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 3RD WORKSHOP

Venue: Savannah Suites Hotel, 8 Faskari Street, Area 3, Garki, Abuja
Date: Tuesday, 9th May 2017
MC: Engr. A. R. Lawal (Project Coordinator, FCTWB) / Mrs. Bunmi Olowookere (PRS, FCTWB)

9:00 - 9:30	Registration of Participants
9:30 - 9:35	Opening Prayer
9:35 - 9:45	Welcome Address (Project Director, Mr. Sani Pai, Director: EPRS/FCTA)
9:45 - 9:55	Keynote Address (Mr. Hirotaka Nakamura, Chief Representative, JICA Nigeria Office)
9:55 - 10:10	Introduction and Project Overview (Tech. Manager, Engr. A. A. Nahuche, FCTWB)
Session 1	**Output-1: NRW Calculation and Monitoring**
10:15 - 10:30	Bulk & Zonal Meters (Engr. Moh. Kabir Rabiu)
10:30 - 10:45	Billing System (Mrs. Rose Akpan)
10:45 - 10:55	Works and Challenges (Engr. Moh. Kabir Rabiu)
Session 2	**Output-2: NRW Reduction Pilot Projects**
10:55 - 11:20	Procedures of Pilot Project (Engr. Abdullahi Masaud)
11:20 - 11:35	Gudu Case Study (Mr. Abdul Ozumi)
11:35 - 11:50	Jabi Case Study (Mr. Abdulrahman Muhammed)
11:50 - 12:05	Garki I Case Study (Mr. Igbinosa Courage)
12:05 - 12:30	Findings in Case Studies, Issues and Challenges (Engr. Moh. Kabir Rabiu) * Equipment for NRW reduction are displayed or demonstrated.
12:30 – 13:45	Tea/Coffee Break
Session 3	**Output-3: NRW Reduction Strategic Planning in Phase-2**
13:45 - 14:15	Work Plan (Phase-2) (Mr. A. Miyoshi, Chief Advisor, JICA Expert Team)
14:15 - 14:30	Working Group on Strategic Planning (Tech. Manager, Engr. A. A. Nahuche, FCTWB)
14:30 - 15:00	Way Forward
15:00 - 15:10	Closing Remarks (Project Manager, Mr. Hudu Bello, Director: FCTWB)
15:10 - 15:15	Closing Player
15:15 -	Lunch

FEDERAL CAPITAL TERRITORY
REDUCTION OF NON-REVENUE WATER PROJECT
3RD WORKSHOP

ATTENDANCE LIST

DATE: 9TH MAY 2017, VENUE: SAVANNAH SUITES HOTEL

FCTA/EPRS

S/N	NAME	POSITION
1	Lawal Abubakar	DD
2	Umar Sambo	SPO

FCT WATER BOARD

S/N	NAME	POSITION
3	Hudu Bello	Director
4	Nahuche A.A	Technical Manager
5	Adis M.S	HOD Commerce
6	Hasfat Ahmed L.	HOD F&A
7	Abbaas Ahmed	Head PRO
8	Abolade Lawal	Project Coordinator
9	Kabir Rabiu	Head NRW
10	Musa Dikko	Head Pipeline
11	Kenneth Madu	Snr. Craftman
12	Isah Danjuma	H/Monitoring
13	Abduhaman Aliyu	AAM jahi/Katampe
14	John M.Y	AAM Karu/N
15	Simon I. D	AAM(C) Karu/N
16	Garba Danlamso	STO (Gudu)
17	Hussaini Muhammed	HTO Commerce
18	Aliyu Moh'd Chilana	AAM Wuse
19	Mustapha Abdullahi	AAM Kubwa II
20	Aminu M Umar	Int. Enth. Dprt.
21	Jibrin M Yauru	ACTO
22	Solomon O. Oladoja	Snr. Engineer
23	Abubakar Imran E.	T.O
24	Yusuf Yelwa	CTO
25	Idris Mohammed	S.W.S
26	Rafiu A. Sarafadeen	PPM
27	Adaobi K Nwakile	ACCO/AM Wuse II
28	Mainasaru Ibrahim	STO
29	Abubakar Danladi	Snr. Foreman
30	B.E Oduga	C.P.O
31	Hajara B. Koti	C.S.O
32	Abizuru A. Joseph	Supervisor
33	Kanyi Wandoo Mimi	AD/QC
34	Shehu Balananle	S/S
35	Nnaji Glory H.O	ACAO(Admin)
36	Funmi Olukoyi	AAM/ACEO
37	Fabikun Adedeji	Head MIS
38	Igbinosa Courage	Engineer

S/N	NAME	POSITION
39	Ezeh Hillary	Surveyor/GIS
40	Obrike C.M	AD(RWSS)
41	Abdul Ozumi	AAM(D) Gudu
42	Ibrahim Umar	AAM(C) Gudu
43	Iliya Galadima	AWS Garki I
44	Ibrahim Yauri	Snr. Foreman
45	Abubakar Shuaibu	Craftman
46	Segun Kayode	P.R.O
47	Alhamdu J Ngafono	AAM
48	Ehimhen Ehianeta	AAM (C)
49	Abanwonse J.K	AAM(C)
50	Gwani John	AAM (D)
51	Mohammed Gana	AAM(D) Garki I
52	Abdullahi Masaud	Head Metering
53	Rose Akpan	HOU Billing
54	Abdullahi U Faruk	PPM
55	Habib Ahmed Kiru	AM Gudu
56	Abubakar Ubale A	S.E (Civil)
57	Azih Kenneth N.	AM Karu/N
58	Aliyu S.B Muazu	A.D Commerce
59	Choji S.D	ACTO Commerce
60	Nma Yahaya	PTO (D) Kubwa III
61	Yusuf Abubakar	PCO Kubwa III
62	Ibrahim Murtala	PTO
63	Aliyu Maradun	Head M/C
64	Olumoh Suraj	Distribution Gudu
65	Adenuga A.O	AM Garki I
67	Shehu Suleiman	Head GIS
68	Stanley Nweke	AAM (D) Wuye
69	Salau Abigail H.	AAM Asokoro
70	Moh'd A.S Ramat	AM Jabi
71	Sani U. Bunza	AM Bwari
72	Hamzat R.T	Head Audit
73	Ottah C.E	SME
74	Mohammed Dauda	Pipeline Unit
75	Abdul Yusuf	Sup. P&P
76	Anthony Timothy	Distribution
77	Sulaiman Razaq A.	AM Asokoro
78	Taiwo Adeyemi	H (Emb./Fin. Inst.)
79	Abdulrahman Muhammed	S.E
80	Abubakar Adamu	Trade Officer
81	Amedu Daniel Ametah	AAM (C)
82	Raymond Olowokere	Distribution
83	Yahuza Ibrahim	Distribution
84	Salihu O.Sadiq	AAM (D) Jabi
85	Abdularahman Shehu Sani	H/Prepaid Meter
86	William Joseph Maryamu	Metering/Corper
87	Mijinyawa Yahaya	AM Garki II
88	Dele Olatunji	Chief Hydrologist

S/N	NAME	POSITION
89	Akande A.O	PM(AMR)
90	Phoebe Ocheja	A/Director
91	Usman Dakingari A	AM Kubwa II
92	A.U Sanda	AM Wuse
93	Mumini A.R	AAM(D) Gwarinpa
94	Nweke I.F	AAM(C) Kubwa I
95	John Olarenwaju	AM Kubwa I
96	Aliyu B Zakari	AAM(D) Kubwa
97	Isah Mohammed	AAM(C) Maitama
98	Isaac Owolabi	AD Commerce/CC
99	Ahmed Adu	Distribution
100	Yetunde Olaniyan	ACE
101	Sulaiman Muh'd	AAM(C) Jabi
102	Mohammed Shehu	AM Maitama
103	Amodu O.O	Distribution
104	Amos Bulus	E&M

FCDA

S/N	NAME	POSITION
105	Engr Solomon T. Udo	Principal Engr.
106	Engr. Gambo U.L	C.E
107	Engr. E.C Udeh	A.D

JICA NIGERIA & JICA EXPERT TEAM

S/N	NAME	POSITION
108	Takayuki Ohira	Project Formulation Advisor
109	Akinori Miyoshi	Chief Advisor NRW Project Team
110	Taketoshi Fujiyama	aDeputy Chief Advisor NRW Project Team
111	Toru Toyoda	NRW project Team
112	Kiyoshi Kiyama	NRW project Team
113	Hiroyuki Morita	NRW project Team
114	Toshinobu Kasuya	NRW Project team
115	Otobo Deborah	Secretary/Office Admin
116	Mark Ajala	Technical Assistant
117	Jackson Jacob	Assistant

AFRICAN DEVELOPMENT BANK

S/N	NAME	POSITION
118	Tom Mugoya	Water & Sanitation Engr.
119	Bashiru Ibrahim	
120	Janoxem Jeanne	AFD Project Manager

LAGOS WATER COOPERATION

S/N	NAME	POSITION
121	Titilola Bright Oridami	LWC

The Federal Capital Territory Reduction of NRW Project (Phase-2)

Introduction and Project Overview

9th May 2017

Engr. A. A. Nahuche
Technical Manager, HoD Distribution, FCTWB

What is Non-Revenue Water?

NRW is an indicator of water supply management and O&M for actions to be taken, and also is supposed to be kept lower to improve efficiency of water supply services.

System Input Volume	Authorized Consumption	Billed Authorized Consumption	Billed Metered Consumption	Revenue Water
			Billed Unmetered Consumption	
		Unbilled Authorized Consumption	Unbilled Metered Consumption	Non-Revenue Water (NRW)
			Unbilled Unmetered Consumption	
	Water Losses	Commercial (Apparent) Losses	Unauthorized Consumption	
			Customer Metering Inaccuracies and Data Handling Errors	
		Physical (Real) Losses	Leakage on Transmission and/or Distribution Mains	
			Leakage and Overflows at Utility's Storage Tanks	
			Leakage on Service Connections up to Point of Customer Use	

* "Un-accounted for Water (UfW)" is no longer common term.

Project Outline

Implementing Body

Federal Capital Territory Administration (FCTA)
Federal Capital Territory Water Board (FCTWB)
* *Collaboration with FCDA, AGIS, FMWR, FMBNP is a key to success of the Project particularly in NRW reduction strategic planning.*

Project Areas

Federal Capital Territory (FCT)
Pilot Areas: Gudu, Jabi and Garki I
* *Involvement of all Area Offices is essential for the Project.*

Project Period

Phase-1: October 2014 to December 2016 (completed)
Phase-2: January 2017 to September 2018 (ongoing)

Project Outline (continued)

Overall Goal	Level of Non-Revenue Water (NRW) is reduced at the service area of FCTWB.
Project Purpose	**Capacity of FCTWB for NRW reduction is strengthened.**
Output-1	Level of NRW of both the service area of FCWTB and water distribution areas are monitored regularly.
Output-2	Methods/operational procedures for effective NRW reduction are established though pilot projects at Pilot Metering Areas (PMAs) under pilot Area Offices.
Output-3	A medium-term strategic plan of FCTWB for NRW reduction is developed, utilizing the results of Output 1-2.

3. Sessions in Workshop

Purpose of Workshop

- Formation of shared awareness of project orientation and updated progress, problems and challenges

Session 1
Output-1: NRW Calculation and Monitoring

Session 2
Output:2 NRW Reduction Pilot Project

Session 3
Output-3: NRW Reduction Strategic Planning in Phase-2

Session 1
Output-1: NRW Calculation and Monitoring

1-1. Bulk & Zonal Meters

1-2. Billing System

1-3. Works and Challenges

Session 2
Output-2: NRW Reduction Pilot Project

2-1. Procedures of Pilot Project

2-2. Gudu Case Study

2-3. Jabi Case Study

2-4. Gakri I Case Study

2-5. Findings in Case Studies, Issues and Challenges

Session 3
Output-3: NRW Reduction Strategic Planning in Phase-2

3-1. Work Plan (Phase-2)

3-2. Working Group on Strategic Planning

3-3. Way forward

The Federal Capital Territory Reduction of NRW Project (Phase-2)

Bulk & Zonal Meters

9th May 2017

Engr. Moh. Kabir Rabiu
HoU NRW, Distribution, FCTWB

1. Bulk Meters

1.1 Roles of Bulk Meters

FCTWB needs to read bulk meters, located at outlet of LUD Water Treatment Plant, scientifically/quantitatively for

- Calculation of water production or water flow (system input volume) into the entire FCTWB's water supply system
- Analysis of IWA water balance, particularly NRW ratio of entire water supply system.
- Analysis of water loss along trunk mains, together with reading zonal meters as mentioned below.
- Analysis of daily maximum factor for water demand forecasting in water distribution management

1. Bulk Meters

1.2 Location of Bulk Meters

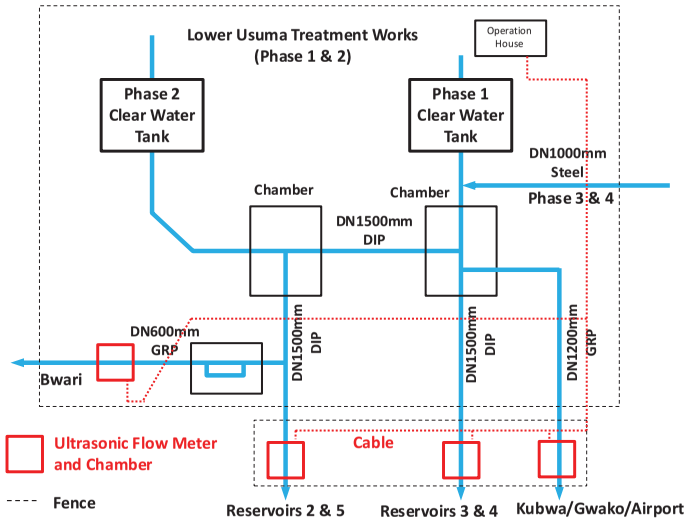
See the next slide.

- No.1: Transmission Main (DN600mm) to Tank Bwari
- No.2: Transmission Main (DN1500mm) to Tank 2 & 5
- No.3: Transmission Main (DN1500mm) to Tank 3 & 4
- No.4: Transmission Main (DN1200mm) to Tank Kubwa, Airport and Gwako

1.3 Procurement

- Chamber Construction for 4 locations (completed)
- 4 Ultra-sonic Flow Meters (completed)
- 1 Data Logger (completed)

Location of Bulk Meters



Works completed

Chamber Construction

Sensor of Ultrasonic Flow Meter

Chambers constructed

Main Unit of Ultrasonic Flow Meter

2. Zonal Meters

2.1 Roles of Zonal Meters

FCTWB needs to read zonal meters, to be located at outlet of the selected tanks, for

- Calculation of water flow (system input volume) into each water distribution zone under a tank.
- Analysis of IWA water balance, particularly NRW ratio of each water distribution zone under a tank.
- Prioritization and ensuring efficiency of NRW reduction operations by water distribution zone.
- Analysis of water loss along trunk mains, together with reading bulk meters as mentioned above.

2. Zonal Meters

2.2 Location of Bulk Meters

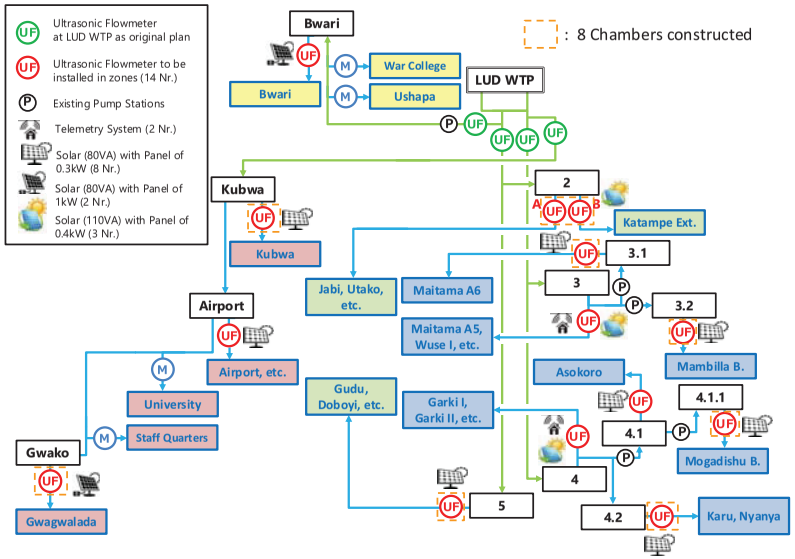
See the next slide.

