops and trainings in Japan, in the Project. The JCC, regular meetings and workshops should be organized under the initiative of FCTWB staffs supported by the JICA Expert Team, as a mean of motivating and empowerment.

On the other hand, the JICA Expert Team communicates and considers mutual collaboration if necessary with the National Water Resources Institute (NWRI) in Kaduna State, which probably has a new training course on leakage detection and pipe repair.

Table 6 Methods of Capacity Development for Individuals (tentative)

Output	Items to be transferred	Key Points	Methods
Output-1	● Specification, planning and design on installation of bulk flow meter	● Roles of bulk flow meter and its importance in NRW reduction	● Workshops, and personal coaching if needed
	● Accurate NRW calculation by billed water consumption and water supply data	● Data for calculation of NRW ratio ● Definitions of items for water balance analysis	● Workshops, and personal coaching if needed
	● Data arrangement for water balance analysis	● A variety of data	● Workshops, and personal coaching if needed
Output-2	● Implementing structure	● Establishment of implementing structure and confirmation of responsibilities	● Workshops
	● Update of network drawings	● Update by using GIS ● Prioritization in pipe replacement	● Personal coaching
	● PMA and SMA	● Definitions	● Workshops, and personal coaching if needed
	● Flow measurement in PMA and SMA	● MNF and method	● OJT
	● Leakage detection	● Leak detectors and correlator ● Leak point identification by step test and other equipment	● OJT
	● Illegal connections and meter inaccuracy in water balance analysis	● Estimation of water loss by illegal connections and meter inaccuracy	● Workshops, and personal coaching if needed
	● NRW reduction operation plan	● Approaches for target achievement ● Composition of the plan ● Role assignment in development of the plan	● Workshops, and personal coaching if needed
Output-3	● Hydraulic analysis	● Allocation of consumption ● Identification of defective pipelines	● Workshops, and personal coaching if needed
	● The medium-term strategic plan for NRW reduction and annual NRW reduction plan	● Compositions of the medium-term strategic plan and the annual plan	● Workshops, and personal coaching if needed

Note: Workshop is not always for each item to be transferred, but for combination of some items
Teaching contents in workshops will basically become questions of test in interim assessment, and this will be hinted to staffs

Figure 10 shows training concept. For sustainability after the Project, the JICA Expert Team suggests the hands-on trainees be selected appropriately from Departments, Units and Area Offices, by the Working Group for NRW Reduction Planning in charge of the Output-3, NRW Management Team in charge of all three Outputs, and NRW Action Team in charge of the Output-2.

Trainings in Japan will be held in "Yokohama Waterworks Bureau", and Table 7 shows tentative training plan in Japan for the Working Group and the Teams respectively, in consideration of their responsibilities, the outputs, and the activities. However, the plan will be modified and rescheduled according to the needs of counterparts defined by CA.

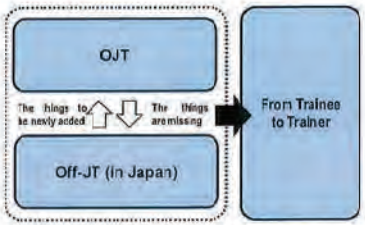


Figure 10 Training Concept

Table 7 Training Plan in Japan (tentative)

Day	Contents	Remarks
For Working Group for NRW Reduction Planning, in May 2017		
1 (Sun)	Arrival	
2 (Mon)	Orientation by JICA	
3 (Tue)	Introduction, water supply planning	
4 (Wed)	Medium- and long- term planning process, bulk supply control	Water treatment plant
5 (Thu)	Leakage prevention	
6 (Fri)	Leakage detection	Practice
7 (Sat)	Review of trainings, courses	
8 (Sun)	Preparation of action plan	
9 (Mon)	Tariff control, customer care	
10 (Tue)	Mapping, pipeline replacement plan (including asbestos pipe)	
11 (Wed)	Water meter, examination for connection	
12 (Thu)	Sewerage treatment	Sewerage treatment plant
13 (Fri)	Presentation of action plan, evaluation, certification	
14 (Sat)	Leaving	
For NRW Management and Action Teams in May 2015 and May 2016		
1 (Sun)	Arrival	
2 (Mon)	Orientation by JICA	
3 (Tue)	Introduction, NRW	
4 (Wed)	Medium- and long- term planning process, bulk supply control	Water treatment plant
5 (Thu)	Leakage prevention	
6 (Fri)	Leakage detection	Practice
7 (Sat)	Review of trainings, courses	
8 (Sun)	Preparation of action plan	
9 (Mon)	Pipeline repair and maintenance	
10 (Tue)	Supervision, inspection	
11 (Wed)	Mapping, pipeline replacement plan (including asbestos pipe)	
12 (Thu)	Water meter, examination for connection	
13 (Fri)	Presentation of action plan, evaluation, certification	
14 (Sat)	Leaving	

1.4.6 Operational-3: Quality control

The JICA Expert Team together with FCTWB controls properly various records of communications and operations, manuals and documents (e.g. reports) with quality through review, validation and verification. Particularly, monitoring sheet will be utilized and improved as an effective tool of progress management.

The JICA Expert Team applies the cycle of Plan-Do-Check-Act (PDCA) so that knowledge to be obtained and lessons to be learned through the activities can be fed back to the Project during implementation for achievement of substantial results at the end of the Project.

1.5 Other key considerations in the Project implementation

1.5.1 Public Relations

Public relations (PR) in the Project are divided into the following three aims:

(1) Publication of cooperation between Nigeria and Japan
(2) Promotion of importance and effectiveness of NRW reduction
(3) Promotion of understanding and cooperation by customers through explanations of necessity and impact

(1) Publication of cooperation between Nigeria and Japan

The JICA Expert Team publishes information actively and effectively by means of web publication, leaflets and flyers so that the Project can be regarded as a leading challenge against NRW under the close cooperation between Nigeria and Japan.

(2) Promotion of importance and effectiveness of NRW reduction

As an approach toward institutional, policy and social aspects such as influence on the policies in water supply sector, importance and effectiveness of NRW reduction should be recognized widely by higher government offices including FCTA and FMWR in order for the Overall Goal of the Project to be attained in the future. For example, the JICA Expert Team supports FCTWB to take the initiative in dealing with NRW at annual Nigerian National Council on Water Resources, which is an opportunity of information sharing with the parties related to water supply in Nigeria.

(3) Promotion of understanding and cooperation by customers through explanations of necessity and impact

Understanding and cooperation by customers should be gained for NRW reduction operations in PMAs, through concrete explanation and educational activities.

1.5.2 Collaboration with development partners

The projects that the JICA Expert Team should pay attention to are: the Third National Urban Water Sector Reform Project assisted by World Bank, and the Urban Water Sector Reform and Port-Harcourt Water Supply and Sanitation Project assisted by African Development Bank. The former includes installation of water meters and NRW reduction, so the JICA Expert Team collects information and operates the Project in collaboration with development partners as need arises.

Chapter 2 Work Plan

2.1 Implementation flow of the Project

The whole implementation flow of the Project is shown in Figure 11 (following page), and the details are described below.

2.2 Implementing method in the Project

2.2.1 Phase-1: October 2014 to December 2016

(1) Preparation and discussion of Work Plan (Phase-1)

The JICA Expert Team prepares the draft Work Plan. Only after its approved by JICA, the Team explains and discusses it with Nigerian Counterparts and then obtains their consensus. If necessary, revision of the PDM and the PO is considered.

(2) Activities for the Output-1

These activities aim for the realization of measurement and monitoring of NRW in the whole water supply service area of FCTWB, and monthly and quarterly NRW ratios are reported properly at regular meetings of FCTWB.

1) Installation of bulk flow meter (Activity 1-1)

Although water production (flow) from water treatment plant shall be measured and monitored to calculate NRW and its ratio quantitatively as an important component, there are few bulk flow meters at the Usuma water treatment plants (Phase-1 to -4), service reservoirs, along pipelines such as trunk and distribution mains. Consequently, the Project includes installation of ultrasonic bulk flow meters at four trunk mains branching off from the above plants, exactly Phase-1 and -2, for measurement and monitoring of water production with accuracy. Other trunk mains from the plants Phase-3 and -4 are equipped with fixed bulk flow meters, but the JICA Expert Team checks accuracy of them initially by the above ultrasonic bulk flow meter in terms of accurate flow measurement and proposes calibration if the need arises.

Ultrasonic bulk flow meters are installed according to process shown in Figure 12 and considerations on each process are described in Table 8.

Figure 12 Installation Process of Bulk Flow Meters

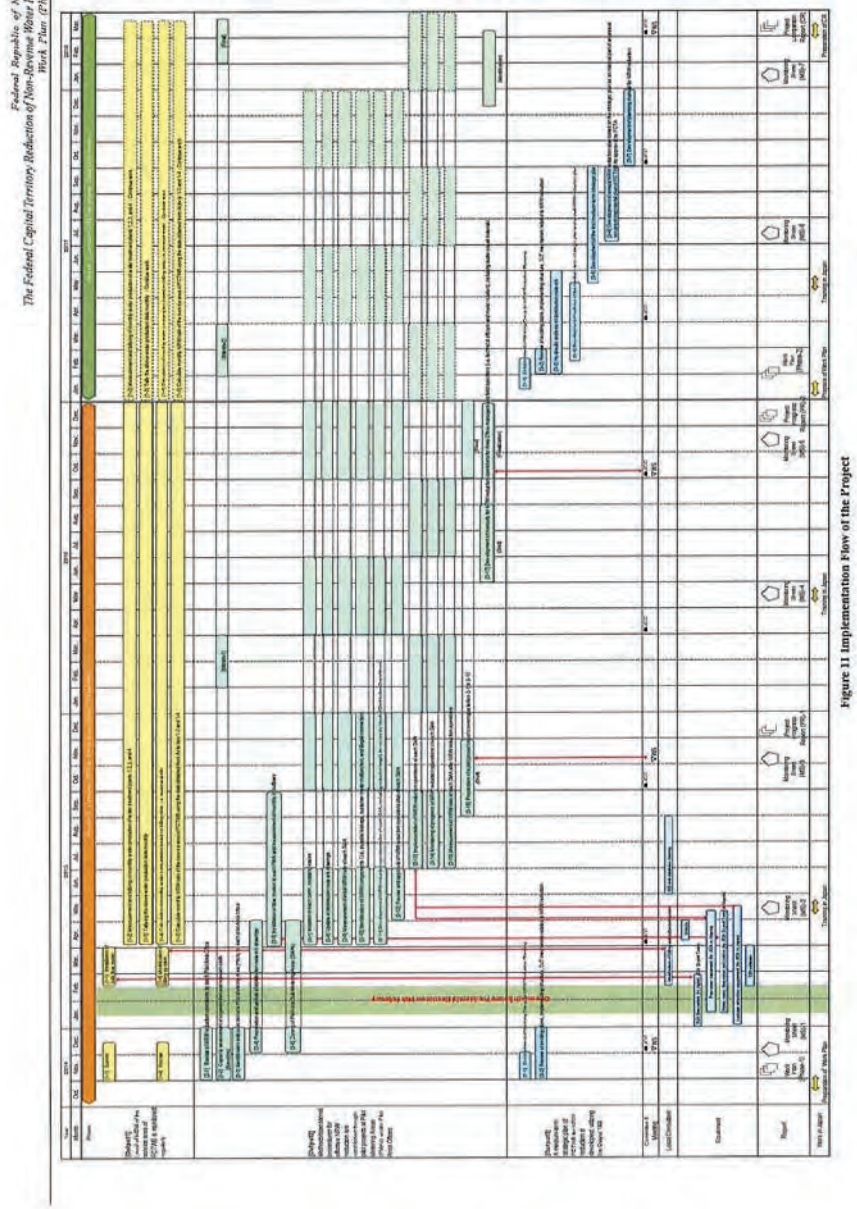


Figure 11 Implementation Flow of the Project

Table 8 Considerations for Installation of Bulk Flow Meter

Process	Considerations
Detail Design	1) Survey on conditions such as water flow, pressure and material of each trunk main for appropriate specifications of ultrasonic flow meter. 2) Specifications considering local situations 3) Decision of installation points allowing for a certain length of straight-line segment of pipeline in the upstream side, because of possible measurement error to be caused by velocity dispersion arising from unsteady flow. 4) Installation of converting devices in a monitoring room or preferably water treatment plant in order to measure and monitor intensively flow of four trunk mains at a time. Suggestion of installation of recorder for continuous monitoring if necessary.
Procurement	1) Procurement following the JICA guidelines for equipment and materials to be procured by JICA 2) Process and schedule control to avoid delay in procurement and installation
Installation	1) Construction and installation in FCTWB's responsibility after sufficient communication and consultation with the JICA Expert Team 2) Consideration to O&M, e.g. installation of coaxial cable between sensor and converter into horseshoe-shaped side ditch 3) Attention to drainage in chamber of ultrasonic flow meter to avoid sensor submerged by rain water or groundwater.

2) Measurement and tallying of monthly water production (Activity 1-2&3)

After clarification of current water production control by FCTWB, the JICA Expert Team defines an objective and points to be improved of water production control, as well as establishes method of data recording and tallying.

Water production from treatment plant is supposed to be controlled by recording forms, so the Team reviews existing forms and suggests an improvement if needed in parallel with installation of bulk flow meters. Water production (flow) from treatment plant is a fundamental data for water supply management including calculation and analysis of NRW, therefore, the Team encourages FCTWB not only to measure and monitor data steadily through calibration and maintenance of bulk flow meters, but also to record data by means of forms.

3) Calculation of monthly water consumption based on billing data (Activity 1-4)

The JICA Expert Team observes current billing and collection system of FCTWB (namely PUMA Ver.1) from the following enclosed viewpoints and then makes programme of the system modified to calculate monthly water consumption from billing data efficiently.

Billing and collection system (PUMA Ver.1) has been supported and maintained by Millennium Integrated Limited, so the programme is supposedly modified and maintained by the said company under local contract with the JICA Expert Team. However, this contract should be transferred into the hands of FCTWB because expense of this maintenance will occur constantly as a recurrent cost. The JICA Expert

Team proposes provisionally budget of the Project absorb the expenses for three months at least after the commencement of calculation of NRW ratio mentioned below, through the system modification and installation of bulk flow meters.

Confirmation of billing system

- Billing and collection based on meter reading results are very important indicators for FCTWB's water supply services relying on water tariff for revenue. The JICA Expert Team confirms the following information by interview and accompanying meter readers in the field.
  - Actual situation of meter reading in the field by FCTWB Area Offices and process in case a meter reader finds out defect water meter
  - Coordination, reporting process and method of result of meter reading to the FCTWB Headquarters
- Data entry and transfer from result of meter reading by FCTWB to billing and collection system (PUMA Ver.1)
- Necessity of programme modification of billing and collection system (PUMA Ver.1) for tallying water consumption

Principles in system modification

- A training component for meter reading based on standard operating procedures (SOP), suggestion on establishment of data entry and double/cross-checking system
- Consideration of compatibility with the above activities, tallying of water production for smooth linkage in data management.

4) Calculation of monthly NRW ratio (Activity 1-5)

By utilizing the observed data and record forms of water production, and data obtained from the modified billing and collection system as the result of the above activities, the JICA Expert Team provides guidance to FCTWB staffs about calculation method of monthly NRW and its ratio. Management of monthly NRW and its ratio includes preparation of record forms, data keeping, data sharing with relevant departments/units and reporting for medium- and long-term NRW reduction activities.

(3) Activities for the Output-2

These activities aim for establishment of a framework of effective NRW reduction, methods and procedures through pilot projects.

1) Review of NRW reduction operations by each pilot Area Office (Activity 2-1)

Area Offices of FCTWB are responsible for maintenance of networks including secondary and tertiary distribution pipelines under 300 mm diameter and service pipes. Because of no leak detectors or equivalent, they have repaired visible leakages after receiving a report from customer, so NRW reduction operations including measures against illegal connections and meter inaccuracy have been not active but passive.

The JICA Expert Team reviews current their maintenance works, scheduling and recording, then assesses their capacity and finds out their needs on NRW reduction.

2) Capacity assessment of organization and relevant staffs (Activity 2-2)

a. Capacity assessment of organization of FCTWB

Figure 13 shows the flow of the organizational CA for FCTWB. The Project plans to implement ③ and ④ over again after the 2nd year (2015).

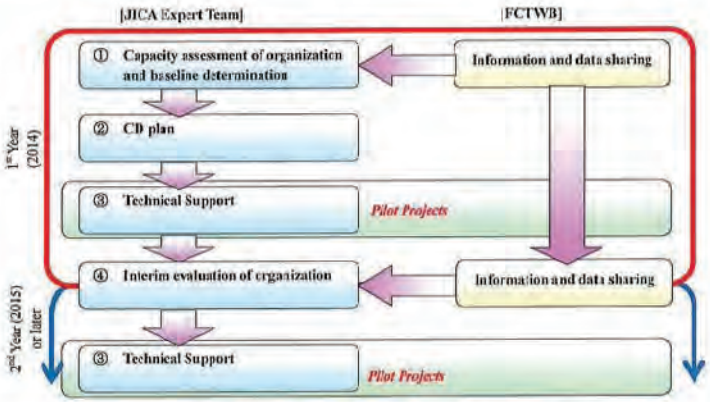


Figure 13 Flow of Capacity Assessment of Organization

① Capacity assessment of organization and baseline determination

Following PI for reduction of NRW and on the basic checklist for water supply body, the Project determines the organizational baseline for FCTWB based on the data and related information from FCTWB and through the interviews. As a result of the assessment, the Project will show the present data analysis and the organizational outline clearly.