- Tank 2 (x2), Tank 3, Tank 3.1, Tank 3.2, Tank 4, Tank 4.1, Tank 4.1.1, Tank 4.2, Tank 5, Tank Bwari, Tank Kubwa, Tank Airport and Tank Gwako (DN250mm to DN1500mm)

2.3 Procurement

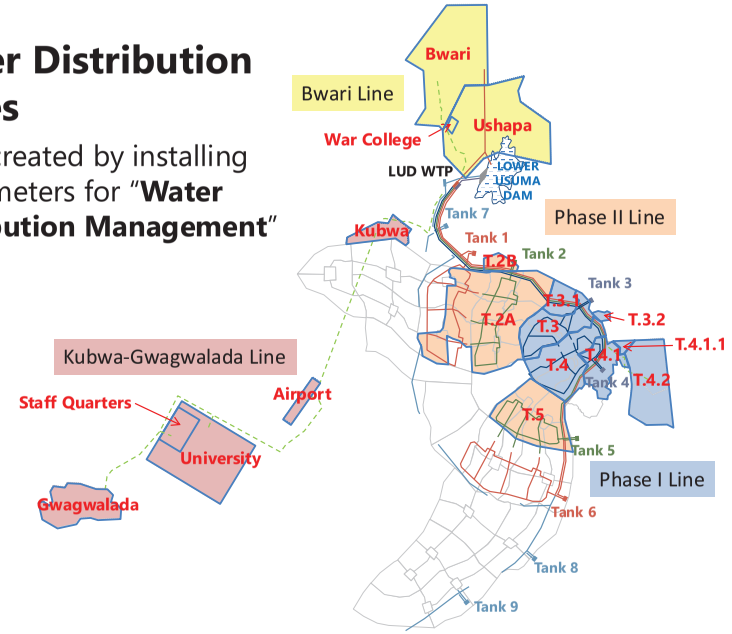
- Chamber Construction for 8 locations (completed)
- 14 Ultra-sonic Flow Meters (in shipment)
- 13 Data Logger (in shipment)
- 2 Telemetry System (in shipment) as a pilot
- 13 Solar Power System (under procument)

Location of Zonal Meters



Water Distribution Zones

To be created by installing zonal meters for "**Water Distribution Management**"



Thank you for your attention.

The Federal Capital Territory Reduction of NRW Project (Phase-2)

Billing System

9th May 2017

Mrs. Rose Akpan
HoU Billing, Commerce, FCTWB

Upgrade of Billing System

The Project upgraded the outdated billing systems of FCTWB to provide a common user-friendly platform with flexible analysis of billing and payment information and to achieve 100% meter reading (no flat-rate, no estimate and no duplicated bills and no unbilled customers) as ultimate goal. This helps FCTWB to adequately manage her customers in order to ensure satisfaction and maximize revenue potential.

SCOPE

To establish a modern and flexible billing system at FCTWB which will facilitate the efficient collection, sharing, dissemination and storage of metering, payment and billing data, the scope includes:

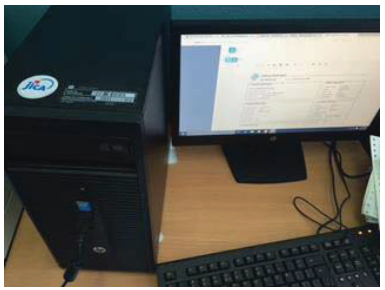
a. Upgrade of Active-PUMA 1.0 and 3.0 software to latest Active-PUMA 4.0;
b. Merging existing Active-PUMA 1.0 and 3.0 application databases into a common Active-PUMA 4.0 repository to be simultaneously accessible by both conventional and AMR billing systems.
c. Creation of new report templates with a view to displaying both Naira value and water volume to enhance analysis of Non-Revenue Water.

Update of Billing System

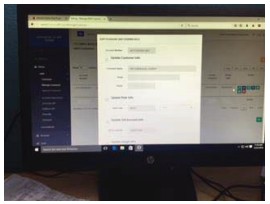
Category	Items	Description	Qty.	Unit
Server Infrastructure	Computer Server and Accessories	HP ProLiant DL560 Gen8 E5-4603v2 2P 32GB-R Hot Plug SFF 1200W RPS Server Enterprise Server	3	unit
Computers	High-end Computer Workstations	HP HPE h8qe series, 8GB HDD, 1TB RAM	6	unit
Platform Software	Operating System	Microsoft Windows Server 2012 R2	3	license
Platform Software	Microsoft SQL Server	Microsoft SQL Server 2014 Standard Edition (1 processor license)	1	license
Custom Enterprise Software	Automated Billing Application	Custom Automated Billing Application (ActivePUMA 1.0 Upgrade)	1	license
Custom Enterprise Software	Automated Billing Application	Custom Automated Billing Application (Merging of upgraded ActivePUMA 1.0 and ActivePUMA 3.0 into one common platform)	1	license
Implementation, Integration and Deployment	Data Integration	Existing and new data integration (millions of payment, bill, meter reading and customer records)	1	lot
Training	Training and Capacity Building	Training of system administrators and operators on use of new software	5	day

Update of Billing System

Computer Server



Computer Workstation



Data Entry

The Federal Capital Territory
Reduction of NRW Project (Phase-2)

Works and Challenges in Output-1

9th May 2017

Engr. Moh. Kabir Rabiu
HoU NRW, Distribution, FCTWB

Schedule

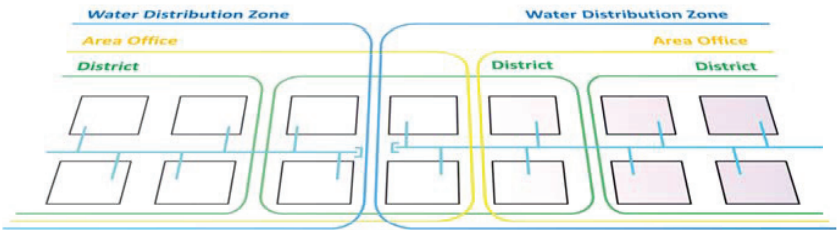
Item	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Bulk Meter Reading (Inflow)									
Procurement of Zonal Meters									
Solar System for Zonal Meters									
Installation of Zonal Meters									
Zonal Meter Reading (Inflow)									
Zonal Coding of Customers									
Tallying Billed Consumption									
NRW Calculation & Monitoring									

Works to be done and Challenges

- To stabilize power supply to main units of ultrasonic flow meters.
- To analyze the situation and find solution for data loss of bulk meters possibly because of non fully-filled water inside pipe.
- To monitor bulk & zonal meters regularly (monthly) by reading, recording and analyzing.
- To maintain bulk & zonal meters, other equipment and devices routinely (daily) by visual check and tools.
- To complete zonal coding of customer database (see the next slides)
- To enhance meter reading ratio or capture consumption. quantitatively by installing meters to flat-rate customers as well as by decreasing estimate bills and unbilled customers.
- To improve accuracy of meter reading data by ensuring regular meter reading through discipline as well as by eliminating duplicated bills if any.
- To relieve the complexity of water meter types, customer types, several water tariffs, meter reading by Units and Area Offices.

Multi-Boundaries in FCTWB

Two boundaries exist:
(1) **Administrative District**
(2) **Area Office's managing area**
New boundary will be demarcated under the Project:
(3) **Water Distribution Zone** (defined by distribution network configuration and isolation)



FCTWB should find **optimum** water distribution management.

Zonal Coding of Customers and Procedures

To sort out customers or its water consumption by water distribution zone, the following steps will be taken.

Schedule: May to June 2017

Coordinator: Mr. Adis, HoD Commerce

Supervisors: Mr. M. Dikko, Engr. Kabir, Mr. Shehu S., Mr. Kehinde and Mrs. Rose

Step-1: MIS Unit creates a new attribute "Zonal Code" in customer database. (completed)

Step-2: GIS Unit prepares GIS maps showing roads, cadastral data (plot no.), pipelines and district boundaries. (by 15th May)

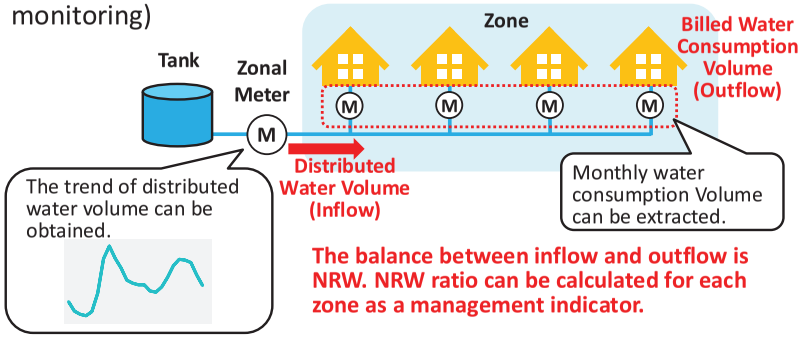
Step-3: GIS Unit confirms and draws zonal boundaries on GIS maps with support of staff of **Distribution**, **Commerce** and **Area Offices**. (by 5th June)

Step-4: Based on the zonal boundaries on GIS maps, **Billing Unit** updates customer database by assigning zonal code to each customer with support of staff of **Distribution**, **Commerce** and **Area Offices**. (by 23rd June)

Water Distribution Management

Quantitative & Scientific Comprehensive Control (3 Pillars)

Water Volume: Water supply utilities should supply **necessary and sufficient water** even at peak and in future. (Zonal NRW monitoring)



Water Pressure: Water supply utilities should supply water **at proper water pressure** at each service point. (Pressure Map)

Water Quality: Water supply utilities should supply **safe water**, ensuring residual chlorine at each service point. (Chlorine Map)

The Federal Capital Territory
Reduction of NRW Project (Phase-2)

Procedures of Pilot Project

9th May 2017

Engr. Abdullahi Masaud
HoU Metering General, Distribution, FCTWB

Contents

- FCTWB Water Balance and Components
- Procedures of Pilot Project
- PMA & SMA Creation
- Distribution Aspects
- Commerce Aspects

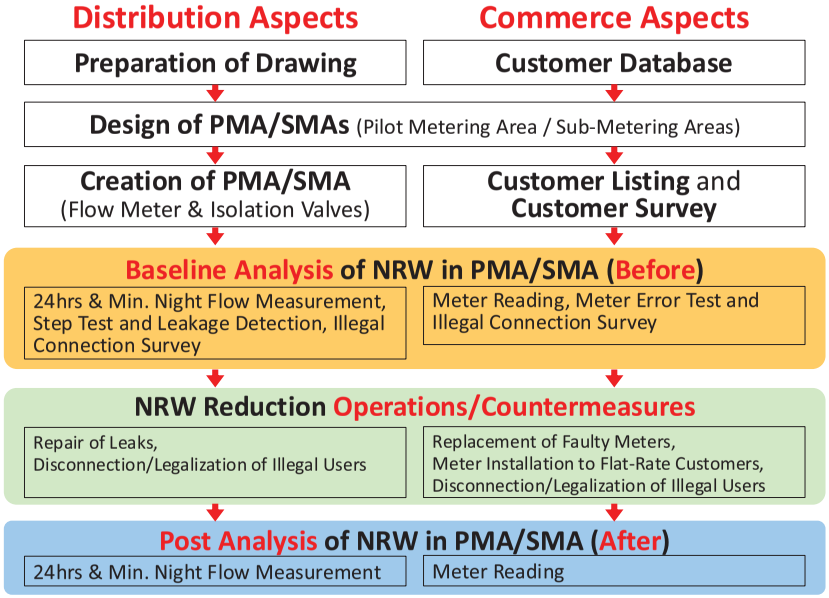
FCTWB Water Balance and Components

Revenue Water	Billed metered consumption **(Metered)**	C
	Billed unmetered consumption **(Flat-rate, Estimate)**	C
Non Revenue Water	Unbilled metered consumption **(Nonexistence)**	C
	Unbilled unmetered consumption **(FCTWB's use, Excess use in flat-rate customers, Difference between metered and estimate consumption, others)**	C
	Unauthorized consumption **(Illegal connection/bypass)**	C&D
	Customer meter inaccuracies **(Faulty meter)**	C&D
	Leakage / Overflows / Intentional release **(Leakage)**	D

C: Commerce Dep't, D: Distribution Dep't

Department in charge

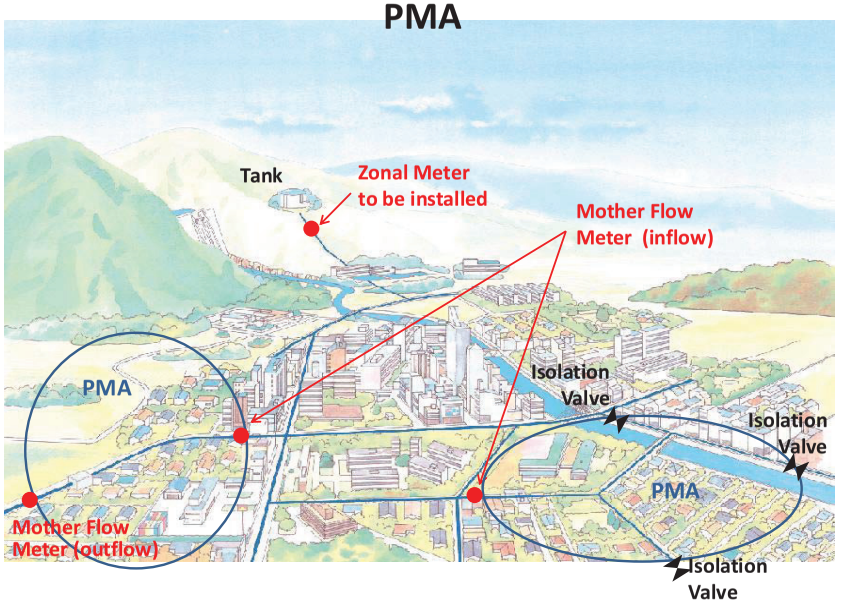
Procedures of Pilot Project



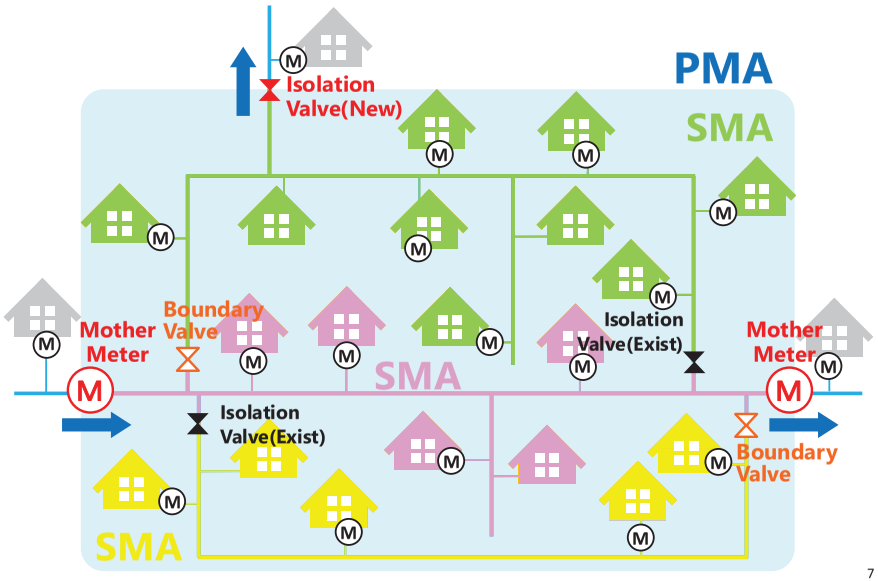
What is PMA & SMA ?

- **PMA** is defined as **Pilot Metering Areas (PMA)**, a pilot case of **District Metered Area (DMA)**, internationally-used term, which is discrete area of water distribution network and.
- **SMA** is defined as **Sub-Metering Area (SMA)**, which is a segment of PMA.
- PMAs and SMAs were created to implement Pilot Project in the Project.
- A PMA was selected in each pilot Area Office namely Gudu, Jabi and Garki I.