② CD Plan

For the items shown in the basic checklist for water supply body, the Project determines the necessary activities and goals of the organizational CD for each year, considering the present baseline.

③ Technical support

Through the pilot projects, NRW will be reduced and the capacity of overall water supply body will be developed.

④ Interim assessment of organization

After a year from starting the activities, the Project assesses the achievements of CD plan. As same as the baseline determination, the Project assesses the organizational capacity based on the data and related information from FCTWB.

b. Capacity assessment of relevant staffs of FCTWB (individuals)

Figure 14 shows the flow of the individual CA for members of FCTWB Headquarters and Area Offices. The Project plans to implement ③, ④ and ⑤ over again after the 2nd year (2015)

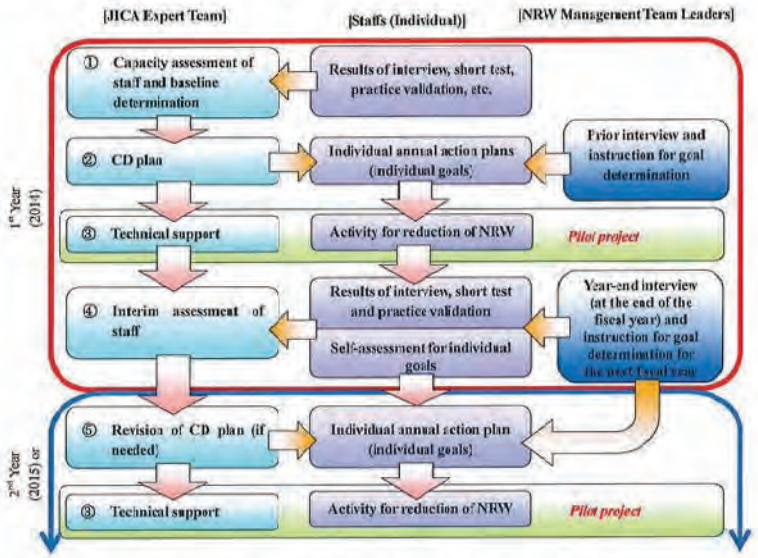


Figure 14 Flow of Capacity Assessment of Staffs (Individuals)

① Capacity assessment of relevant staffs and baseline determination

The baseline of the organizational capacity of FCTWB is determined by the results of interview, questionnaire, short test, practice validation, and self-report. As a result of assessment, the Project will implement the present data analysis.

② CD Plan

Considering the baseline resulted from CA, the Project determines the necessary activities and goals for individual CD for each year. In order to increase motivation of staff for the activities of NRW reduction, the Project plans that each staff will make his/her Annual Individual Action Plan based on CD plan. This activity promotes a spontaneous action of each staff because he/she will make own annual plan actively.

③ Technical support

Through the pilot project, the individual capacity for the activities of NRW reduction will be developed. As the activities of NRW reduction, the Project plans the analysis of supply volume; leak detection; leakage

repairing; meter intangible flow measuring; data collection and analysis; hydraulic analysis; database compilation; preparation of a plan for NRW reduction; and so on.

④ Interim assessment of relevant staffs

After a year from starting the activities, the Project assesses the achievements of CD plan. As same as the baseline determination, the Project assesses the individual capacity based on the results of interview, questionnaire, short test, practice validation, and self-report.

⑤ Revision of CD Plan (if needed)

Based on the results of interim assessment, the Project will extract some important items to be developed from the next fiscal year for each staff, and review the necessary capacity and goals considering Project Purpose and Overall Goal if necessary.

c. Approaches to institutional, policy and social aspects surrounding FCTWB

Figure 15 shows the follow of approaches to institutional, policy and social aspects surrounding FCTWB.

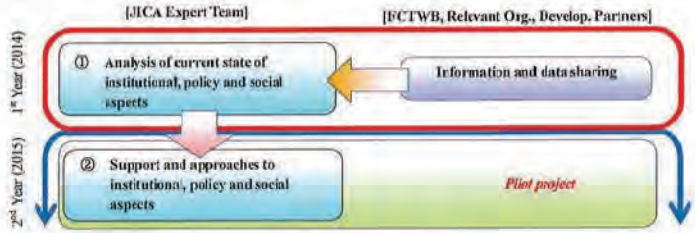


Figure 15 Approaches to Institutional, Policy and Social Aspects

① Analysis of current state of institutional, policy and social aspects

In accordance with "Basic tool No.5: Detail check list for water supply body" in "Handbook for Capacity Assessment of Urban Water Sector and Water Supply Body in Developing Country, June 2010, JICA", the JICA Expert Team analyzes current state of institutional, policy and social aspects based on information from FCTWB, regulatory ministries and agencies, and development partners.

② Support and approaches to institutional, policy and social aspects

While the pilot project, the JICA Expert Team implements monitoring, coordination and approaches for the following external elements in order to develop the organizational and individual CD.

- To monitor the approval for independence of FCTWB
- To calculate the necessary cost and benefit for NRW reduction, and to support for securing the budget by showing the calculation results and effectiveness

- To support an activity for raising awareness about NRW reduction in order to appeal to the policies of the central government and FCT
- To coordinate with FCTWB for optimizing and simplifying customs clearance procedure
- To support active PR activities because people have little conscience about nonpayment of utility cost including water charges

3) Identification and selection of a Pilot Metering Area (PMA) for each pilot Area Office (Activity 2-3)

Three pilot areas (namely Garki I, Gudu and Jabi) were selected through the JICA Detail Planning Survey in terms of project operational efficiency. The NRW Management and Action Teams with support of the JICA Expert Team select and determine a PMA within each Pilot area.

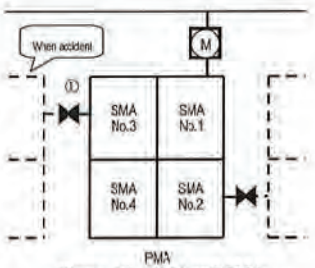


Figure 16 PMA and SMAs

A pilot area is divided into a few PMAs. In consideration of topography, ground height and land uses, each PMA ranges from 1,000 to 1,500 in customer and is an isolated area which water is supplied from an inlet point equipped with a fixed water flow meter. (see Figure 16).

Also, a PMA is divided into smaller areas, Sub Metering Areas (SMAs), because it is not efficient and practical to carry out pilot activities in a whole PMA at a time.

In the process of creation of PMA, minimization of water supply outage, public relations to customers to be suffered and interoperable water supply with the neighboring PMAs by opening isolation valves (see valve ① in Figure 16) in case of an accident are taken into consideration.

4) Preparation and update of distribution network drawings (Activity 2-4&8)

FCTWB has paper-based as-built drawings of the facilities constructed in early 1990s. Distribution networks have been digitized, but only in the Phase-1, so FCTWB should keep on digitizing those of other remaining areas. The JICA Expert Team assists technically in preparation and update of network drawings of pilot areas, and proposes expansion of these activities into the whole water supply service area in an efficient way.

a. Network drawings in case that pipeline information is unidentified or inaccurate

Pipelines are identified by meter pipe and cable detector or non-metal pipe detector (e.g. Plastic Pipe Locator D305, Goodman Co., Ltd) and their locations are identified located by mobile GPS equipment. And then network drawings are prepared by GIS software (e.g. Arc GIS).

b. Matching the facilities and as-built drawings

Not only basic information of material, diameter and length of pipelines, but also information of construction year and registration number should be shown in network drawings and matched to as-built drawings. Moreover, integrated management of various information and drawings makes it possible to realize effective planning of leakage repair and pipelire rehabilitation. The JICA Expert Team proposes effective management of network drawings adapted to conditions of FCTWB.

c. Introduction of mesh management

Introduction of mesh system can make routine O&M more effective, which consists of main mesh (approximately 1km interval) and sub mesh (appoximately 250m interval) for map numbering, and then contribute to smooth transformation to digital mapping system in the future.

Also, mesh system can be utilized for leakage survey, contorol of water pressure and residual chlorine. Therefore, the JICA Expert Team proposes a management system of network drawings with this mesh system.

Photos Example of Management by Mesh System

d. Comprehensive mapping system

Through examination of existing network drawings, human resources, possibility of combination with other software, personnel and construction costs of new mapping system construction, the JICA Expert Team proposes the most appropriate comprehensive mapping system, in which FCTWB uses different software depending on applications with reasonable cost.

e. Maintenance of drawings

Digitization of network drawings contributes to sharing of the latest information among a number of staffs. Appropriate information sharing realizes planning of construction and water outage without relying on experiences, memories and feelings of a limited number of staff. Integrated management of drawings brings in streamlined office works.

The JICA Expert Team assists in not only creation of network drawings but also know-hows of sharing of drawings, procedures of drawing updating and management of drawings. Finally the Team proposes the most appropriate management system of drawings for FCTWB.

The JICA Expert Team plans to entrust training of compiling a database to a local GIS expert for a certain period after April 2015, but this is determined based on fact-finding and discussions with FCTWB.

5) Installation of flow meters to each PMA and measurement of monthly in/outflows, zoning of PMA into Sub Metering Areas (SMAs), isolation of each SMA, measurement of initial NRW ratio of each SMA, and identification of NRW components (Activity 2-5 to 7, 9, 10)

Setting PMA and SMAs in the Project is a very effective methodology for NRW reduction. PMA means an isolated water supply area in which supply is monitored and managed by flow meter, and flow into the PMA (i.e. System Input Volume: SIV) is measured by one or a few flow meters. Water loss within the PMA is calculated by deducting total consumption of all water meters within the PMA from total flow measured by flow meter(s) in a specified period.

In the Project, the JICA Expert Team proposes to install inter-PMA pipelines and valves for stable water supply even if water outage occurs.

a. Measurement of water meter error/inaccuracy

Water meter error/inaccuracy, interval of water meter replacement and its sensitivity by age should be examined in an approach of NRW reduction. The NRW Action Team with support of the JICA Expert Team chooses samples of water meter by type, manufacturer and age, and then investigates their errors. Average value of water meter errors/inaccuracy gained through the sampling survey is applied in analysis of water balance analysis.

For the above investigation, the JICA Expert Team provides reference meters or introduces simple test method using poly-drum tank shown in Figure 17.

① For water flow measurement, a poly-drum tank is utilized as a simple standard tank.

② A pipe is used to connect a removed water meter with a stopcock, which is attached at the bottom of a poly-drum tank. Then, an input water flow is precisely measured. By controlling the input flow with a head of water and aperture of stopcock, it is possible to calculate an error between the input flow and the calculated value by water meter. With this result, water meter error/inaccuracy can be measured.

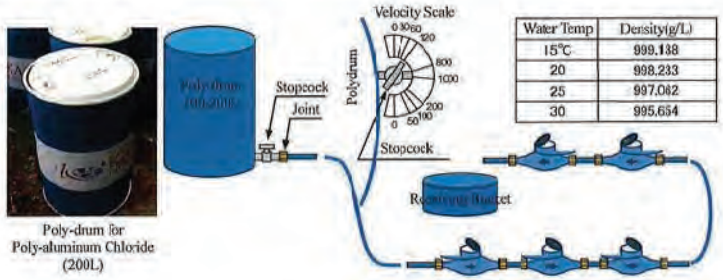
③ The input water, which is fundamental for this test, should be measured with accuracy. It is better to utilize water bottles or other containers. Input water is measured by weight (with consideration of water density). For approximately 10 to 20 minutes, measured water is put into a poly-drum tank.

④ The amount of this measured water is not necessary to be round numbered value, such as 10L, 50L, etc. The important point is to measure with accuracy.

⑤ It should be careful not to spill the water because the water is put into a tank with water bottles in batches. Alternatively, it is possible to put a rough amount of water into a tank, and to measure the remained water in a receiving bucket after the test.

⑥ Before putting water into a tank, an operator should open the stopcock and confirm whether water is drained or not. After that, he/she closes the stopcock, and starts puting water into a tank. This operation enables him/her to know that the test is finished when water is not drained.

⑦ Flow velocity is determined by aperture of stopcock, so water flow should be measured in advance. It is necessary to measure the time to put water, which is accurately measured, into a tank multiple times; to confirm the aperture from a small flow to a large flow; and to prepare a velocity scale indicating the aperture.



Water Temp	Density(g/L)
15℃	999.138
20	998.233
25	997.062
30	995.654

Figure 17 Simple Test Method of Water Meter Error/Inaccuracy (example)

b. Calculation of leakage volume in PMA by minimum night flow survey

Minimum Night Flow (MNF) survey, of which an example of meauremet results shown in Figure 18, can bring out basal leakage volume in an isolated PMA. Rough procedures of the MNF survey are to flow water from one or a few inlet points to a isolated area at midnight, and then to measure the water flow all the time. Assuming there is time zone at midnight in which all customers do not consume, flow meter(s) should not count. Inversely if flow meter(s) count, it means water leakage exists. Although the MNF survey containss stochastic feature, reliable result can be obtained by measurement during several days and by shortened period of data sampling.

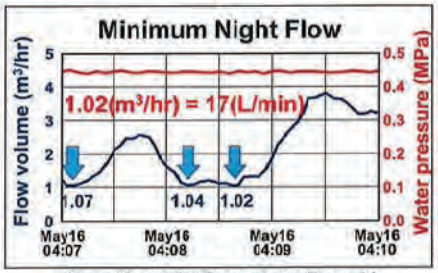


Figure 18 MNF Measurement (Example)

c. Calculation of leakage in each SMA by step test

A PMA ranging from 1,000 to 1,500 in customers is divided into four to five SMAs. Leakage of each SMA is calculated by combination of the MNF survey and step test.

Process of step test is shown as an example in Figure 19, in case a PMA is divided into four SMAs.

In this process, however, water outage for a long time is inevitable. For example, water supply for SMA-2, -3 and -4 must be suspended during survey in SMA-1. In addition, if it is difficult to isolate a PMA completely, it is also difficult to measure leakage. If water outage for a long time is not accepted or isolation is not easily done, through discussions with FCTWB, the JICA Expert Team considers shortening measurement time or an alternative process using an ultrasonic flow meter at an inlet of each SMA to measure leakage in the SMA.

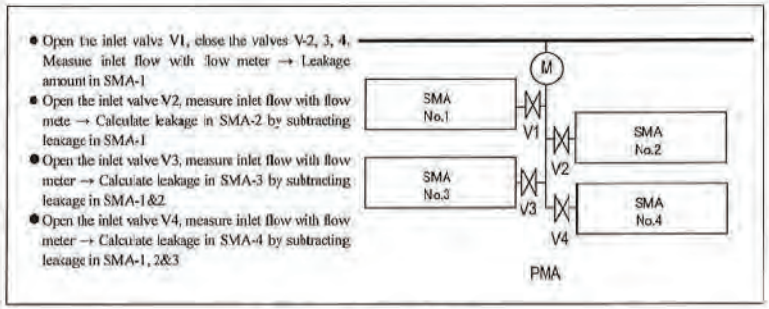


Figure 19 Process of Step Test

d. Measures against illegal connections

Through field surveys, illegal connections (water theft) and conditions of service pipes and their connections are investigated in the pilot areas, particularly where illegal connections are suspicious such as along shallowly-buried or exposed pipelines and at damaged pavement. By comparison of consumptions before and after the detection and suitable treatment, illegal consumption can be measured provisionally.

The JICA Expert Team trains water meter readers of the NRW Action Team to find out the possibility of illegal connections by noticing improper water meter and unusual consumption. In addition, educational programme on water supply services for primary school students is considered as a useful measure against illegal connections because this programme contributes to feedback from children to their family.

e. Preparation of water balance analysis

Table 9 shows components of Revenue Water and NRW according to definitions of International Water Association (IWA). The results of the above surveys can derive ratios of the components.

Table 9 Water Balance Analysis

Total Distribution Volume	Authorized Consumption	Revenue Water	Billed Authorized Consumption	Billed Metered Consumption	
				Billed Unmetered Consumption	
		Non-Revenue Water	Unbilled Authorized Consumption	Unbilled Metered Consumption	
				Unbilled Unmetered Consumption	
	Water Losses		Commercial Losses	Unauthorized Consumption	Site visit
				Customer Meter Inaccuracies and Data Handling Errors	Sampling test
			Physical Losses	Leakage on Transmission and Distribution Mains	MNF
				Leakage and Overflows from the Utilities Storage Tanks	
				Leakage on Service Connections up to the Customer Meter	

6) Development of NRW reduction operation plan of each SMA, review and approval of NRW reduction operation plan, execution of NRW reduction operations and monitoring of progress of NRW reduction operations (Activity 2-11 to 14)

The NRW Management and Action Teams with support of the JICA Expert Team develop a NRW reduction operation plan of each SMA consisting of the enclosed items, and implement NRW reduction operations. Monitoring of the operations leads to preparation of records of the Project activities. Details of some contents in the plan are as follows.

Items of NRW Reduction Operation Plan (draft)
- Location of SMA
- Isolation of SMA and its method
- Process of NRW reduction operations
- Operation items (customer information management, leakage detection survey and repair, survey on illegal connections, survey on internal use, calculation of NRW, and monitoring method)
- Estimation of cost for operations
- Schedule of operations

a. Customer information management

The JICA Expert Team checks the following customer information: water tariff system, customer database, water consumption data by water meter reading, ledger of water meters, and revenue management system. Then, the JICA Expert Team proposes improvement in reassembly and operations of them if necessary.

b. Leakage detection survey and pipe repair

Method of Leakage Detection Survey

After measurement of potential leakage by MNF survey in a PMA, step test, leakage detection in SMAs and pinpointing of exact leakages, these leakages are finally repaired.

Step Test

After the estimation of leakage in each SMA by step test, the SMAs having larger leakage volume are prioritized and targeted for the following operations.