PMA

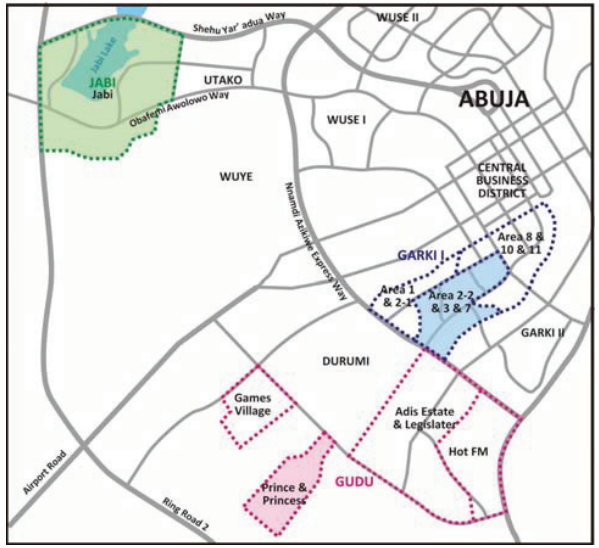


Concept of PMA & SMA Creation



PMA & SMA Creation

Selected PMAs based on certain Criteria



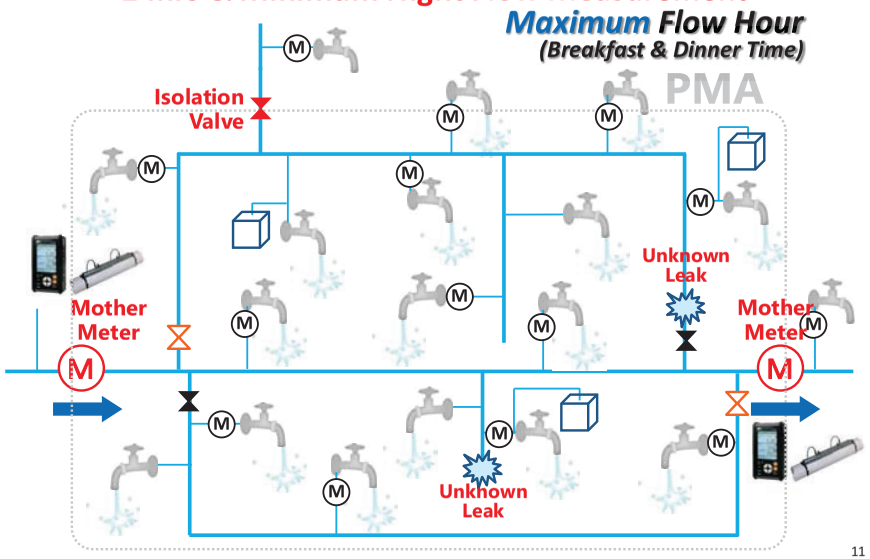
Distribution Aspects

24hrs & Minimum Night Flow Measurement

- To measure **water flow (m3/hr)** into PMA/SMAs in 24 hours.
- To understand **water flow pattern**
- To identify the **minimum flow** and its **period of time** in a day.
- Usually, minimum flow appears in **midnight** when most of people including illegal users sleep and do not consume water.
- In principle, we assume **"minimum night flow** is **leakage"** in PMA/SMAs.

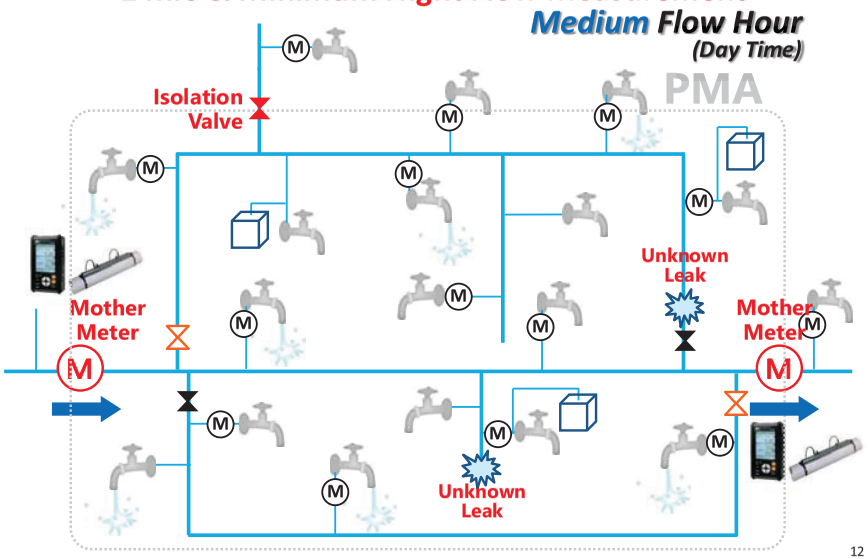
Distribution Aspects

24hrs & Minimum Night Flow Measurement



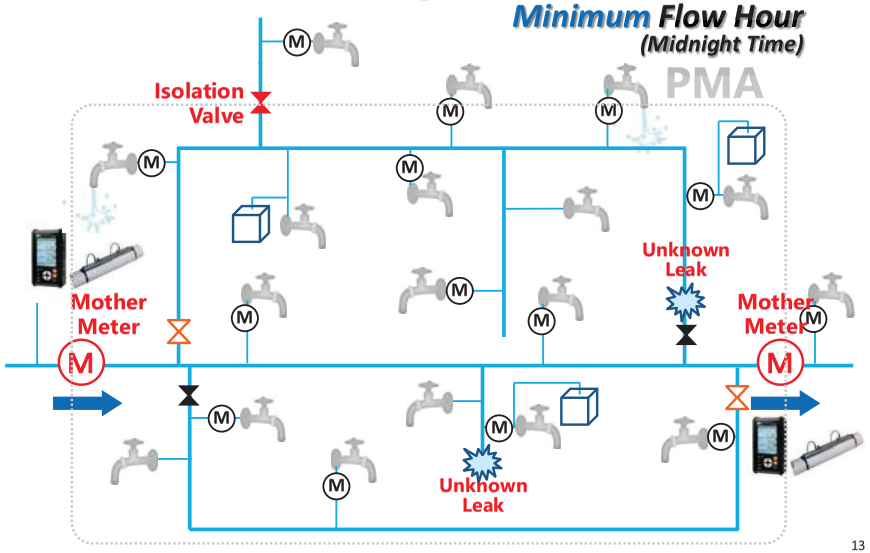
Distribution Aspects

24hrs & Minimum Night Flow Measurement



Distribution Aspects

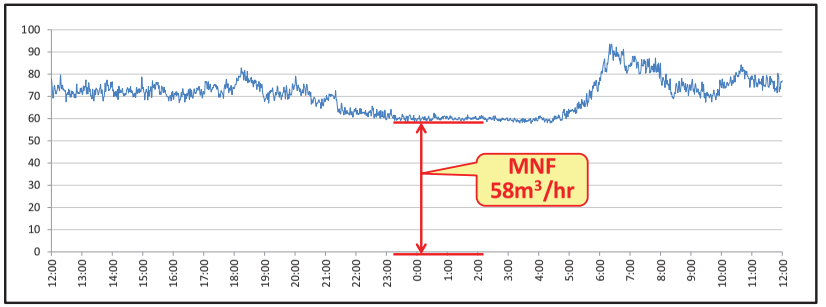
24hrs & Minimum Night Flow Measurement



Distribution Aspects

24hrs & Minimum Night Flow Measurement (Before)

Sample Case

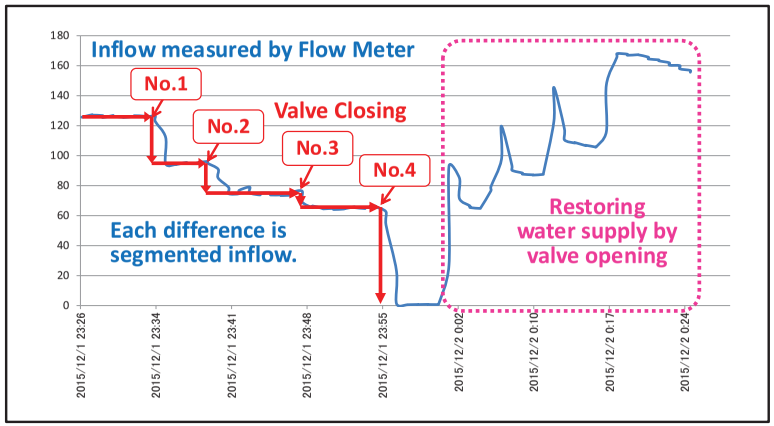


- As expected, **minimum flow hour** was found in the **midnight**.
- But, this case looks relatively **high for midnight**.
- It may include not only **leakage** but also **illegal water use**, even consumption.

Distribution Aspects

Step Test for Prioritization

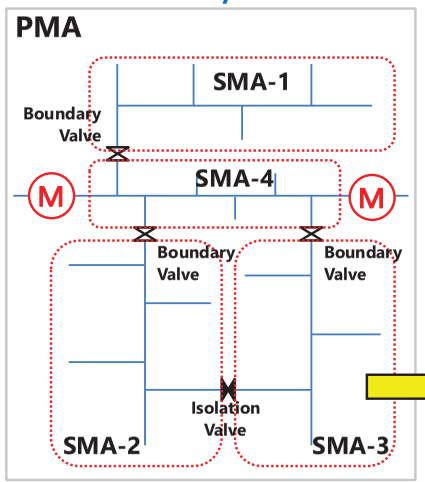
- **Stepwise** valve closing.
- To segment and capture water flow **area by area** like SMA as well as **line by line** for **prioritization/targeting**.



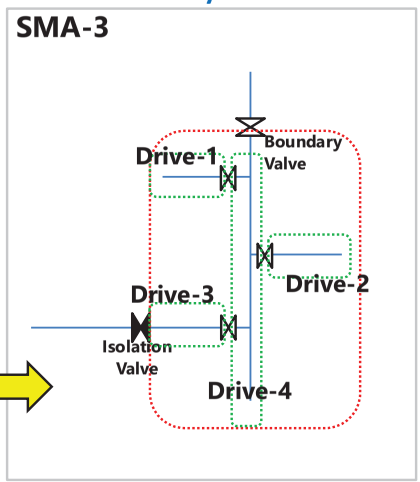
Distribution Aspects

Step Test for Prioritization

Area by Area



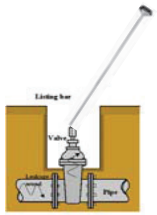
Line by Line



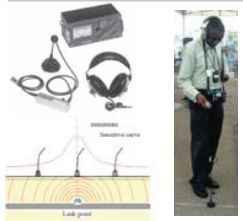
Distribution Aspects

NRW Reduction Operations (Leakage Detection and Repair)

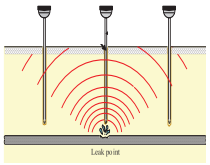
Acoustic Rod (Listening Stick)



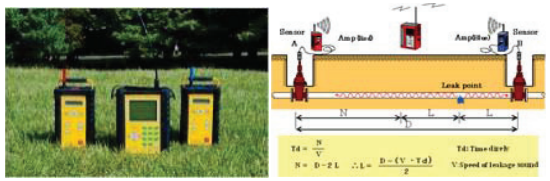
Leak Detector (Ground Microphone)



Leak Pinpointing



Leak Detector (Correlator)

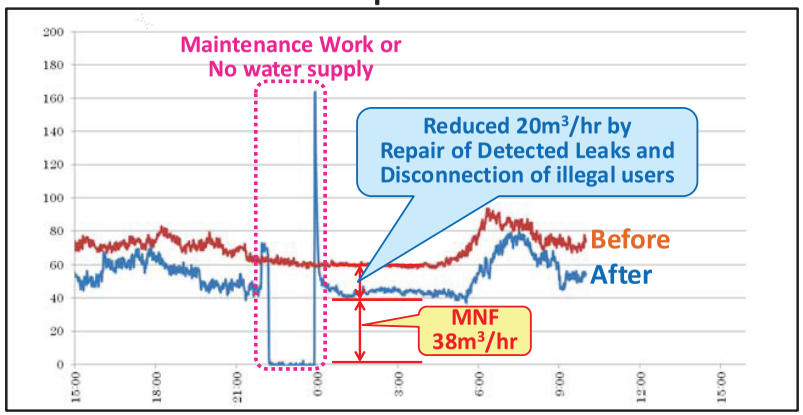


Repair of Leakage

Distribution Aspects

24 hrs & Minimum Night Flow Measurement (After)

Sample Case



- Minimum night flow became lower after NRW reduction operations, but this case looks still **high for midnight**.
- This may include **unfound leak**, **illegal use**, and also **unexpected consumption** such as **water storing at tank**, in the midnight.

Commerce Aspects

Customer Listing and Customer Survey

- Conventional (Metered & Flat-Rate) - Domestic
- Conventional (Metered & Flat-Rate) - Commercial(un-coded)
- Major Consumers (Metered & Flat-Rate)
- AMR (Metered & Flat-Rate) - Domestic
- AMR (Metered & Flat-Rate) - Commercial or Institution if any
- Prepaid (Metered & Flat-Rate) - Domestic
- Prepaid (Metered & Flat-Rate) - Commercial
- Unbilled authorized Customer
- Number of Residents, Individual Tank, Water Use Pattern, etc.

Commerce Aspects

Meter Reading

Metered Customer

- Identifying consumption by **sure reading** in **a certain period** interval

Flat-Rate Customer

- Installation of **Temporary** Customer Meter (**Sampling**)
- Identifying actual consumption and excess usage by sampled customer in **a certain period** interval and **estimate** total consumption.

Calculation of Revenue Water
(based on **Meter-Read** Consumption)

System Input Volume (Flow-Meter-Read) **- Revenue Water = NRW**
Then, calculate **each component** of NRW for **breakdown**

Commerce Aspects

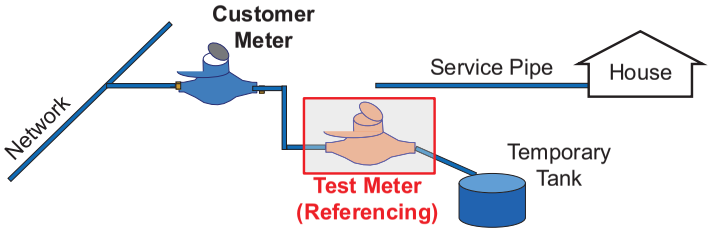
Meter Error Test

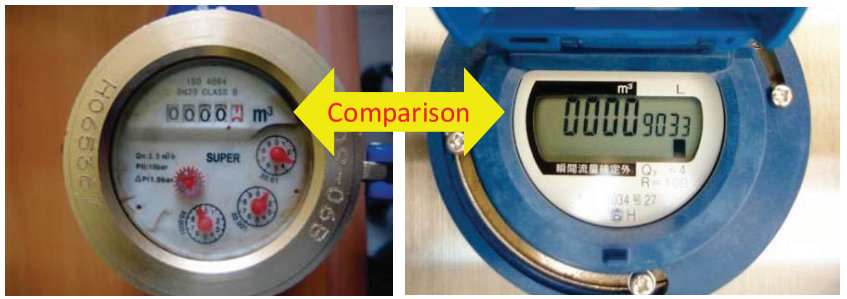
- To calculate "**Customer Metering Inaccuracies**" as a component of **NRW**
- By using **Test Meter** (**133** samples)
- See the next slide
- Supposed to be prioritized and targeted through meter reading records

Illegal Connection Survey

- To calculate "**Unauthorized Consumption**" as a component of **NRW**
- **Detection of irregularity** together with **Meter Error Test** (**133** samples)
- Also, **detection of irregularity** in **Leakage Detection Survey** by **Distribution Team**
- Supposed to be prioritized or targeted through meter reading records

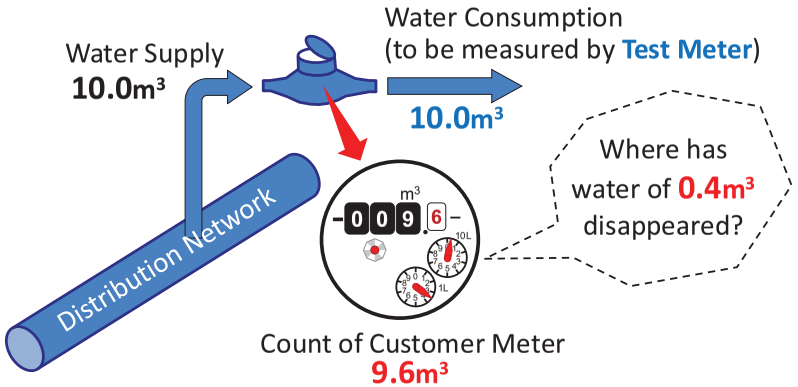
Meter Error Test by using Test Meter





Customer Meter | Test Meter (Referencing)

What is Water Meter Error?



$$\text{Water Meter Error} = \frac{10.0 - 9.6}{10.0} = 0.4\ m^3\ (4.0\%)$$

A Component of NRW

Thank you very much for your attention.