Identification of exact leakage points

In order to repair damaged parts causing leakage, pinpointing survey is executed by using acoustic rod, conventional leakage detector, correlative detector and time integral detector.

In case of using correlative one, sensors should be installed at valves, hydrants or water meters, but actually it may face difficulty because they do not always exist at desirable locations. In this case, the JICA Expert Team considers an alternative which is able to be installed at water meters and an integrated type with communicator equipped with higher radio field strength.

c. Survey on illegal connections

Investigation of illegal connections is executed in each SMA. If illegal connections are exposed, promptly they should be induced to legalization or disconnected after a certain period of grace. For this survey, the JICA Expert Team and FCTWB should pay attention to securing the protection and safety of members and staffs.

d. Survey on internal water use by FCTWB

Water to be consumed for washing pipelines should be measured, in particular, after new installation and rehabilitation of pipelines, and when moving to the other SMAs, etc.

e. Calculation of NRW

By the MNF survey before and after NRW reduction operations, the reduced NRW is calculated as an effect of the operations.

f. Monitoring

Reporting at regular meetings is an important effort for monitoring. Progress including problems and improvement of pilot projects can be shared and discussed, and accordingly this may result in modification of implementing schedule or activities as constructive decisions.

7) Measurement of NRW ratio of each SMA after NRW reduction operations (Activity 2-15)

The NRW Action Team with support of the JICA Expert Team conducts the MNF survey again after NRW reduction operations to measure the reduced NRW and their effect. The increased revenue from multiplication of the reduced water losses by unit water price can contribute to importance and positive impact of NRW reduction for the organizations concerned.

8) Preparation of a pilot project report covering operations (Activity 2-16)

The NRW Action Team with support of the JICA Expert Team prepares records of NRW Reduction operations in the above SMA and analyzes the cost-effectiveness of the operations.

Replacement of aging pipelines is effective in addressing water leakage, but a lot of cost is required. So, the JICA Expert Team considers effective countermeasures against commercial losses to prevent water meter error, misreading and arrears from occurring. Furthermore, the JICA Expert Team recommends the list of countermeasures in order of priority for FCTWB to be able to preferentially select the most cost-effective and appropriate countermeasures.

Implementation of pipeline rehabilitation based on the service life of pipe can be utilized as a simple means. In addition, plotting age of the pipes as well as results of leakage surveys on network drawings or diagrams enables to select the most effective operations or countermeasures for pipeline rehabilitation. For example, so as to reduce water leakage from the recently-installed pipes, an available countermeasure is to reduce pressure from the traffic by burying pipes deeper or to change pipe material with stronger quality one. On the other hand, for the pipes without leakage yet even if they are aged, measures to prolong their service life can be taken.

To lessen that financial strain of FCTWB in its efforts to reduce NRW ratio, the JICA Expert Team recommends adoption of the pipeline rehabilitation plan that can strike a balance between prolonging the life of pipeline networks and budget or cost aspect.

As described above, the JICA Expert Team proposes the pipe network diagram is divided into water leakage meshes. This method manages the number of water leakage points more effectively. If there are several leakages on the mesh, it needs to be investigated every year (mesh of red and yellow in Figure 20). On the other hand, if there are not so many leakages on the mesh, it needs to investigate every two years (mesh of green in Figure 20). Depending on the number of leakages in the mesh, the frequency of monitoring can be decided. For a more efficient and effective leakage investigation, the JICA Expert Team proposes methods that can sustain leakage detection and be taken efficiently with a limited budget.

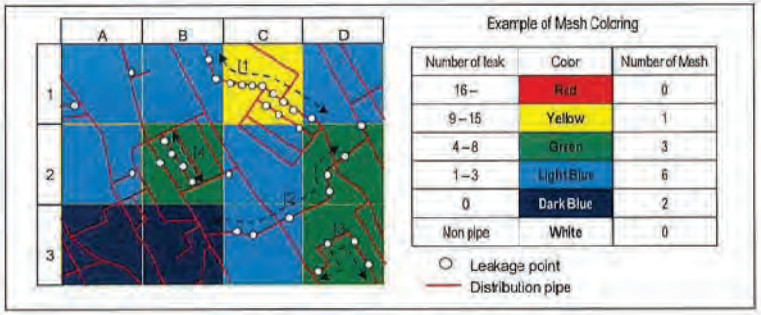


Figure 20 Leakage Density by Mesh Coloring

9) Expansion of the above Activities 4) to 8) into other SMAs

After the completion of NRW reduction operations in the first SMA of each PMA, the above activities are expanded into other SMAs. In this process, it is expected that the NRW Action Team implements the operations in a self-reliant way and consequently NRW reduction by FCTWB becomes sustainable.

10) Development of manuals for NRW reduction operations for Area Office managers and field operators (Activity 2-17)

Based on the results of the pilot projects, the JICA Expert Team develops manuals for NRW reduction operations consisting of manual for Area Managers and Assistant Area Managers as well as manual for field operators. Contents are discussed and determined with FCTWB.

The latter includes visual-audio materials into which actual operations in the field during the Project are put. The JICA Expert Team in collaboration with FCTWB prepares those materials by the widely-used software (e.g. Windows Movie Maker and PowerPoint), in fact as a capacity strengthening, this contributes to continuous revision and creation of new materials by FCTWB in the future.

11) Preparation of Progress Report

The JICA Expert Team and counterparts prepare a draft progress report of the Project in the Phase-1 as an

updated monitoring sheet, and report it to FCTWB and JICA Nigeria Office. Then, the progress report together with minutes of meetings is officially submitted to organizations concerned in Nigeria and JICA Headquarters.

2.2.2 Phase-2: January 2017 to March 2018

(1) Preparation and Discussion of Work Plan (Phase-2)

The JICA Expert Team prepares the draft Work Plan. Only after its approved by JICA, the Team explains and discusses it with Nigerian Counterparts and then obtains their consensus. If necessary, revision of the PDM and the PO is considered.

(2) Activities for the Output-1

These activities aim for the realization of measurement and monitoring of NRW in the whole water supply service area of FCTWB, and monthly and quarterly NRW ratios are reported properly at regular meetings of FCTWB.

1) Calculation of monthly NRW ratio (Activity 1-5)

The same activity from the Phase-1 is continued, but the JICA Expert Team provides advice depending on situation of NRW throughout the Phase-2 so as to make the activity established well under the initiative of FCTWB.

(3) Activities for the Output-2

These activities aim for establishment of a framework of effective NRW reduction, methods and procedures through pilot projects.

1) Monitoring of pilot areas

By utilizing manuals to be prepared and based on results in the Phase-1, the JICA Expert Team monitors operations by the NRW Management and Action Teams in pilot areas, and trains them additionally and makes suggestions if need arises.

(4) Activities for the Output-3

On the basis of results of the Output-1 and -2, these activities are designed to develop the medium-term strategic plan for NRW reduction and annual NRW reduction plan, and lead to expansion of NRW reduction into other areas or Area Offices in a strategic way.

1) Establishment of Working Group for NRW Reduction Planning (Activity 3-1)

The Working Group for NRW Reduction Planning is in charge of supervisory works for NRW reduction planning, which consists of Director of FCTWB, Heads of Department such as Administration, Distribution, Commercial and Head of PRS Unit, and NRW Management Team. As a key role player in NRW reduction

planning, both two Technical Managers doubling as Team Leaders of NRW Management Team should be nominated.

2) Review of existing plans, implementing structure, OJT mechanism related to NRW reduction (Activity 3-2)

The JICA Expert Team reviews existing plans, implementing structure, OJT mechanism related to NRW reduction. Implementing structure of NRW reduction in a systematic way has been not organized in FCTWB. To sustain NRW reduction as a core maintenance work, the JCA Expert Team may propose establishment of a specialized unit or task force for NRW reduction in FCTWB Headquarters and/or Area Offices, through a series of discussions.

The JICA Expert Team motivates counterparts to disseminate acquired know-hows and technologies into other Area Offices as well as other state water agencies.

3) Hydraulic analysis of distribution network (Activity 3-3)

Hydraulic analysis is composed of the enclosed works, and especially needs network drawings with diameter and length, water flow data and ground elevation data. If existing digitized network drawings lack ground elevation data, the data from Google Earth® is applied as a simplified alternative for hydraulic analysis.

Works in Hydraulic Analysis
- Review of current hydraulic analysis of FCTWB
- Data collection such as diameter, length, water flow, ground elevation
- Population and consumption
- Drawings of trunk and distribution mains
- Capacity of facilities such as service reservoirs and pump
- Setting of hourly factor
- Isolated service areas
- Hydraulic analysis
- Pressure measurement in the field, and review
- Identification of the areas suffering from supply
- Recommendation of improvement in networks
- Inclusion in Medium-term strategic plan

The JICA Expert Team expects to introduce widely-used EPANET for hydraulic analysis. The first stage of hydraulic analysis targets trunk and distribution mains of larger size (more than 300mm) in the whole water supply service area of FCC, then compares calculated water pressure with actual measured pressure at each node to examine appropriate pressure. Water flow at each node is calculated from the number of customers (households) and water consumption of customers. The hydraulic analysis of trunk and distribution mains enables to confirm whether if the main networks can function appropriately for water demand or not.

The second stage of hydraulic analysis targets distribution networks, then compares calculated water pressure with actual measured pressure at each node to examine appropriate pressure. If any nodes suffer from low water pressure, diameter of pipelines is reviewed.

According to the result of the above hydraulic analysis, identification of the pipelines to be improved such as sizing up of diameter and unification or division of supply areas are finally reflected into the first medium-term strategic plan for NRW reduction.

4) Development of outlines of the medium-term strategic plan for NRW reduction and annual NRW reduction plan (Activity 3-4)

Table 10 shows outlines of the medium-term strategic plan for NRW reduction and annual NRW reduction plan, but they will be finalized though discussion with the Working Group for NRW reduction planning. Middle-level members of the Working Group to be future heads of departments/units should be involved in development of the outlines.

Table 10 Outlines of the Medium-Term Strategic Plan and Annual NRW Reduction Plan (tentative)

Medium-term Strategic Plan for NRW Reduction (5-year plan)	Annual NRW Reduction Plan
A. Introduction to NRW and approaches (e.g. PDCA) B. Target and indicator C. Staffing plan and their responsibilities D. HRD plan E. Summary of results of pilot projects F. Causes of NRW and their patterns by features of areas G. Flow of NRW reduction H. NRW reduction operation plan ● Network drawings and data ● Design and creation of DMA or equivalent (such as PMA and SMA) ● Prioritization in NRW reduction ● Replacement plan of existing pipelines ● Field examination of existing valves, etc ● Installation of flow meter ● Measurement of Minimum Night Flow ● Leakage detection ● Repair of leaks and recording ● Customer listing ● Identification of illegal connections and meter inaccuracy ● Data collection of billed consumption before/after NRW reduction ● Measures against illegal connections and meter inaccuracy ● Water balance analysis after NRW reduction operations ● Safety measures I. Implementation schedule J. Estimation of total and annual costs K. Estimation of total and annual benefits L. Recommendations M. Manual for equipment	a. Relation with medium-term strategic plan for NRW reduction b. Review of target and indicator c. Staffing plan d. Flow of NRW reduction operations e. NRW reduction operations f. Implementation schedule g. Estimation of annual cost h. Estimation of annual benefit i. Reporting and workshops

5) Development of the first medium-term strategic plan (2018-2022) (Activity 3-5)

a. Contents of the first medium-term strategic plan

Technical Managers with support of the JICA Expert Team take on leading roles to develop the first medium-term strategic plan (2018-2022) in consideration of cost and budget allocation.

Based on the Output-2 in the Phase-1, the strategic plan presents a strategy to expand NRW reduction into the whole FCC water service area and Area Offices. Also, it includes the medium-term target level of NRW ratio and plans for distribution networks, sustainable capacity strengthening of relevant staffs and NRW reduction operations as routine works.

Prioritization of areas to be targeted for NRW reduction is workable so that NRW reduction operations can spread effectively throughout the whole FCC. The JICA Expert Team proposes creation of District Metered Areas (DMA) or equivalent such as PMA of the Project, and also flow and cycle of NRW reduction operations as shown in Figure 21.

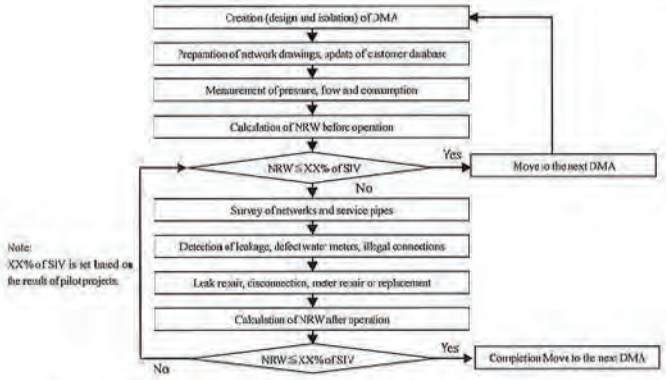


Figure 21 Flow and Cycle of NRW Reduction Operations and (example)

b. Flow from preparation of outline to development of medium-term strategic plan

Figure 22 shows the flow from preparation of outline to development of medium-term strategic plan.

Period	Flow	Members in charge in FCTWB
February 2017 -	① Draft outline and time-line	• Project Manager, Deputy Project Manager
March 2017 -	② Draft content	• Project Manager, Deputy Project Manager • NRW Management Team Leaders
April 2017 -	③ Nomination of persons in charge of planning	• Project Manager, Deputy Project Manager • NRW Management Team Leaders
May 2017 -	④ Finalization of outline and content	• Project Manager, Deputy Project Manager • NRW Management Team Leaders • Nominated Team Members
May 2017 -	⑤ Development of draft plan	• Project Manager, Deputy Project Manager • NRW Management Team Leaders • Nominated Team Members

① Project Manager and Deputy Project Manager prepare draft outline and time-line with support of the JICA Expert Team.
② Project Manager, Deputy Project Manager and NRW Management Team Leaders prepare draft content based on draft outline with support of the JICA Expert Team.
③ Project Manager, Deputy Project Manager and NRW Management Team Leaders nominate members for planning.
④ Project Manager, Deputy Project Manager, NRW Management Team Leaders and nominated members for planning finalize outline and content with support of the JICA Expert Team.
⑤ Nominated members for planning prepares draft plan with support of the JICA Expert Team, and then the draft plan is developed finally through approval of Project Manager, Deputy Project Manager and NRW Management Team Leaders.
* FCTWB continues activities and monitoring in PMAs at least until the end of the Project, consequently lessons learned should be reflected in the strategic plan

Figure 22 Flow from Preparation of Outline to Development of Medium-term Strategic Plan

6) Development of annual NRW reduction plan (Activity 3-6)

The Working Group and the JICA Expert Team develop annual NRW reduction plan, which is feasible for NRW to implement projects systematically and technically, based on the medium-term strategic plan for NRW reduction.

7) Development of planning manual of NRW reduction (Activity 3-7)

Planning manual of NRW reduction as practical one is developed for FCTWB to develop long-term strategic plan for NRW reduction in the future. Outline of the manual is tentatively as follows, but will be finalized through discussions.

Outline of Planning Manual of NRW Reduction (tentative)

Introduction	• Objective of manual • Necessity and impact of future NRW reduction plan • Contents of manual
NRW Reduction Plan	• Standard process of NRW reduction planning • Information and data for NRW reduction planning • Modification of NRW reduction plan
Considerations	• Considerations on planning process • HR, and etc.

8) Preparation of Final Report

The JICA Expert Team and counterparts prepare a draft final report of the Project in the Phase-1 and -2 as a full report, and report it to FCTWB and JICA Nigeria Office. Then, the final report together with minutes of meetings is officially submitted to organizations concerned in Nigeria and JICA Headquarters.

Chapter 3 Project Management, Monitoring, Outcomes, Schedule and Assignment Plan

3.1 Project Management and Monitoring

In principle, on the basis of partnership, in particular the initiative and ownership by FCTWB with the assistance of JICA, implementation as well as management and monitoring of the Project shall be done by jointly both Nigerian and Japanese sides. Figure 23 shows the concept of project management and monitoring for implementation of the Project.

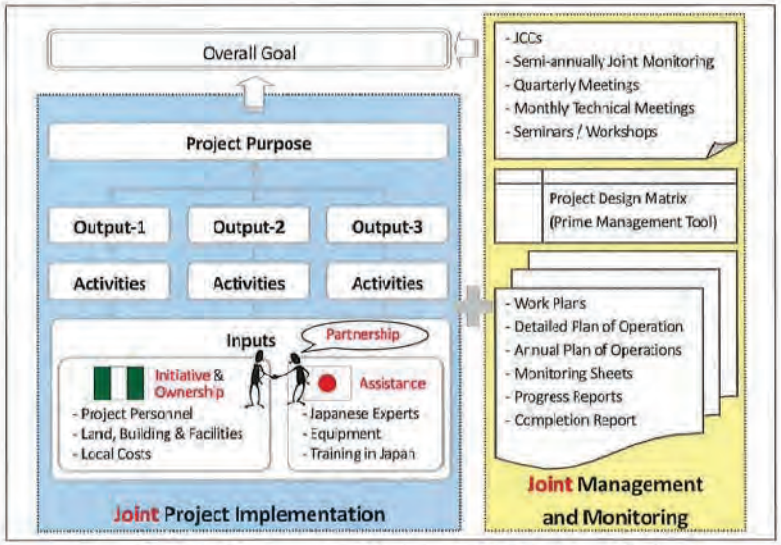


Figure 23 Project Management and Monitoring for Implementation of the Project

Project Design Matrix (PDM) does not only give an outline of the Project but also function as a prime tool for management. Based on the PDM which is revised by mutual agreement as need arises, detailed plan of operation (DPO) is prepared or revised. Annual plan of operations (APOs) aiming to be utilized by FCTWB for budget planning are also prepared every year.