The Federal Capital Territory Reduction of NRW Project (Phase-2)

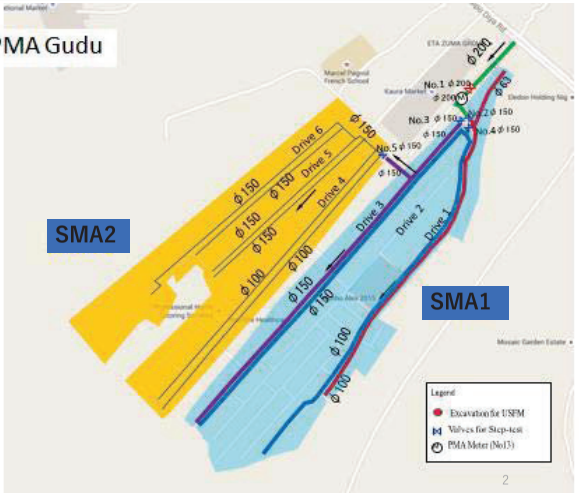
Gudu Case Study

9th May 2017

Mr. Abdul Ozumi
Assistant Area Manager, Gudu Area Office, FCTWB

GUDU PMA Basic Information

- Number of Small Management Areas :2
- Number of general customers
  - SMA1: 466
  - SMA2: 317
- Number of Major customers: 1



Data Collection to Calculate the NRW Ratio

Basic information to Calculate the NRW ratio

- **Water supply volume**
- **Water consumption volume**

- Water supply volume
  - Flow measurement by Ultrasonic Flow Meter or Mechanical meter

  NOTE:
  - In Gudu, Distribution pipes are installed simply, tree branch, isolation work was not needed.
- Water consumption volume
  - Meter reading

  NOTE:
  - In Gudu, Many cases “Not access” to reading a meter were occurred.

Customer List & Meter Reading Result

Basic information to Calculate the NRW ratio
Lot of No access, Not visible etc. ⇒ No data

S/No	ACC / ID No	CONSUMER'S NAME	ADDRESS		USER'S CATEGORY	METER TYPE	METER READING						WEEKLY WATER CONSUMPTION (m^3)	S OF INTERVAL (DA	AVERAGE DAILY CONSUMPTION (m^3/DAY
							1ST WEEK (FROM DEC 2 - 8)			2ND WEEK (DEC 9 - 15)					
			HSE No	CLS OR AVENUE			METER READING (m^3)	DATE	TIME	READING (m^3)	DATE	TIME			
D1-1	GUB 049 AA	AJAJI ISAE	3A	CLOSE 1	DOMEST	CONVENT	FAULTY	02-Dec	1:00 PM	335			#VALUE!	7	
D1-2		ENGR FEL	5E	CLOSE 1	DOMEST	PREPAID	FAULTY	02-Dec					#VALUE!	7	
D1-3	GUB 059 AA	SULIEMAN	6	CLOSE 1	DOMEST	PREPAID	FAULTY	02-Dec	11:40 AM	244	09-Dec	10:20 AM	#VALUE!	7	
D1-4	GUB 055 AA	OCCUPAN	5B	CLOSE 1	DOMEST	PREPAID	NOT READABLE						#VALUE!	7	
D1-5	GUB 102 AA	ALEX NWO	6	DRIVE 1	DOMEST	PREPAID	450			461	21-Jan	12:00 AM	11	7	1.57
D1-6	GUB 047 AA	KENETH C	1	CLOSE 1	DOMEST	PREPAID	532	02-Dec	11:00 AM	536	09-Dec	11:16 AM	4	7	0.57
D1-7	GUB 051 AA	OCCUPAN	3C	CLOSE 1	DOMEST	PREPAID	324	02-Dec	12:52 PM	331	09-Dec	11:20 AM	7	7	1.00
D1-8		ADO ABDU	4	CLOSE 1	DOMEST	PREPAID	465	02-Dec	11:30 AM	479	09-Dec	10:19 AM	14	7	2.00
D1-9		OCCUPAN	5C	CLOSE 1	DOMEST	PREPAID	193	02-Dec	12:23 PM	199			6	7	0.86
D1-10		BANJO OJ	5E	CLOSE 1	DOMEST	PREPAID	594	02-Dec	12:16 PM	606	09-Dec	10:34 AM	12	7	1.71
D1-11	GUB 061 AA	SENATOR	7B	CLOSE 1	DOMEST	PREPAID	377	02-Dec	11:30 AM	380	09-Dec	10:46 AM	3	7	0.43
D1-12	GUB 063 AA	HON ENEI	7D	CLOSE 1	DOMEST	PREPAID	241	02-Dec	11:11 AM	244	09-Dec	10:47 AM	3	7	0.43
D1-13		JUDE EFU	25B	CLOSE 1	DOMEST	CONVENT	589	02-Dec	11:52 AM	590	09-Dec	10:46 AM	1	7	0.14
D1-14	DBA 770 AA	BRIG GEN	1	DRIVE 1	DOMEST	PREPAID	523	02-Dec	12:00 AM	536	09-Dec	2:24 AM	13	7	1.86
D1-15	DBA 730 AA	OCCUPAN	7	DRIVE 1	DOMEST	PREPAID	39	21-Jan		47	21-Jan	11:31 AM	8	7	1.14
D1-16	GUB 103 AA	OCCUPAN	8	CLS 1DRI	DOMEST	CONVENT	2961	02-Dec	10:55 AM	2972			11	7	1.57
D1-17		OKWADIO	10	CLS 1DRI	DOMEST	CONVENT	1875	02-Dec	11:48 AM	1898	09-Dec	10:45 AM	23	7	3.29
D1-18	GUB 108 AA	SEN EMM	16	DRIVE 1	DOMEST	PREPAID	FAULTY	02-Dec	12:49 PM	301	09-Dec	10:30 AM	#VALUE!	7	
D1-19		EZE	19A	DRIVE 1	DOMEST	PREPAID	FAULTY	03-Dec	1:03 PM				#VALUE!	7	
D1-20	GUB 081 AA	OCCUPAN	21C	DRIVE 1	DOMEST	PREPAID	FAULTY	03-Dec	12:50 PM				#VALUE!	7	
D1-21	GUB 105 AA	CHF OLUS	14	DRIVE 1	DOMEST	FLAT RATE	FLAT RATE						#VALUE!	7	
D1-22	GUB 076 AA	S. IFEKWE	19C	DRIVE 1	DOMEST	PREPAID	NO ACCESS						#VALUE!	7	
D1-23	GUB 108 AA	OCCUPAN	20	DRIVE 1	DOMEST	PREPAID	NOT VISIBLE						#VALUE!	7	
D1-24	GUB 073 AA	MRS. ESTH	17B	DRIVE 1	DOMEST	PREPAID	NOT VISIBLE	04-Dec	11:53 AM				#VALUE!	7	
D1-25	GUB 078 AA	B. MUSTA	19D	DRIVE 1	DOMEST	PREPAID	NOT VISIBLE						#VALUE!	7	
D1-26	GUB 077 AA	RASHEED	19E	DRIVE 1	DOMEST	PREPAID	NOT VISIBLE						#VALUE!	7	
D1-27	GUB 064 AA	OCCUPAN	21F	DRIVE 1	DOMEST	PREPAID	NOT VISIBLE						#VALUE!	7	

Water Consumption by Statistical Analysis

Aggregation of Water Consumption from the Customer Record and Meter Reading

Meter Reading have been conducted 6-time

Number of general customer (Consumption>0) >0

Category	Meter Type	SMA1	SMA2	Total	Category	Meter Type	SMA1	SMA2	Total
Domestic	Convent	29	35	64	Flat Rate	Domestic	17	40	57
	Flat Rate	17	40	57		COMMERCIAL	0	0	0
	AMR	0	0	0		Sub-total	17	40	57
	Prepaid	408	235	643		Prepaid	0	0	0
	Unknown	1	5	6		Conventional	0	0	0
	Sub-total	455	315	770		Unknown	0	0	0
Commercial	Convent	4	0	4		Sub-total	0	0	0
	Flat Rate	0	0	0		Total	17	40	57
	AMR	0	0	0					
	Prepaid	7	1	8					
	Unknown	0	1	1					
	Sub-total	11	2	13					
	TOTAL	466	317	783					
By counter		466	317	783					

Consumption of general cust

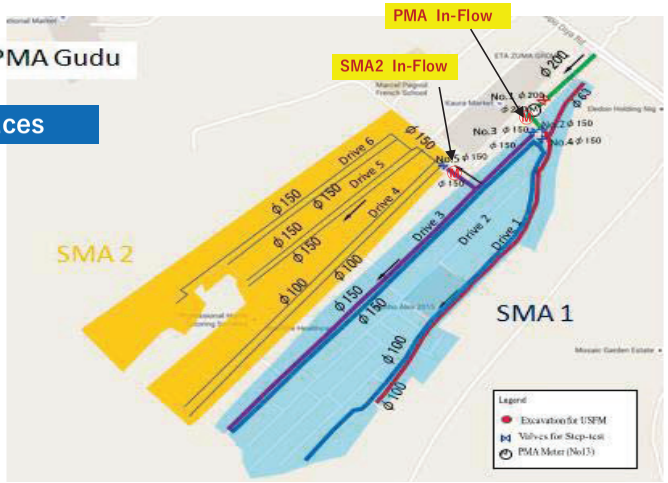
		Category	No of Customers SMA1	SMA2	total	Water Volume SMA1	SMA2	Total	
Billed meter consumption	Domestic	Metered	241	125	366	416.53	291.73	708.26	
		Average					1.94	⑫	
		Unread	197	150	347	382.18	291	673.18	①
	Commercial	Metered	8	0	8	20.27	0	20.27	
		Average					2.53	⑭	
		Unread	3	2	5	7.59	5.06	12.65	⑮
		Subtotal			726	826.57	587.79	1,414.4	④-1
Billed unmetered consumption	Domestic Flat Rate	Prepaid	17	40	57	20.91	49.2	70.11	⑯
		Unit Volume					1.23	Ⓐ	
		Subtotal			57			70.1	⑤-1
Total			466	317	783			1,484.5	②-1'

＊Ⓐ**Unit Volume:** Prepaid Flat Rate 3.00N/m, Price80N/m3, Daily Unit Volume(3000/80)*12/365=1.23m3/d.

5

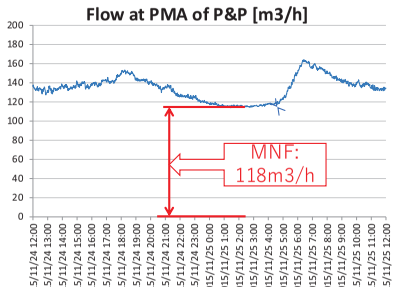
Annex5-104

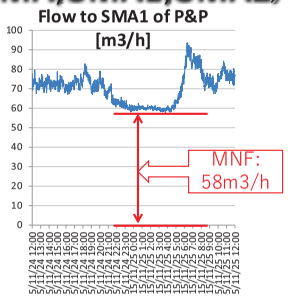
Gudu SMAs Flow Measurement

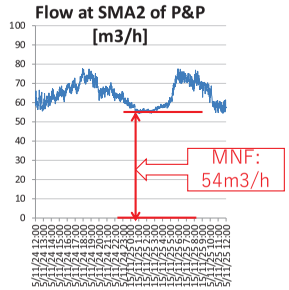


6

Measurement of Flow Rate (PMA,SMA1,SMA2)







7

NRW Ratio of GUDU PMA(Before)

GUDU PMA Water Balance Analysis (Before)

					m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption		④	1,414.4	44.0%	④-1	1,414.4
							④-2	0.0
		Billed Unmetered Consumption (Flat Rate)		⑤	87.4	2.7%	⑤-1	70.1
	1,502						⑤-2	17.3
				⑥	224.2	7.0%	⑥-1	161.5
							⑥-2	62.7
	③Non Revenue Water	Commercial Losses	Authorized Unbilled	⑦	104.0	3.2%	⑦-1	69.0
							⑦-2	35.0
3,216			Customer Meter Inaccuracies	⑧	25.7	0.8%		
			Illegal Connection	⑨	85.3	2.7%		
	1,714		Unidentified Consumption	⑩	477.8	14.9%	1360.3	
Very High	53.3%		Leakage	⑪	797.2	24.8%	42.3%	1,275.0
		Physical Losses						39.6%

8

Counter Measures to Reduce High NRW Ratio

• Leakage detection	• Repair
• Illegal connection investigation	• Disconnection
• Meter accuracy test	• Getting accurate consumption rate & Meter replacement
• Registration of not registered customer	• Meter installation
• Grasp authorized unbilled customers	• Registration of not registered customer & Meter installation &24hrs flow measurement
	• Rigorous meter reading

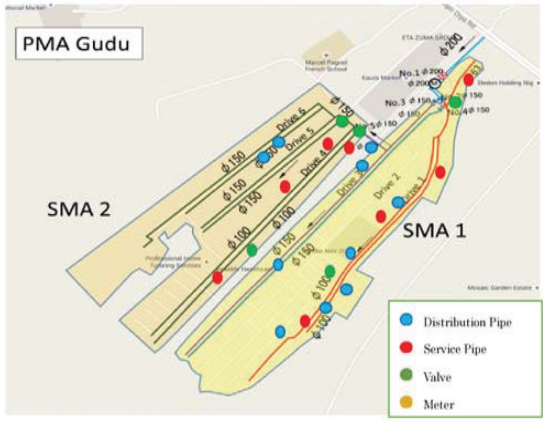
Result of Leakage Survey (GUDU)

SMA1

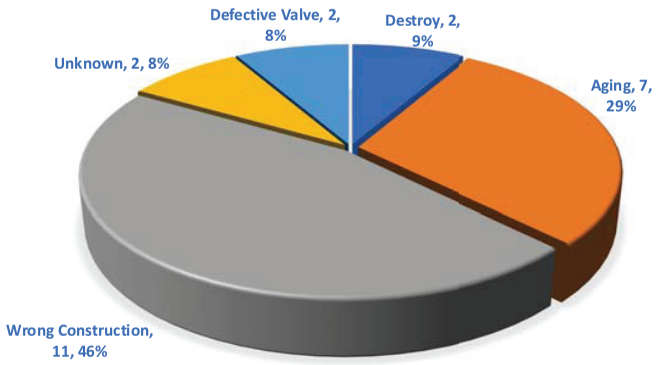
	Leakage point	Number	Leakage volume
1	Distribution Pipe	8	7.30 M3/H
2	Service Pipe	4	0.40 M3/H
3	Valve	2	1.10 M3/H
4	Meter	0	M3/H
	Total	14	8.80 M3/H
5	Illegal Use	28	
6	Bad Meter	15	
7	No Access	128	

SMA2

	Leakage point	Number	Leakage volume
1	Distribution Pipe	2	2.00 M3/H
2	Service Pipe	5	1.10 M3/H
3	Valve	3	1.10 M3/H
4	Meter	0	M3/H
	Total	10	4.20 M3/H
5	Illegal Use	5	
6	Bad Meter	19	
7	No Access	65	



Causes of Leakage (GUDU)



Leakage & Illegal Connection Survey Summary from Last Year

1. Leakage Volume

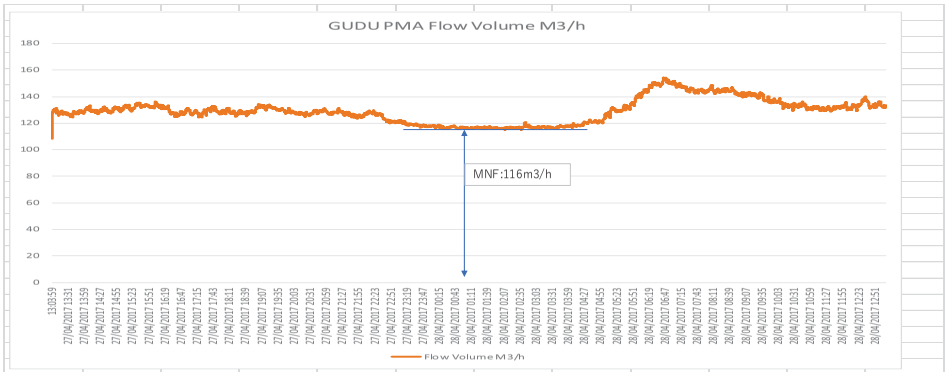
Pipe category		SMA	Number of leakages	Unit volume m3/d	Total m3/d
Service pipe	Pipe size				
	25	1	17	6	102
	25	2	6	6	36
	25Valve	1	2	6	12
	25Valve	2	1	6	6
	30	2	2	6	12
	30	2	1	2.4	2.4
	25	2	2	6	12
	25	1	5	2.4	12
	25	2	1	2.4	2.4
	Sub total		37		196.8
Distribution pipe	>=300				0
	250-150	1	8	20	160
	100	1	10	15	150
	50-100	1	2	30	60
	100	1	2	72	144
	100	1	1	24	24
	100	2	2	24	48
	100	2	2	12	24
	100	1	4	6	24
	100	1	3	2.4	7.2
	<=50				0
	Sub total		34		641
			SMA1	1	683.2
集計			SMA2	2	114
Except 10m3/d customers					0
Grand total				①	797