The Project should be monitored by using monitoring sheets (see Annex-5) to be prepared and revised semi-annually, based on the DPO.

As shared management and monitoring tools by the both sides, these documents are presented in discussions of the JCCs, semi-annually joint monitoring and quarterly meetings.

3.2 Outcomes

3.2.1 Reports

The reports and related documents shown in Table 11 are prepared and submitted to JICA.

Table 11 Reports

Phase	Title	No. of Copies	Submission
Phase-1	Work Plan (Phase-1)	4	At the commencement of the Project (Phase-1)
	Monitoring Sheet Ver.1	3	At the commencement of the Project (Phase-1)
	Monitoring Sheet Ver.2	3	6 months later after submission of Ver.1
	Monitoring Sheet Ver.3	3	6 months later after submission of Ver.2
	Progress Report 1	4	At the middle of the Phase-1, by updated Monitoring Sheet
	Monitoring Sheet Ver.4	3	6 months later after submission of Ver.3
	Monitoring Sheet Ver.5	3	6 months later after submission of Ver.4
	Progress Report 2	4	At the end of the Phase-1, by updated Monitoring Sheet
Phase-2	Work Plan (Phase-2)	4	At the commencement of the Project (Phase-2)
	Monitoring Sheet Ver.6	3	6 months later after submission of Ver.5
	Monitoring Sheet Ver.7	3	6 months later after submission of Ver.6
	Project Completion Report	4	At the end of the Phase-2

3.2.2 Technical documents

The following three manuals are developed through the Project.

- Technical manual of NRW reduction for Area Managers and Assistant Area Managers (in the Phase-1)
- Technical manual of NRW reduction operations for Field Operators (in the Phase-1)
- Planning manual of NRW reduction (in the Phase-2)

3.3 Overall schedule of the Project

The Project commences in the end of October 2014 and will terminate in March 2018 through both the Phase-1 and -2. Table 12 (page 38) shows overall schedule of the Project. Gray-colored lines are ones from the tentative PO attached in the R/D, and other-colored lines are proposed by the JICA Expert Team at this moment.

The JICA Expert Team took the following key activities and events into account to prepare work schedule as well as assignment plan described below.

Entire

① JCC, regular meetings, joint monitoring and workshops take place, and monitoring sheets are prepared and submitted.

Phase-1

② The period between October and December 2014 is intended mainly for launching of the Project;

supporting for selection, arrangement and procurement of equipment; holding of the first JCC, regular meetings and workshop (kick-off); creation of PMAs; conducting fact-finding surveys by JICA Experts; and then carrying out CA and planning CD.

③ The period from January 2015 for several months is intended for activities for the Output-1; procurement of equipment; zoning of SMAs; and preparation of network drawings, that is, preparatory activities for NRW reduction operations as pilot projects. The JICA Expert Team stays in Nigeria after period of presidential election.

④ The period from supposedly May 2015 after preparatory activities until October 2016 is intenced for implementation of pilot projects simultaneously in three PMAs under the mentorship and supervision of the JICA Expert Team.

⑤ Meanwhile, activities for the Output-1 including calculation of NRW ratio are continued until the end of the Phase-1. The SMA, in which pilot project is completed is monitored. And technical manuals of NRW reduction is developed supposedly from June 2016.

Phase-2

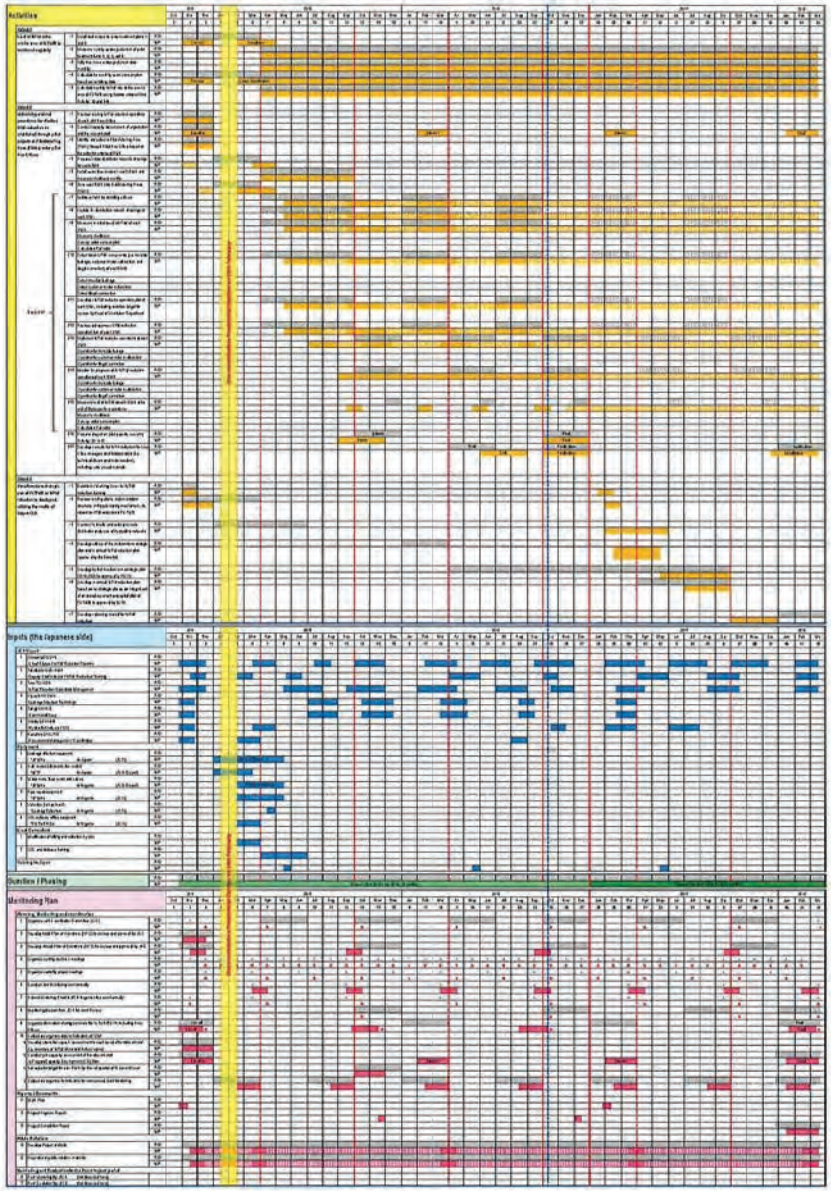
⑥ The activities for the Output-1 and monitoring of NRW reduction operations in PMAs are kept on.

⑦ In the beginning of the Phase-2, hydraulic analysis is conducted.

⑧ Based on results of the Phase-1 (Output-1 and -2), the medium-term strategic plan for NRW reduction is developed, throughout the Phase-2, and finally annual NRW reduction plan is developed and incorporated in FCTWB's annual recurrent and capital plan.

⑨ In the end of the Phase-2, planning manual of NRW reduction is developed.

Table 12 Overall Schedule of the Projec



3.4 Team members and Assignment Plan

3.4.1 Team members

Table 13 shows members of the Nigerian personnel in the Projects.

Table 13 Members of Nigerian Personnel (tentative)

No.		Name	Position in the Project	Title in FCTA/FCTWB
Top Management (FCTA and FCTWB Headquarters)				
1	1	Ali Isa Muhammad	Project Director	Director EPRS, FCTA
2	2	Hudu Bello	Project Manager	Director, FCTWB
3	3	Samuel Tunde Bello	Deputy Project Manager	HOD, Administration and Supply
4	4	Engr. A.A. Nahuche	Technical Manager / NRW Management Team Leader	HOD, Distribution
5	5	Adis S. Muhammad	Technical Manager / NRW Management Co-Team Leader	HOD, Commerce
NRW Management Team (FCTWB Headquarters)				
6	1	Engr. Abolade. R. Lawal	Coordinator	HOU, Special Project (D)
7	2	Moh. Kabiru Rabiu	Member	HOU, Logistic (D)
8	3	Musa Dikko	Member	HOU, Pipeline (D)
9	4	Shehu Suleiman	Member	HOU, GIS (D)
10	5	Douglas E. Oloton	Member	HOU, Metering General (D)
11	6	Engr. A.O. Akande	Member	HOU, Metering/AMR Meter (D)
12	7	Engr. Yetunde Olaniyan	Member	HOU, Water Monitoring (D)
13	8	Engr. Abdullahi Masaud	Member	HOU, Metering/Pre-paid Meter (D)
14	9	Abubakar Ubale Abubakar	Member	Civil Engr. II, Logistic (D)
15	10	Mohammed Dauda	Member	Technical Officer, Pipeline (D)
16	11	Ezeh Hilary	Member	Surveyor, GIS (D)
17	12	Isaac C. Owolabi	Member	HOU, Customer Care (C)
18	13	Danjuma Isah	Member	HOU, Monitoring & Detection (C)
19	14	Taiwo Adeyemi	Member	Staff, Monitoring & Detection (C)
20	15	Aliyu Maradun	Member	HOU, Major Consumers (C)
21	16	Rose Akpan	Member	HOU, Billing (C)
22	17	Suleman Agbawn	Member	Officer, Billing (C)
23	18	Francisca Samuel	Member	HOU, Training/Welfare, (A)
24	19	Akudike Ike D.	Member	HOU, Facility Management, (A)
25	20	Hafsat Ahmed Lawi	Member	HOD, Finance
26	21	Aliyu Usman	Member	HOD, Production & Reservoir
27	22	Bunmi Olowookere	Member	HOU, PRS
28	23	Abbas A. Ahmed	Member	HOU, PR
29	24	Vincent Obeh	Member	HOU, MIS

No.		Name	Position in the Project	Title in FCTA/FCTWB
NRW Action Team (Three Pilot Area Offices)				
		Jabi Area Office		
30	1	Muhammed A.S. Ramat	Team Leader	Area Manager (D)
31	2	Sadiq Salihu	Member	Assistant A.M. (D)
32	3	Abawonse J.K	Member	Assistant A.M. (C)
33	4	Jummai Ugbodaga	Member	Senior Commercial Officer (C)
34	5	Mohammed Moh'd	Member	Planning Officer (C)
35	6	Aliyu Ibrahim	Member	Senior Works Superintendent (D)
36	7	Abubakar Danladi	Member	Foreman (D)
37	8	Raliat Zubairu	Member	Higher Trade Officer (C)
38	9	Mahmud Muhammed	Member	Foreman (D)
39	10	Hassan Yelwa	Member	STA (Commerce)
		Gudu Area Office		
40	1	Abdurrahaman U. Sanda	Team Leader	Area Manager (D)
41	2	Ogbu O. Williams	Member	Assistant A.M. (C)
42	3	Abdul Ozumi	Member	Assistant A.M. (D)
43	4	Adamu Ismaila	Member	Unit Head (C)
44	5	Umar I. Adamu	Member	Assistant Technical Officer (C)
45	6	Kolangora Mohammed	Member	Assistant Unit Head (D)
46	7	Salisu Mohammed	Member	Plumber (D)
		Garki I Area Office		
47	1	Adesoji Adenuga	Team Leader	Area Manager (C)
48	2	Umar Ibrahim	Member	Assistant A.M. (C)
49	3	Mohammed Gana	Member	Assistant A.M. (D)
50	4	Olusegun Rose	Member	Senior Trade Officer (C)
51	5	Abdulahi Ibrahim	Member	Assistant Technical Officer (C)
52	6	Iliya Galadima	Member	Higher Works Superintendent (D)
53	7	Raymond Olowookere	Member	Foreman (D)
54	8	Ibrahim Yelwa	Member	Foreman (D)
55	9	Hassan Abubakar	Member	Commerce Officer (C)
56	10	Shehu Isa	Member	Craftsman (D)

Remarks (A): Administration and Supply, (C):Commerce, (D): Distribution

Table 14 shows members of the JICA Expert Team in the Project.

Table 14 Members of the JICA Expert Team

No.	Name	Position in the Project.	Company
1	Akinori MIYOSHI	Chief Advisor / NRW Reduction Planning	Yachiyo Engineering Co., Ltd
2	Taketoshi FUJIYAMA	Deputy C.A. / NRW Reduction Planning	Yachiyo Engineering Co., Ltd
3	Toru TOYODA	NRW Reduction Operations Management	Yokohama Water Co., Ltd.
4	Kiyoshi KIYAMA	Leakage Detection Technology	Yachiyo Engineering Co., Ltd
5	Takuji OKUBO	Commercial Loss	Yokohama Water Co., Ltd.
6	Shinta SEGAWA	Hydraulic Analysis / GIS	Yokohama Water Co., Ltd.
7	Kazuhiro ISHIURA	Procurement Management / Coordinator	Yachiyo Engineering Co., Ltd

3.4.2 Assignment plan

Table 15 (following page) shows an assignment plan of the JICA Expert Team for the Project.

3.5 Local contracts

Table 16 shows the list of local contracts expected in the Project. After assessment of capacity and needs of FCTWB, the JICA Expert Team determines specifications through discussions with FCTWB and JICA and follows the JICA guideline for procedures of local contracts. Then, the Team instructs local contracting companies and supervises their performance appropriately.

Table 16 Local Contracts

No.	Item	Selection in	Selection by (supposed)	Contractor to be invited
1	Modification of billing and collection system	after Feb. 2015	Tender	e.g. Millennium Integrated Limited
2	GIS and database	After Apr. 2015	Tender or technical proposal	

3.6 Provisional List of Equipment to be procured

The following equipment for implementation of the Project, described in Table 17, are supposed to be procured by the Project, but items, specifications and quantities will be determined through fact-findings and discussions in consideration of needs of FCTWB. For equipment to be procured by JICA, the JICA Expert Team assists in its procurement as needed.

After the procurement and handover of equipment, the JICA Expert Team instructs FCTWB staffs about appropriate use and maintenance.

Table 15 Assignment Plan of the JICA Expert Team

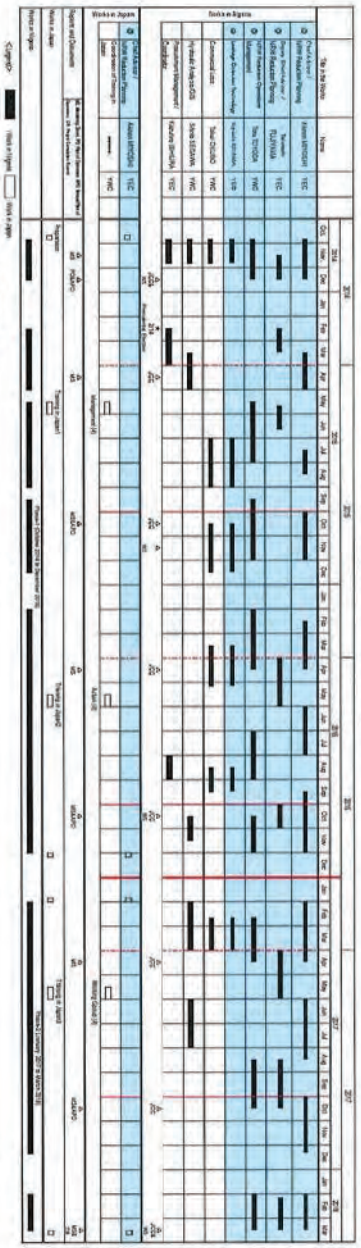


Table 17 Tentative List of Equipment for the Project

No.	Equipment	Specification	County to Purchase		Assumed Quantity	Remarks
			Japan	Nigeria		
For Activity 1-2						
1	Ultrasonic flow meter	fixed type, including cable	●		4	
2	Data logger		●		4	
For Activity 2-4 and 2-8						
1	GIS software			●	2	
2	Plotter (A0)	A0		●	1	
3	GPS terminal	Handset		●	2	
4	Personal computer	Desktop type		●	2	
5	Anti-virus software			●	2	
For Activity 2-5						
1	Flow meter			●	-	The quantity will be decided after Activity 2-4
For Activity 2-7						
1	Sluice valve			●	-	The quantity will be decided after Activity 2-4
For Activity 2-11						
1	Ultrasonic flow meter	Portable type	●		6	
2	Water pressure data logger	2ch	●		6	
3	Water leak detector	Leak noise correlator	●		2	
4	Water leak detector	Acoustic type	●		6	
5	Non-metal pipe locator		●		3	
6	Metal locator		●		3	
7	Time integral water leakage detector		●		3	
8	Acoustic rod		●		9	
9	Distance meter		●		3	
10	Hammer drill		●		3	
11	Boring bar	1.0m	●		3	
12	Drillbit	Dia.19×800mm	●		9	
13	Residual chlorine analyzer	Portable type	●		3	
14	Metal pipe and cable locator		●		3	
15	Reference meter		●		3	for checking customer meters
For Activity 2-13						
1	Generator	200V		●	3	
2	Asphalt cutter			●	3	
3	Concrete breaker			●	3	
4	Small-sized dewatering pump			●	3	
5	Small-sized tamper			●	3	
6	Electric drum			●	3	
7	Customer meter			●	-	The quantity will be decided after Activity 2-4
For Output 2						
1	Pickup truck for pilot sites			●	2	
For Operation of the Project						
1	Laser printer	A4		●	1	
2	Inkjet printer	A3		●	1	
3	Multifunction copier			●	1	
4	UPS			●	3	
5	Graphic/movie editing software			●	1	

3.7 Local staffs

The JICA Expert Team will employs the following local staffs when needed.

- Facilitator
- Assistant engineer
- Secretary
- Driver for Project vehicle