2. Illegal Connection Volume

Pipe size	SMA	Number of connections	Unit volume m3/d	Total m3/d
25	1	13	4.06	52.78
25	2	4	4.06	16.24
25	1	2	4.06	8.12
20	2	2	4.06	8.12
Sub total		21		85.26
		SMA1	1	60.9
		SMA2	2	24.36
Grand Total			②	85

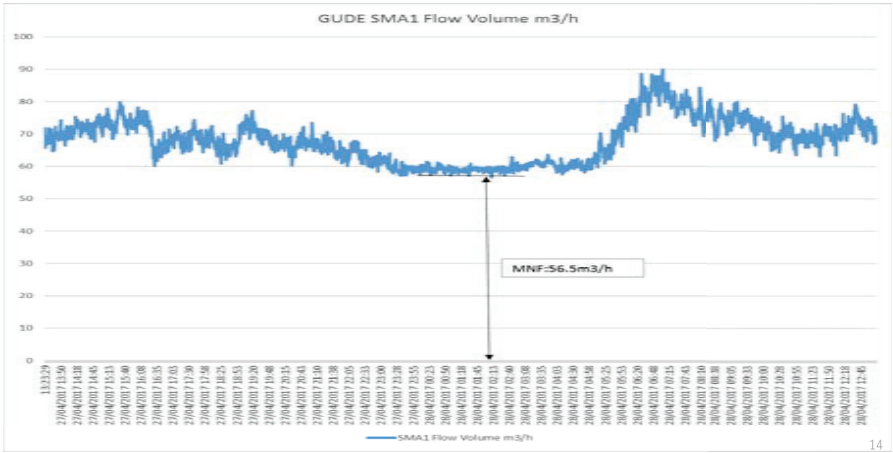
GUDU PMA Flow Measurement

Water supply volume into the PMA measured by the ultrasonic flow meter

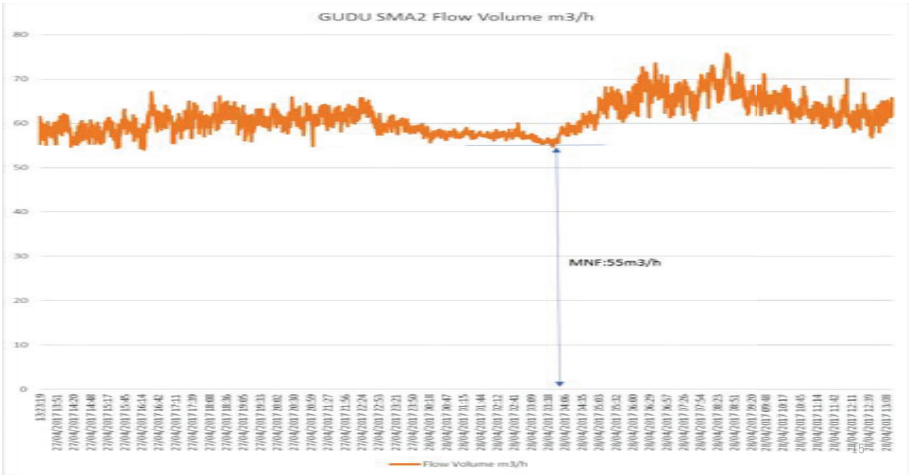


PMA				SMA1			
Ave	129.2318	1 Day	3101.563	Ave	67.96613	1 Day	1631.187
Mechanical		1 Day	3590				

GUDU SMA1 Flow Measurement



GUDU SMA2 Flow Measurement



NRW Ratio of GUDU PMA(After)

GUDU PMA Water Balance Analysis		(Ex Post)			m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption		④	2,351.9	75.8%	④-1	2,246.6
							④-2	105.3
	2,449	Billed Unmetered Consumption (Flat Rate)		⑤	97.0	3.1%	⑤-1	97.0
							⑤-2	0.0
				⑥	199.6	6.4%	⑥-1	199.6
							⑥-2	0.0
3,102	③Non Revenue Water	Commercial Losses	Unbilled Authorized	⑦	104.0	3.4%	⑦-1	69.0
							⑦-2	35.0
			Customer Meter Inaccuracies	⑧	0.0	0.0%		
			Illegal Connection	⑨	60.9	2.0%	349.1	
	653		Unidentified Consumption	⑩	288.2	9.3%		
	21.0%		Leakage	⑪	0.0	0.0%	11.3%	
		Physical Losses						

NRW Ratio of GUDU SMA1 (After)

GUDU SMA1 Water Balance Analysis	(Ex Post)			m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption	④	1,348.7	82.7%	④−1	1,348.7
						④−2	0.0
	1,398	Billed Unmetered Consumption (Flat Rate)	⑤	49.8	3.1%	⑤−1	49.8
						⑤−2	0.0
			⑥	104.6	6.4%	⑥−1	104.6
						⑥−2	0.0
	③Non Revenue Water	Commercial Losses	Unbilled Authorized	⑦	59.4	3.6%	⑦−1	24.4
							⑦−2	35.0
1,631			Customer Meter Inaccuracies	⑧	0.0	0.0%		
			Illegal Connection	⑨	28.4	1.7%		
	233		Unidentified Consumption	⑩	40.4	2.5%	68.8	
							4.2%	
	14.3%		Leakage	⑪	0.0	0.0%		
		Physical Losses						

NRW Ratio of GUDU SMA2 (After)

GUDU SMA2 Water Balance Analysis	(Ex Post)				m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption		④	1,000.5	68.0%	④−1	895.2
							④−2	105.3
	1,049	Billed Unmetered Consumption (Flat Rate)		⑤	48.4	3.3%	⑤−1	48.4
							⑤−2	0.0
				⑥	97.9	6.7%	⑥−1	97.9
							⑥−2	0.0
	③Non Revenue Water	Commercial Losses	Unbilled Authorized	⑦	44.7	3.0%	⑦−1	44.7
							⑦−2	0.0
1,471			Customer Meter Inaccuracies	⑧	0.0	0.0%		
			Illegal Connection	⑨	32.5	2.2%		
	422		Unidentified Consumption	⑩	247.3	16.8%	279.8	
							19.0%	
	28.7%		Leakage	⑪	0.0	0.0%		
		Physical Losses						

Comparison of NRW Ratio

	Before %	After %	Improvement
SMA1	52.0	14.3	37.7
SMA2	53.9	28.7	25.2
PMA	53.3	21.0	32.3

THANK YOU

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The Federal Capital Territory Reduction of NRW Project (Phase-2)

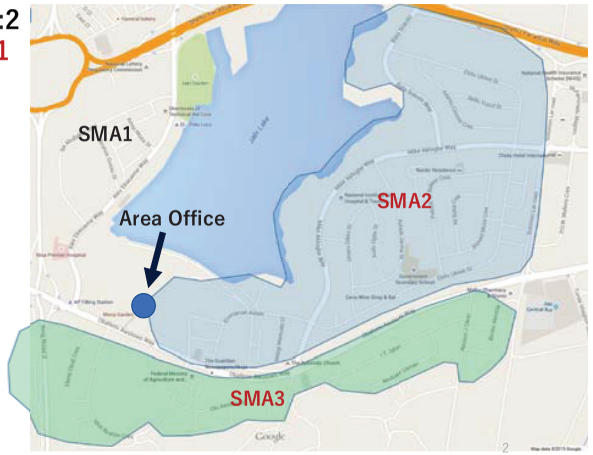
Jabi Case Study

9th May 2017

Mr. Abdulrahman Muhammed
NRW Unit, Distribution, FCTWB

JABI PMA Basic Information

- Number of Sub Metering Areas :2
  - Previously 3 SMAs, but SMA1 was not isolated, eliminated from PMA.
- Number of general customers
  - SMA2: 377
  - SMA3: 196
- Number of Major customers: 32



Data Collection to Calculate the NRW Ratio

Basic information to Calculate the NRW ratio

- **Water supply volume**
- **Water consumption volume**

- Water supply volume
  - Flow measurement by Ultrasonic Flow Meter

  Note:
  - In Jabi, since distribution pipes have been installed as loop, in order to do isolation, closing valves/ out flow measurement from PMA were required.
- Water consumption volume
  - Meter reading

  Note:
  - In Jabi, All meters replacement were carried out
  - Water supply management to Villages are needed

Customer List & Meter Reading Result

Basic information to Calculate the NRW ratio

SMA3																0.50
SMA	Meyer Error test	A/C Number	me of Custor	lot No. and Addres	Customer type[Domestic,Commercial]	Meter type [con,est,fla]	Meter Reading at All Customer						Weekly Water Cons	Days of Interval	Average Daily Consumption Amount (m3/Day)
							1st Week			2nd Week					
							Meter Reading	Date [2/9]	Time [9:33]	Meter Reading	Date [2/16]	Time [15			
SM3-1		JAC017AA	BILKISU MI	FLAT 1 PLOT 381	Domestic	convent	14807	16/1/20	AM	14924	16/2/29	AM	117	40	2.93
SM3-2	1	JAC486AA	BASHIR AD	FLAT 2 PLOT 381	Domestic	convent	161	16/1/20	AM	220	16/2/29	AM	59	40	1.48
SM3-3		JAA233AA	AMBASSA	0 PLOT 383 ETA	Domestic	convent	7577	16/1/20	AM	9214	16/2/29	AM	1637	40	40.93
SM3-4		JAA167AA	WAZIRI AS	0 PLOT 384 JA	Domestic	convent	2034	16/1/20	AM		16/2/29	AM		40	
SM3-5	1	JAA024AA	ALH. INUSA	0 PLOT 385 ETA	Domestic	convent	9671	16/1/20	AM	9789	16/2/29	AM	118	40	2.95
SM3-6		JAA159AA	THE OCCU	0 PLOT 386 JA	Domestic	convent	555	16/1/20	AM	801	16/2/29	AM	246	40	6.15
SM3-7		JAA363AA	Mrs. Fouta	395D	Domestic	convent	22465	16/1/20	AM	22855	16/2/29	AM	390	40	9.75
SM3-8		JAA234AA	THE OCCU	0 PLOT 380 no23	Domestic	convent	7985	16/1/20	AM	8000	16/2/29	AM	15	40	0.38
SM3-9		JAA378AA	THE OCCU	FLAT 1 PLOT 280	Domestic	convent	442	16/1/20	AM	465	16/2/29	AM	23	40	0.58
SM3-10		JAA379AA	THE OCCU	FLAT 2 PLOT 380	Domestic	convent	197	16/1/20	AM	231	16/2/29	AM	34	40	0.85
SM3-11		JAA380AA	THE OCCU	FLAT 3 PLOT 380	Domestic	convent	227	16/1/20	AM	239	16/2/29	AM	12	40	0.30
SM3-12		JAA367AA	HAJIA HAI	FLAT 4 PLOT 380	Domestic	convent	106	16/1/20	AM	113	16/2/29	AM	7	40	0.18
SM3-13		JAA368AA	MISS RAC	FLAT 5 PLOT 380	Domestic	convent	686	16/1/20	AM	722	16/2/29	AM	36	40	0.90
SM3-14		JAA270AA	OGELENY	0 PLOT 398 ETA	Domestic	convent	6245	16/1/20	AM	6739	16/2/29	AM	494	40	12.35
SM3-15		JAA168AA	ADAMU D	0 PLOT 399 JA	Domestic	convent	1578	16/1/20	AM	1846	16/2/29	AM	268	40	6.70
SM3-16	1	JAA400AA	MR OYEY	0 PLOT B 399 NI	Domestic	convent	500	16/1/20	AM	524	16/2/29	AM	24	40	0.60
SM3-17	1	JAC320AA	MR NWAB	0 PLOT 397 ETA	Domestic	convent	12294	16/1/20	AM	12524	16/2/29	AM	230	40	5.75
SM3-18		JAC042AA		379 no25	Domestic	convent	SECURITY PROBLEM		AM			AM	####	0	
SM3-19		JAA049AA	YAHANNA	0 PLOT 401 ETA	Domestic	convent	10931	16/1/20	AM	11235	16/2/29	AM	304	40	7.60
SM3-20		JAA240AA	THE OCCU	FLAT 2 PLOT 402	Domestic	convent	N/A	16/1/20	AM	3015	16/2/29	AM	####	40	
SM3-21		JAA241AA	THE OCCU	FLAT 3 PLOT 402	Domestic	convent	4557	16/1/20	AM	4631	16/2/29	AM	74	40	1.85
SM3-22		JAA242AA		FLAT 4 PLOT 402	Domestic	convent	5494	16/1/20	AM	5689	16/2/29	AM	195	40	4.88
SM3-23	1	JAA232AA	ENGR EZEN	0 PLOT 403 ETA	Domestic	convent	8025	16/1/20	AM	8233	16/2/29	AM	208	40	5.20
SM3-24	1	JAA282AA	MR EZENW	0 PLOT B 403 ET	Domestic	convent	4444	16/1/20	AM	4695	16/2/29	AM	251	40	6.28
SM3-25		JAB009AA	GP CPT J	0 PLOT 405 ETA	Domestic	convent	38161	16/1/20	AM	39691	16/2/29	AM	1530	40	38.25
SM3-26		JAC060AA		406 no8	Domestic	convent	9085	16/1/20	AM	9303	16/2/29	AM	218	40	5.45

Water Consumption by Statistical Analysis

Aggregation of Water Consumption from the Customer Record and Meter Reading

Meter Reading has been conducted 6 times

Number of customer					Number of meter read customer (Consumption>0) >=0				
Category	Meter Type	SMA2	SMA3	total	Category	Meter Type	SMA2	SMA3	total
Domestic	Convent	357	178	535	Flat rate	Domestic	5	0	5
	Flat rate	5	0			Commercial	1	0	1
	AMR	0	0	0		Sub-total	6	0	6
	Prepaid	0	0	0		Convent	6	0	6
	Unknown	0	0	0					
	Sub-total	362	178	540		Sub-total	6	0	6
Commercial	Convent	14	18	32					
	Flat rate	1	0						
	AMR	0	0	0					
	Prepaid	0	0	0					
	Unknown	0	0	0					
	Sub-total	15	18	33					
	TOTAL	377	196	573					
Countr		377	196	573					

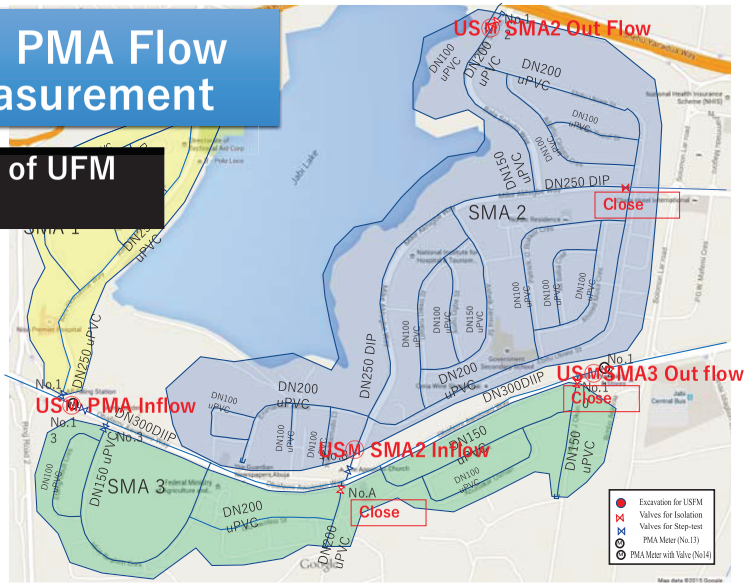
			No of customers			Water volume			
			SMA2	SMA3	total	SMA2	SMA3	total	
Billed meter consumption	Domestic	Metered	278	141	419	1,291.9	336.9	1,628.8	
		Average					3.89	⑫	
		Unread	79	37	116	307.3	143.9	451.2	⑬
	Commercial	Metered	9	18	27	43.31	21.89	65.2	
		Average					2.41	⑭	
		Unread	5	0	5	12.07	0.00	12.07	⑮
		Subtotal			567	1,654.6	502.7	2,157.3	④-1
Billed unmetered consumption	Flat RATE	Convent	6	0	6	13.56	0	13.56	⑯
		Unit volume					2.26	⑰	
		Subtotal				13.6	0.0	13.6	⑤-1
		total	377	196	573			2,170.8	②-1

5

Annex5−110

JABI PMA Flow Measurement

Location of UFM 4 Places



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Installation of UFM & Close Valves

7

Before NRW Ratio of JABI PMA

JABI PMA Water Balance Analysis		Before				m3/D	%		m3/D
①System Input Volume	②Revenue Water		Billed Metered Consumption		④	2,327.8	27.6%	④-1	2,157.3
								④-2	170.5
	2,532		Billed Unmetered Consumption (Flat Rate)		⑤	204.0	2.4%	⑤-1	13.6
	30.0%							⑤-2	190.5
					⑥	104.4	1.2%	⑥-1	11.6
								⑥-2	92.8
	③Non Revenue Water		Commercial Losses	Unbilled Authorized	⑦	172.1	2.0%	⑦-1	122.1
								⑦-2	50.0
8,445				Customer Meter Inaccuracies	⑧	-306.5	-3.6%		
				Illegal Connection	⑨	15.8	0.2%		
	5,913			Unidentified Consumption	⑩	5,190.4	61.5%	5,943.2	
Extremely High	70.0%		Physical Losses	Leakage	⑪	737.0	8.7%	70.4%	

8

Counter Measures to Reduce High NRW Ratio

• Leakage detection	• Repair
• Illegal connection investigation	• Disconnection
• Meter accuracy test	• Getting accurate consumption rate & Meter replacement • Meter installation
• Registration of non registered customer • Grasp authorized unbilled customers	• Registration of non registered customer, Meter installation & 24hrs flow measurement • Proper management of Village water supply is required.

Counter Measures to Reduce High NRW Ratio

Meter accuracy test at a customer`s property

24hr flow measurement at a customer`s property

Annex5-111

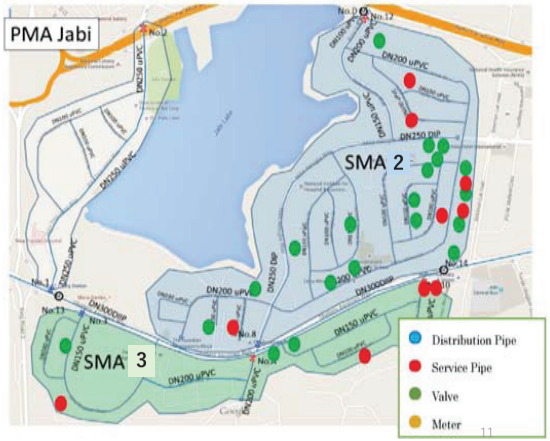
Result of Leakage Survey (JABI)

SMA2

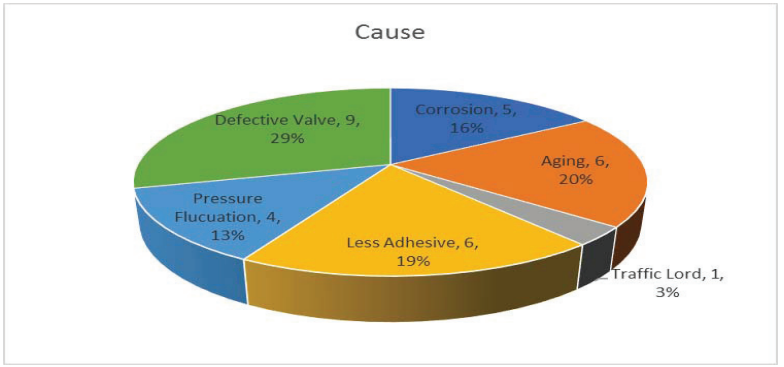
	Leakage point	Number	Leakage volume
1	Distribution Pipe	0	M3/H
2	Service Pipe	7	9.00 M3/H
3	Valve	17	8.71 M3/H
4	Meter	0	M3/H
	Total	24	17.71 M3/H
5	Illegal Use	6	
6	Bad Meter	2	
7	No Access	24	

SMA3

	Leakage point	Number	Leakage volume
1	Distribution Pipe	0	M3/H
2	Service Pipe	4	5.10 M3/H
3	Valve	3	1.10 M3/H
4	Meter	0	M3/H
	Total	7	6.20 M3/H
5	Illegal Use	0	
6	Bad Meter	3	
7	No Access	4	



Causes of Leakage (JABI)



Leakage and Illegal Connection Survey

Leakage Volume

Pipe category		SMA	Number of leakage	Unit volume m3/d	Total m3/d
Service pipe	Pipe size				
	25	2	4	2	8
	25	3	1	1	1
	32			1	0
	63	3	1	36	36
	63	2	1	24	24
	50	3	1	2.4	2.4
	30	2	2	72	144
	30	3	1	72	72
	30	2	8	48	384
	30	2	2	12	24
	30	3	2	12	24
	30	2	2	6	12
	30	3	1	2.4	2.4
	25	3	1	3	3
	20	2	1	0.24	0.24
	Sub total		28		737.04
Distribution pipe	>=300			600	0
	250-150			480	0
	100			100	0
	50-100			75	0
	<=50			50	0
	Sub total		0		0
			SMA2	2	596
			SMA3	3	141
Grand total				⑪	**737.0**

Illegal connection Volume

Pipe size	SMA	Number of connection	Unit volume m3/d	Total m3/d
50				0
32				0
25	2	4	3.94	15.76
20				0
Sub total		4		15.76
		SMA2	2	15.76
		SMA3		
Grand Total			⑫	**15.8**

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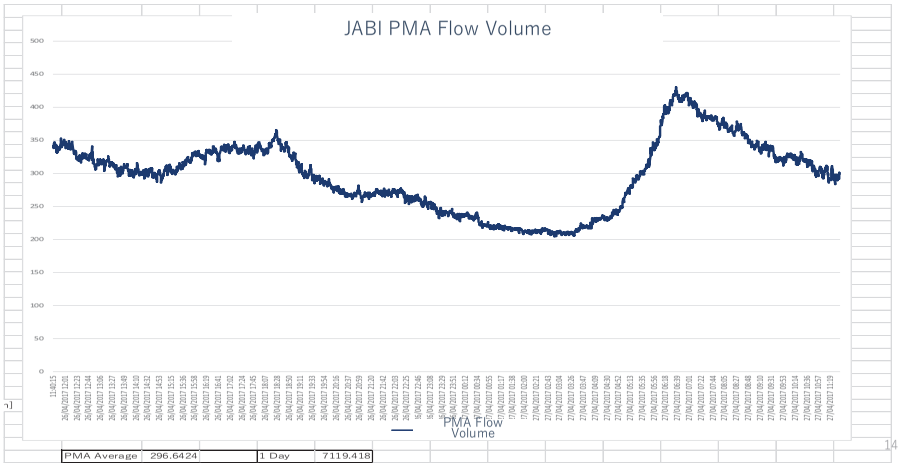
JABI PMA Flow Measurement



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Annex5-112

NRW Ratio of JABI PMA (After)

JABI PMA Water Balance Analysis	Ex Post			m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption	④	4,883.0	68.6%	④-1	3,269.5
						④-2	1,613.5
	4,917	Billed Unmetered Consumption (Flat Rate)	⑤	33.9	0.5%	⑤-1	4.5
	69.1%					⑤-2	29.4
			⑥	19.7	0.3%	⑥-1	0.0
						⑥-2	19.7
	③Non Revenue Water	Commercial Losses Unbilled Authorized	⑦	168.2	2.4%	⑦-1	118.2
						⑦-2	50.0
7,119		Customer Meter Inaccuracies	⑧	0.0	0.0%		
		Illegal Connection	⑨	15.8	0.2%		
	2,203	Unidentified Consumption	⑩	1,998.9	28.1%	2,014.6	
	30.9%	Leakage Physical Losses	⑪	0.0	0.0%	28.3%	

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NRW Ratio of JABI SMA2 (After)

JABI SMA2 Water Balance Analysis(After)	Ex Post			m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption	④	3,066.6	78.2%	④-1	2,013.4
						④-2	1,053.2
	3,091	Billed Unmetered Consumption (Flat Rate)	⑤	24.9	0.6%	⑤-1	4.5
	78.9%					⑤-2	20.3
			⑥	19.7	0.5%	⑥-1	0.0
						⑥-2	19.7
	③Non Revenue Water	Commercial Losses Unbilled Authorized	⑦	168.2	4.3%	⑦-1	118.2
						⑦-2	50.0
3,921		Customer Meter Inaccuracies	⑧	0.0	0.0%		
		Illegal Connection	⑨	15.8	0.4%		
	829	Unidentified Consumption	⑩	625.4	16.0%	641.2	
	21.1%	Leakage Physical Losses	⑪	0.0	0.0%	16.4%	

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NRW Ratio of JABI SMA3 (After)

JABI SMA3 Water Balance Analysis (After)		Ex Post			m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption		④	2,675.1	83.5%	④-1	1,267.8
							④-2	1,407.3
	2,684	Billed Unmetered Consumption (Flat Rate)		⑤	9.1	0.3%	⑤-1	0.0
	83.8%						⑤-2	9.1
				⑥	0.0	0.0%	⑥-1	0.0
							⑥-2	0.0
	③Non Revenue Water	Commercial Losses	Unbilled Authorized	⑦	0.0	0.0%	⑦-1	0.0
							⑦-2	0.0
3,202			Customer Meter Inaccuracies	⑧	0.0	0.0%		
			Illegal Connection	⑨	15.8	0.5%		
	518		Unidentified Consumption	⑩	502.3	15.7%	518.1	
	16.2%	Physical Losses	Leakage	⑪	0.0	0.0%	16.2%	

Annex5-113

Comparison of NRW Ratio

	Before %	After %	Improvement
SMA2	45.6	21.1	24.5
SMA3	87.6	16.2	71.4
PMA	70.0	30.9	39.1




Status of NRW Ratio

			No of customers			Water volume			
			SMA2	SMA3	total	SMA2	SMA3	total	
Billed meter consumption	Domestic	Metered	278	141	419	1,291.9	336.9	1,628.8	
		Average						3.89	⑫
		Unread	79	37	116	307.3	143.9	451.2	⑬
	Commercial	Metered	9	18	27	43.31	21.89	65.2	
		Average						2.41	⑭
		Unread	5	0	5	12.07	0.00	12.07	⑮
		Subtotal			567	1,654.6	502.7	2,157.3	④-1
Billed unmetered consumption	Flat RATE	Convent	6	0	6	13.56	0	13.56	⑯
		Unit volume						2.26	Ⓐ
		Subtotal				13.6	0.0	13.6	⑤-1
		total	377	196	573			2,170.8	②-1

			No of customers			Water volume			
			SMA2	SMA3	total	SMA2	SMA3	total	
Billed meter consumption	Domestic	Metered	315	130	445	1,756.6	780.3	2,536.9	
		average						5.70	⑫
		Unread	39	51	90	222.3	290.7	513.0	⑬
	Commercial	Metered	10	14	24	28.0	127.0	155.0	
		average					*	6.46	⑭
		Unread	4	6	10	25.8	38.8	64.6	⑮
		Subtotal	368	201	569	2,032.7	1,236.8	3,269.5	④-1
Billed unmetered consumption	Flat Rate	Convent	2	0	2	4.52	0	4.52	⑯
		unit volume						2.26	Ⓐ
		Subtotal	2	0	2	4.5	0.0	4.5	⑤-1
			370	201	571				
		total						3,274.0	②-1

THANK YOU

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The Federal Capital Territory Reduction of NRW Project (Phase-2)

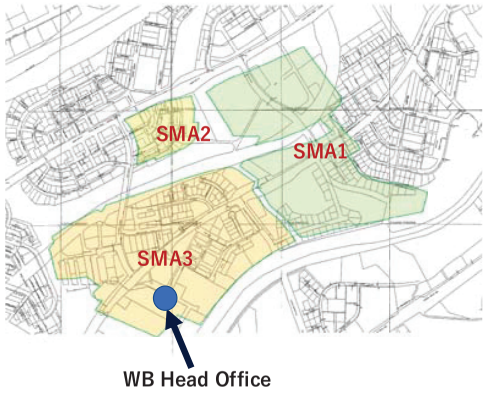
Garki I Case Study

9th May 2017

Mr. Igbinosa Courage
NRW Unit, Distribution, FCTWB

GARKI PMA Basic Information

- Number of Small Management Areas :3
  - Planed SMA2 was larger, but reduced due to meter installation issue
- Number of general customers
  - SMA1: 31
  - SMA2: 123
  - SMA3: 242
- Number of Major customers: 33



Data Collection to Calculate the NRW Ratio

Basic information to Calculate the NRW ratio

- **Water supply volume**
- **Water consumption volume**

- Water supply volume
  - Flow measurement by Ultrasonic Flow Meter

  NOTE:
  - In Garki, Distribution pipes are uncertain

    ⇓
  - Finding pipe & connection point were required.

- Water consumption volume
  - Meter reading in Garki, including conventional and AMR meters

Customer List & Meter Reading Result

Basic information to Calculate the NRW ratio

Garki I AMR Customers List by SMA 1

S/No	Account Number	SMA	Customer Name	Address			Usage type(Resi1,Comm1)	Meter Type(AMR, Conv e)	BILLING METHOD	Meter Reading at All Customer						Weekly Water Consumption Amount (m3)	Days of Interval (Days)	Average Daily Consumption Amount (m3/Day)
				StreetNo	Street Name	Address Line1				1st Week from Nov. 30 to Dec.5			2nd Week from Dec. 7 to Dec.12					
										Meter Reading	Date [2/9]	Time [9:33]	Meter Reading	Date [2/16]	Time [15:44]			
1	A01-097333-GK1	1	GLOBE MOTORS		TAFAWA BALEWA ROAD AREA 8 (A01) GARKI I ABUJA	GARKI I	COMM	AMR	METER READING									
2	A01-092819-GK1/A	1	OBIOMA SAKAGBURUONYE A. (O	Flat 1 Block 1 Plot 2122	#11 NGWA CLOSE (A01) GARKI I	GARKI I	COMM	AMR	METER READING	349	23/6/16		378	30/06/16		29.0	7	4.14
3	A01-110516-GK1	1	THE OCCUPANT	Flat 1 Block 1	#7 NGWA CLOSE (A01) GARKI I	GARKI I	COMM	AMR	METER READING	1,294	23/6/16		1,332	30/06/16		38.0	7	5.43
4	A01-092821-GK1	1	TREASURE ISLAND ZOOL	Flat 1 Block 1 Plot 2131	#0 NGWA CLOSE (A01) GARKI I	GARKI I	COMM	AMR	ESTIMATE	Faulty	23/6/16						7	
5	A01-087139-GK1	1	THEOPHILUS AJUTORA	Flat 0 Block 1 Plot 2129	#12 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	METER READING	4,469	23/06/16					0.0	7	
6	A01-087140-GK1	1	MS. CHIOMA AMAECHI	Flat 1 Block 1 Plot 2131	#15 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	ESTIMATE	Faulty	23/6/16		4,469	30/06/16			7	
7	A01-087141-GK1	1	MRS. COMFORT OMORUKOLA	Flat 0 Block 1 Plot 2129	#17 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	ESTIMATE	Faulty	23/6/16			30/06/16			7	
8	A01-087142-GK1	1	MR. BABANGIDA UMAR	Flat 1 Block 1 Plot 2131	#20 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	ESTIMATE	0	21/6/16	Temp	35	28/06/16		35.0	7	
9	A01-087143-GK1	1	MR. UCHE NDU OKAKWUMMA	Flat 1 Block 1 Plot 2132	#24 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	ESTIMATE	Faulty	23/6/16			30/06/16			7	
10	A01-087144-GK1	1	UNION NET WORK SIR MOSE	Flat 1 Block 1 Plot 2114	#13 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	COMM	AMR	ESTIMATE	Faulty	23/6/16			30/06/16			7	
11	A01-087145-GK1	1	MR. FAROUK AUDU	Flat 1 Block 1 Plot 2112	#10 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	ESTIMATE	Faulty	23/6/16			30/06/16			7	
12	A01-087146-GK1/A	1	ALH. G. A. YUSUF	Flat 1 Block 1 Plot 2125	#5 NGWA CLOSE AREA 3 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	METER READING	2,796	23/6/16		2,828	30/06/16		32.0	7	4.57
13	A01-087147-GK1	1	MR. LAZARUS	Flat 1 Block 1 Plot 2119	#16 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	ESTIMATE	Faulty	23/6/16						7	
14	A01-087150-GK1	1	DR J.A.O. ABALAKA	Flat 1 Block 1 Plot 2125	#4 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	METER READING	Faulty	23/6/16						7	
15	A01-087151-GK1	1	MR. MAHARO MUKAILA	Flat 1 Block 1 Plot 2116	#9 NGWA CLOSE AREA 8 (A08) GARKI I ABUJA	GARKI I	RES1	AMR	ESTIMATE	Faulty	23/6/16		516	30/06/16			7	
16	A03-087149-GK2	1	A.J.A C. OGUGUA	Flat 1 Block 1 Plot 2110	# 2 1 NGWA CLOSE (A01) GARKI I ABUJA	GARKI I	RES1	AMR	ESTIMATE	Faulty	23/6/16						7	
17	A01-098114-GK1	1	MR. ABALAKA JAMES	Flat 1 P lot 2 113	# 2 2 NGWA CLOSE (A01) GARKI I ABUJA	GARKI I	RES1	AMR	METER READING	1635	23/6/16		1645	30/06/16		10.0	7	1.43
18	A03-087148-GK2	1	OWODUNNI A. GBADAMOSI	Flat 1 Block 1 Plot 2113	# 2 2 NGWA CLOSE (A01) GARKI I ABUJA	GARKI I	RES1	AMR	METER READING	6429	23/6/16		6434	30/06/16		5.0	7	0.71
19	A01-098116-GK1	1	MR. KINGSLEY	Flat 3 P lot 2113	# 2 2 NGWA CLOSE (A01) GARKI I ABUJA	GARKI I	RES1	AMR	METER READING	1215	23/6/16		1223	30/06/16		8.0	7	1.14
20	A01-098117-GK1	1	MR. ANTHONY	Flat 4 P lot 2113	# 2 2 NGWA CLOSE (A01) GARKI I ABUJA	GARKI I	RES1	AMR	METER READING	876	23/6/16		881	30/06/16		5.0	7	0.71
21	A01-110689-GK1	1	THE OCCUPANT	Flat 5 P lot 2 113	# 2 2 NGWA CLOSE (A01) GARKI I ABUJA	GARKI I	RES1	AMR	METER READING	2,502	23/6/16		2,504	30/06/16		2.0	7	0.29
22	A01-098287-GK1	1	ENGR OLABODE LATEEF	Flat 1 Block 1	# 2 2 NGWA CLOSE (A01) GARKI II ABUJA	GARKI II	RES1	AMR	ESTIMATE	Faulty	23/6/16			30/06/16			7	
23	A01-098288-GK1	1	ENGR OLABODE LATEEF	Flat 1 P lot 2113	# 2 2 NGWA CLOSE (A01) GARKI II ABUJA	GARKI II	RES1	AMR	ESTIMATE	Faulty	23/6/16			30/06/16			7	
24	A01-033720-GK1	1	AYO SANNI	Flat 3 Block 1	# 2 UMUDIOKA CLOSE (A01) GARKI II ABUJA	GARKI I	RES1	AMR	METER READING	Faulty	23/6/16		26,568	30/06/16		4	7	
25	A01-110692-GK1	1	OBINNA AJUKWO	Flat 1 Block 1	# 4 UMUDIOKA CLOSE (A01) GARKI II ABUJA	RES2	RES1	AMR	ESTIMATE	Faulty	23/6/16			30/06/16			7	

Water Consumption by Statistical Analysis

Aggregation of Water Consumption from the Customer Record and Meter Reading

Meter Reading have been conducted 6-times

Number of customer						Number of Estimate(Cosumption>0) >=0					
Category	Meter Type	SMA1	SMA2	SMA3	total	Category	Meter Type	SMA1	SMA2	SMA3	total
Domestic	CONVE	0	31	15	46	ESTIMATE	RES1	0	2	6	8
RES1							COMM1	0	1	0	1
	AMR	22	109	204	335		TOTAL	0	3	6	9
	Unknown	0	0	0	0						
	Sub-total	22	140	219	381	* Remove Bore hole-2,Vacant-2, No water-1, Disconnect-1 from th					
Commercial	CONVE	0	0	1	1						
COMM1											
	AMR	5	3	12	20						
	Unknown	0	0	0	0						
	Sub-total	5	3	13	21						
	TOTAL	27	143	232	402						
Counter		27	143	232	402						

			Number of Customers				Water Volume				
			SMA1	SMA2	SMA3	total	SMA1	SMA2	SMA3	total	
Billed meter cosumption	Domestic	Metered	20	116	185	321	98.97	119.39	252.37	470.73	
	RES1	Average							1.47	⑰	
		Unread	2	22	28	52	2.94	32.34	41.16	76.44	⑱
	Commercial	Metered	3	2	10	15	11.65	3.66	59.54	74.85	
	COMM1	Average							4.99	⑲	
		Unread	2	0	3	5	9.98	0	14.97	24.95	⑯
		subtotal				393	123.54	155.39	368.04	**846.97**	**②-1**
Billed unmetered consumption											
	ESTIMATE	AMR	0	3	6	9	0	4.92	9.84	14.76	
		Unit volume								1.64	Ⓐ
		Subtotal				9	0.00	4.92	9.84	**14.76**	**②-1**
			27	143	232	402				661.73	②-1'

*Ⓐ Unit Volume:Domentic-AMR-Flat Rate(4000 /80)*12/365=1.64

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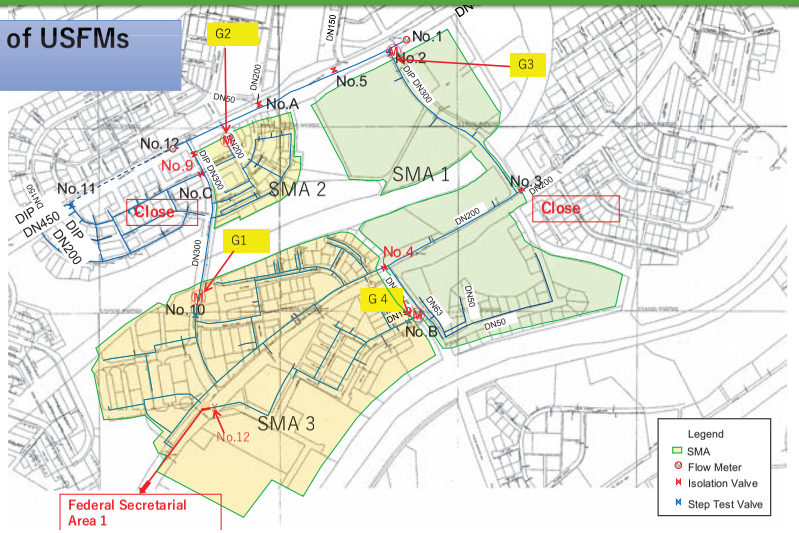
Annex5-116

GARKI SMAs Flow Measurement

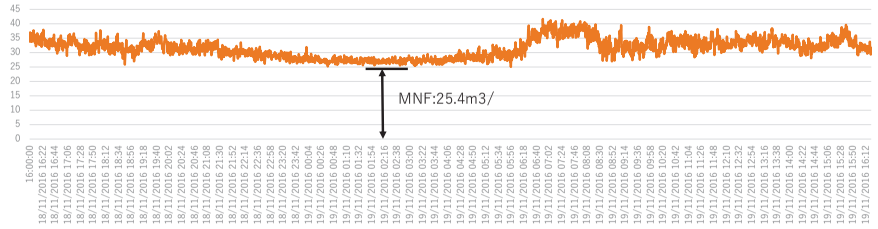
Location of USFMs
4 Places



6

Result of Flow Measurement

Water supply volume into the SMA1 measured by the ultrasonic flow meter



Average m3/h	31.4261	1day m3/D	753.6864

7

NRW Ratio of GARKI PMA(Before)

GARKI PMA Water Balance Analysis		Before			m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption		④	409.3	12.8%	④-1	347.1
							④-2	62.2
	806	Billed Unmetered Consumption (Flat Rate)		⑤	396.9	12.4%	⑤-1	185.3
							⑤-2	211.6
				⑥	386.6	12.1%	⑥-1	151.9
							⑥-2	234.6
3,197	③Non Revenue Water	Commercial Losses	Unbilled Authorized	⑦	41.0	1.3%	⑦-1	6.0
							⑦-2	35.0
			Customer Meter Inaccuracies	⑧	26.8	0.8%		
			Illegal Connection	⑨	11.9	0.4%		
	2,391		Unidentified Consumption	⑩	1,171.0	36.6%	1,936.6	
Extremely High	74.8%		Leakage	⑪	753.7	23.6%	60.6%	
		Physical Losses						

8

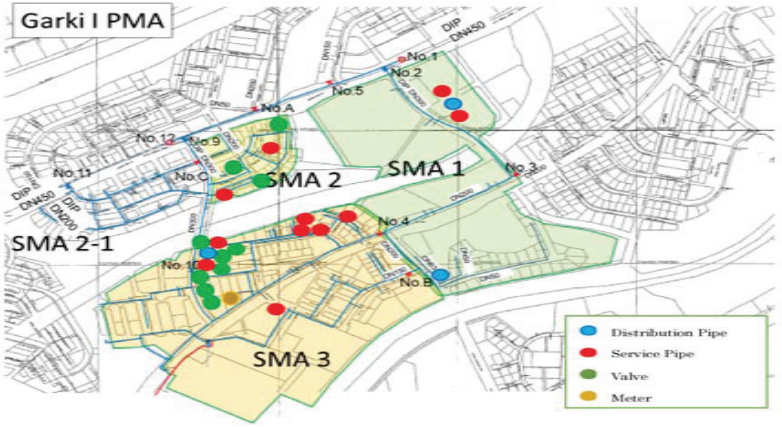
Counter Measures to Reduce High NRW Ratio

- Leakage detection → Repair
- Illegal connection investigation → Disconnection
- Meter accuracy test → Getting a correct consumption rate & Meter replacement

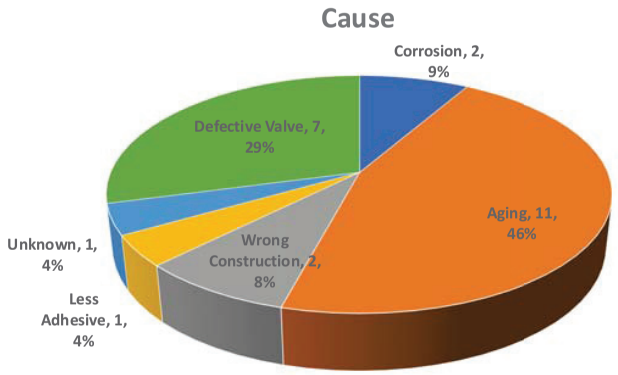
- Registration of none registered customer → Meter installation
- Grasp authorized unbilled customers → Registration of none registered customers & Meter installation & 24hrs flow measurement

- Finding distribution pipe

Result of Leakage Survey (GARKI1)



Cause of Leakage (GARKI1)



Leakage Volume							Illegal connection Volume			
Pipe category	Pipe size	SMA	Number of leakage	Unit volume m3/d	Total m3/d	Pipe size	SMA	Number of connection	Unit volume m3/d	Total m3/d
Service pipe	20	3	14	2	28	50		0		0
	20	1	2	2	4	25	3	2	2.98	5.96
	20				0	25	2	2	2.98	5.96
	50	3	2	30	60	20		0		0
	>50	3	1	24	24	Sub total		4		11.92
	50	3	1	24	24			SMA1	1	0
	50	3	1	12	12			SMA2	2	5.96
	30	3	1	24	24			SMA3	3	5.96
	30	3	2	12	24	Grand Total			⑨	11.92
	25	3	1	48	48					
	25	1	1	12	12					
	25	3	3	12	36					
	25	2	3	6	18					
	25	3	2	6	12					
	25	1	1	2.4	2.4					
	25	2	1	2.4	2.4					
	25	3	1	2.4	2.4					
	26	2	1	0.24	0.24					
	27	3	1	0.24	0.24					
	Sub total		39		333.7					
Distribution pipe	>=300				0					
	250-150	3	1	150	150					
	250-150	1	1	72	72					
	100	1	1	72	72					
	<=50	3	1	48	48					
					0					
	Sub total		4		342					
			SMA1	1	240.4					
			SMA2	2	20.64					
			SMA3	3	492.6					
Grand total				⑪	753.7					

Leakage & Illegal Connection Survey Summary from last year

NRW Ratio of GARKI PMA (After)

GARKI PMA After Water Balance Analysis	Ex post				m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption		④	1,236.4	36.8%	④-1	651.6
							④-2	584.8
	1,332	Billed Unmetered Consumption (Flat Rate)		⑤	95.6	2.8%	⑤-1	14.8
							⑤-2	80.8
				⑥	85.7	2.6%	⑥-1	12.1
							⑥-2	73.6
	③Non Revenue Water	Commercial Losses	Unbilled Authorized	⑦	128.2	3.8%	⑦-1	1.9
							⑦-2	126.3
3,356			Customer Meter Inaccuracies	⑧	0.0	0.0%		
			Illegal Connection	⑨	0.0	0.0%		
	2,024		Unidentified Consumption	⑩	1,809.7	53.9%	1,809.7	
		Physical Losses	Leakage	⑪	0.0	0.0%	53.9%	
	60.3%							

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NRW Ratio of GARKI SMA1 (After)

GARKI SMA1 After Water Balance Analysis	Ex post				m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption		④	266.1	36.4%	④-1	128.3
							④-2	137.8
	276	Billed Unmetered Consumption (Flat Rate)		⑤	10.0	1.4%	⑤-1	0.0
							⑤-2	10.0
				⑥	20.0	2.7%	⑥-1	0.0
							⑥-2	20.0
	③Non Revenue Water	Commercial Losses	Unbilled Authorized	⑦	30.0	4.1%	⑦-1	0.0
							⑦-2	30.0
731			Customer Meter Inaccuracies	⑧	0.0	0.0%		
			Illegal Connection	⑨	0.0	0.0%		
	455		Unidentified Consumption	⑩	405.0	55.4%	405.0	
		Physical Losses	Leakage	⑪	0.0	0.0%	55.4%	
	62.2%							

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NRW Ratio of GARKI SMA2 (After)

GARKI SMA2 After Water Balance Analysis	Ex post				m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption		④	145.7	21.1%	④-1	145.7
							④-2	0.0
	151	Billed Unmetered Consumption (Flat Rate)		⑤	4.9	0.7%	⑤-1	4.9
							⑤-2	0.0
				⑥	4.0	0.6%	⑥-1	4.0
							⑥-2	0.0
	③Non Revenue Water	Commercial Losses	Unbilled Authorized	⑦	1.2	0.2%	⑦-1	1.2
							⑦-2	0.0
692			Customer Meter Inaccuracies	⑧	0.0	0.0%		
			Illegal Connection	⑨	0.0	0.0%		
	541		Unidentified Consumption	⑩	536.2	77.5%	536.2	
		Physical Losses	Leakage	⑪	0.0	0.0%	77.5%	
	78.2%							

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NRW Ratio of GARKI SMA3 (After)

GARKI SMA3 After Water Balance Analysis	Ex post				m3/D	%		m3/D
①System Input Volume	②Revenue Water	Billed Metered Consumption		④	819.0	42.4%	④-1	371.9
							④-2	447.0
	900	Billed Unmetered Consumption (Flat Rate)		⑤	80.7	4.2%	⑤-1	9.8
							⑤-2	70.8
				⑥	61.7	3.2%	⑥-1	8.1
							⑥-2	53.6
	③Non Revenue Water	Commercial Losses	Unbilled Authorized	⑦	98.2	5.1%	⑦-1	1.9
							⑦-2	96.3
1,933			Customer Meter Inaccuracies	⑧	0.0	0.0%		
			Illegal Connection	⑨	0.0	0.0%		
	1,033		Unidentified Consumption	⑩	873.1	45.2%	873.1	
		Physical Losses	Leakage	⑪	0.0	0.0%	45.2%	
	53.5%							

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Improvement of NRW ratio

GARKI	Before %	After %	Improvement
SMA1	85.1	62.2	22.9
SMA2	74.8	78.2	up
SMA3	70.0	53.5	16.5
PMA	74.8	60.3	14.5

THANK YOU

ARIGATO
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The Federal Capital Territory
Reduction of NRW Project (Phase-2)

Findings in Case Studies, Issues and Challenges

9th May 2017

Engr. Moh. Kabir Rabiu
HoU NRW, Distribution, FCTWB

Management of NRW in Pilot Area

Purpose of NRW management in pilot area

- Understanding WHAT I S MANAGEMENT OF NRW
- Understanding HOW TO DO NRW REDUCTION ACTIVITIES
- Understanding PROCEDURES TO DEPLOY NRW REDUCTION ACTIVITIES TO OTHER Areas

Result of NRW Ratio Before Counter-Measures (NRW Reduction Operations)

GUDU Before 2016

SMA	No of Customer	Consumption m3/d	NRW %
SMA 1	466	1,680	52.0
SMA 2	317	1,536	53.9
PMA	783	3,216	53.3

JABI

SMA2	377	3,572	45.6
SMA3	196	4,873	87.6
PMA	573	8,445	70.0

Garki

SMA1	31	754	85.1
SMA2	123	682	74.8
SMA3	242	1,761	70.0
PMA	396	3,197	74.8

Activities in Pilot Area

- Action 1
  - Preparation of correct customer list & water consumption
  - Preparation of correct distribution pipeline drawing
- Action 2
  - Leakage detection & repair
  - Illegal connection investigation
  - Meter accuracy test → *Result is shown in next slide*
- Action 3
  - Registration of not registered customer
  - Grasp authorized unbilled customers

Meter Accuracy Test Result

【Accuracy: +-10%】

GUDU	Prepaid, Conventional			
All	133			
10=>">=-10%		total	99	74.4%
Number of meters: Out of standard				
>10	17			
<-10	17	total	34	25.6%

JABI	Conventional			
All	125			
10=>">=-10%		total	34	27.2%
Number of meters: Out of standard				
>10	36			
<-10	55	total	91	72.8%

GARKI	AMR, Conventional			
All	61			
10=>">=-10%		total	30	49.2%
Number of meters: Out of standard				
>10	8			
<-10	23	total	31	50.8%

- IN JABI, Very low level meter accuracy , 72,8% were out of available range.

⇓

All meter replacement

No Use but Old Meter Accuracy Test before Purchase

- Before purchasing new meters for Jabi. All meters were tested. About 15% of purchased new meters were out of available range.(error ratio less than 10%)

AMR Meters were also tested (stocked by WB)

Management of NRW After Actions in Pilot Area

- 3 Pilot areas: GUDU, JABI, GARKI
- Customers in the pilot areas : as of 2016
  - GUDU: 783
  - JABI: 573
  - GARKI: 396
  - TOTAL: 1752
- Meter error test
  - TOTAL 319
- Meter replacement
  - GUDU none
  - JABI about 600
  - GARKI 40 or more

Difficulties of NRW Ratio Reduction Action

GARKI : Uncertain existing distribution pipe location & connection to SMA2 & 3

JABI : Village water supply on flat ratio, meters theft, ultrasonic flow meter battery stolen

GUDU : No access to many properties for meter reading

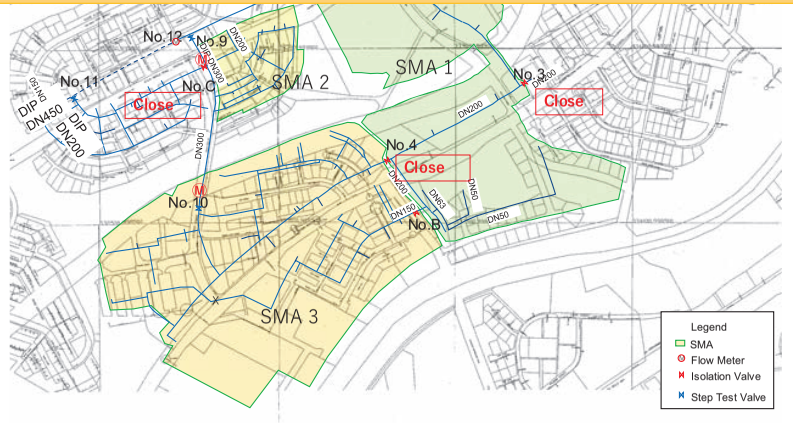
Problems of PMA/SMA Creation

- **Pipe network isolation is difficult due to:**
  - No comprehensive drawings
  - Discrepancy between drawings or staff information and actual situation such as pipe
  - Depth of installed pipeline cause difficult to survey of pipe location

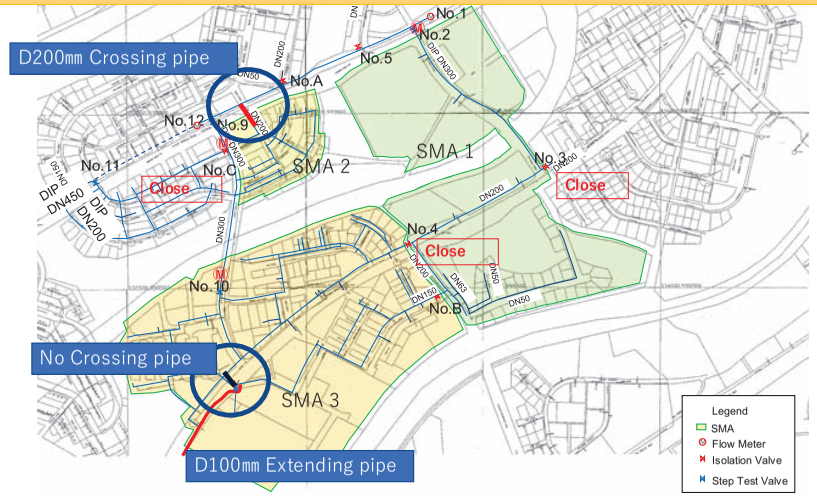
Uncertain existence of pipe connection

⇓

Occurred Mysterious flow measurement result, such as downstream flow is more than upstream.

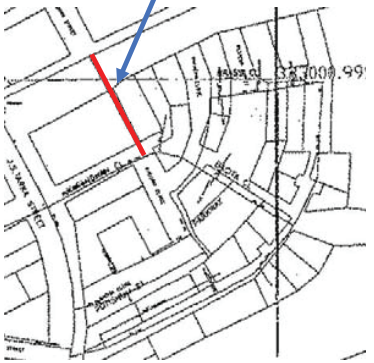


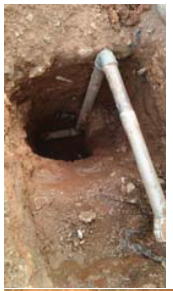
Discovered Pipes & Connections



Details of Discovered Pipe Connection at Garki SMA2

- Distribution map did not show pipe existing
- Carried out searching investigation & trail excavation
- Found connecting pipe to the other pipe





DEA Fails of Discovered Pipe Connection at Garki SMA3

- Distribution map shows existing
- Carried out searching investigation
- Found existing pipe does not connect the other pipe

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Another Challenge of NRW Ratio Reduction Action

Water supply to Villages in Jabi

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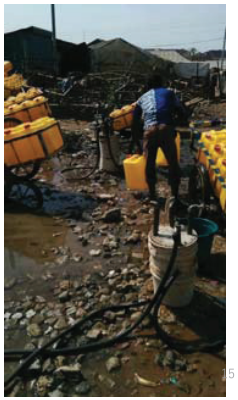
Annex5−124

Another Challenge of NRW Ratio Reduction Action Cont.

JABI Villages



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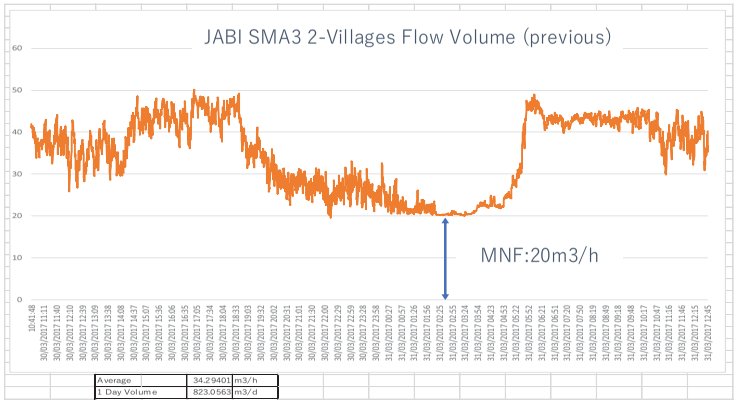
24hr Flow Rate for Jabi Villages

Total water supply volume to the Villages in SMA3: 823m3/d



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Metered Consumption Volume for SMA3 in Jabi Village

Metered Consumption of Villages in SMA3: 178m3/d

Water consumption of the Jabi Villages

S/n	NAME OF CUSTOMER	1st Meter reading 22/Mar	2nd Meter reading 30/Mar	Consumption	m3/d
SMA3					
1. Jabi offstage Village					
1	Mr. Saliu Ibrahim (Slow moving)	2995	3057	62	7.8
2	Mr. Sureya Usuf	2811	3070	259	32.4
3	Zila Mohammed (leakage from near t	4131	4274	143	17.9
4	Jamilu Mohammed	576	606	30	3.8
5	Nnamdi	2637	2973	336	42.0
6	Nnamdi Umaha	1439	1519	80	10.0
7	Chinnakwe Int'l Sch.	120	125	5	0.6
8	Ms. Mary Pure water company	1092	1172	80	10.0
	sub total m3/d				124.4
2. Jabi obstage Village					
1	Saadafu Maigoro	2837	2934	97	12.1
2	Pius Okocha (tap leakage)	4696	4867	171	21.4
3	Musa Mohammed	2214	2373	159	19.9
	sub total m3/d				53.4
① Total m3/d				1 day	**177.8**
	Average m3 /h				7.4
	② UFM 31/Mar/2017	Ave m3/h	34.3	1 day m3/d	**823.0**
	② − ① Difference between inflow and metered volume			1 day m3/d	**645.3**

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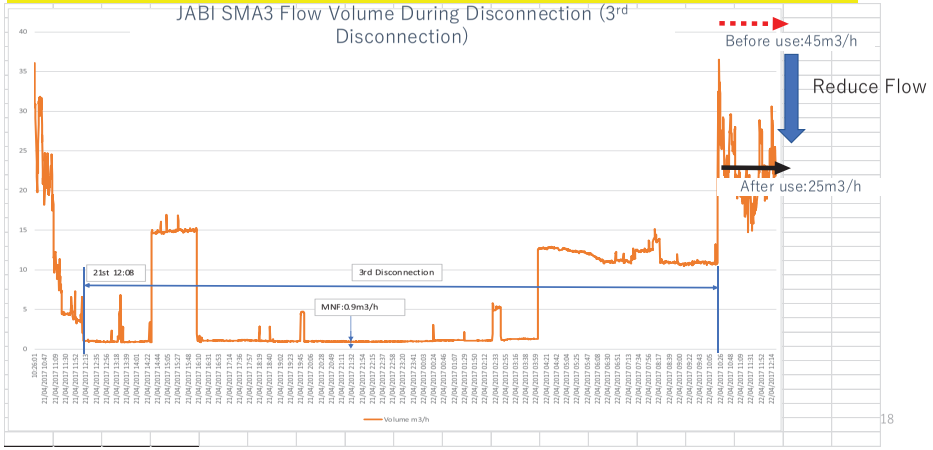
Water Supply for Villages

「Strong order to appropriate use of public taps water」
contribute to reduce water consumption



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Annex5−125

Meter Theft & Battery Stolen in SMA2

Meters stolen

Battery stolen

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Access to the Meters in PMAs

Ratio = Number of possible reading customers / Number of customers

	Meter Reading Ratio
GUDU	45%
JABI	82%
GARKI	84%

-Gudu showed low reading ratio, because prepaid system and management by the developer.

-This situation cause keeping not good meter condition("Not visible" meter occupied 23% of all meters reading) and produce illegal use (number of illegal connection was 32, included suspect)

20

Access to Meter in GUDU

-Investigation of illegal use
- Difficult to enter the property make less investigation of illegal use
- Worse, Service pipe crossing under other person's property

-Prepaid system of Gudu
- Nearly a fourth of meter, "Not visible" make us not able to confirm meter counter is correct or not.
- Need to confirm customer's payment and consumed water volume, using water supply volume data by mechanical flow meter which was installed at inlet of PMA

Improvement of NRW Ratio

NRW Ratio comparison

GUDU

SMA	No of Customer	Before 2016 Consumption m3/d	Before 2016 NRW %	Ex post 2017 Consumption m3/d	Ex post 2017 NRW %	Improvement (Points)
SMA 1	466	1,680	**52.0**	1,631	**14.3**	37.7
SMA 2	317	1,536	**53.9**	1,471	**28.7**	25.2
PMA	783	3,216	**53.3**	3,103	**21.0**	32.3

JABI

SMA2	377	3,572	**45.6**	3,921	**21.1**	24.5
SMA3	196	4,873	**87.6**	3,202	**16.2**	71.4
PMA	573	8,445	**70.0**	7,119	**30.9**	39.1

Garki

SMA1	31	754	**85.1**	731	**62.2**	22.9
SMA2	123	682	**74.8**	692	**78.2**	(3.4)
SMA3	242	1,761	**70.0**	1,933	**53.7**	16.3
PMA	396	3,197	**74.8**	3,356	**60.4**	14.4

Get more reduction with continuous efforts !!

Key Issue of Improving NRW Ratio

- Eradicate situation of "Flat rate" and "Estimated" Billings
- Installation of meter for all water users
- Registration of all customer and elimination of non existing customers
- Rigorous/continuous meter reading
- Frequent updating of customer database
- Continuous leakage and illegal use survey
- Plan for appropriate maintenance and replacement period for water meters.

To ease calculation of NRW [Until all water consumption volume are obtained appropriately]
- Simplify categorization of customers, charges and Billing system
- Unify meter type to conventional type

Issues on Water Meters (Conventional) that the Project Team faced

Water Meters	Items	Issues
Conventional	1. Maintenance	• Manufactures seal is usually broken in the process of maintenance
	2. Operation	• Lots of staff members are required to read water meters. • Fuel for vehicle and personnel cost are more expensive than that of AMRs and Pre-paid meters. • Low work efficiency of meter reading because operator can use only one vehicle (bus) for meter reading.
	3. Procurement	• No appropriate supplier.
	4. Data Compilation	• Presence of human errors.
	5. Reading Accuracy	• Data is not accurate because water meters are not standardized. • There is no systems for checking meter reading report and bills.
	6. Illegal connection	• In case that pre-paid meters are located in in the premises, it is difficult to monitor the pre-paid meter to

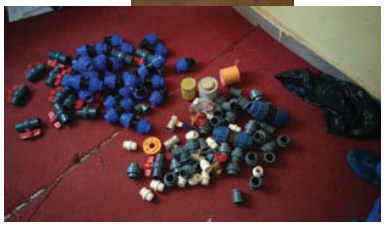
Issues on Water Meters (Pre-paid) that the Project Team faced

Water Meters	Items	Issues
Pre-paid	1. Maintenance	• A lot of training for capacity building required.
	2. Operation	• Monitoring is required periodically to check condition.
	3. Procurement	• Funding issues (Management and Bureaucracy).
	4. Data Compilation	• Some of the applications are not flexible.
	5. Reading Accuracy	-
	6. Illegal connection	• In case that pre-paid meters are located in in the premises, it is difficult to monitor the pre-paid meter to detect illegal connection like bypass.

Issues on Water Meters (AMR) that the Project Team faced

Water Meters	Items	Issues
AMR	1. Maintenance	• It is not easy to maintain AMRs compared with conventional water meters because electric devices mounted. • No workshop. • Spare parts must be ordered from abroad.
	2. Operation	• Some meters can't be read because of antenna trouble (easy to break)
	3. Procurement	• AMRs must be procured from only the agent in abroad. • Funding issues (Management and Bureaucracy)
	4. Data Compilation	• Some of the applications are not flexible
	5. Reading Accuracy	• It does not specify quantity of water leakage.
	6. Illegal connection	• In case that pre-paid meters are located in in the premises, it is difficult to monitor the pre-paid meter to detect illegal connection like bypass.

THANK YOU FOR YOUR ATTENTION



The Federal Capital Territory Reduction of NRW Project (Phase-2)

Work Plan (Phase-2)

9th May 2017

Mr. Akinori Miyoshi
Chief Advisor, JICA Expert Team

Scenes of the Project


Chamber for Bulk Flow Meter at outlet of LUD WTP


Monitor & Logger for Bulk Flow Meter (Ultrasonic)


Chamber Location for Zonal Meter at outlet of Tanks


Checking Drawings by GIS Mapping


Flow Meter for Inflow into Pilot Metering Area


Valves for isolating Pilot Metering Area


24 hrs Flow Measurement by Ultrasonic Flow Meter


Minimum Night Flow Measurement and Step Test


Leakage Detection Survey (Ground-microphone)


Water Meter Accuracy Test

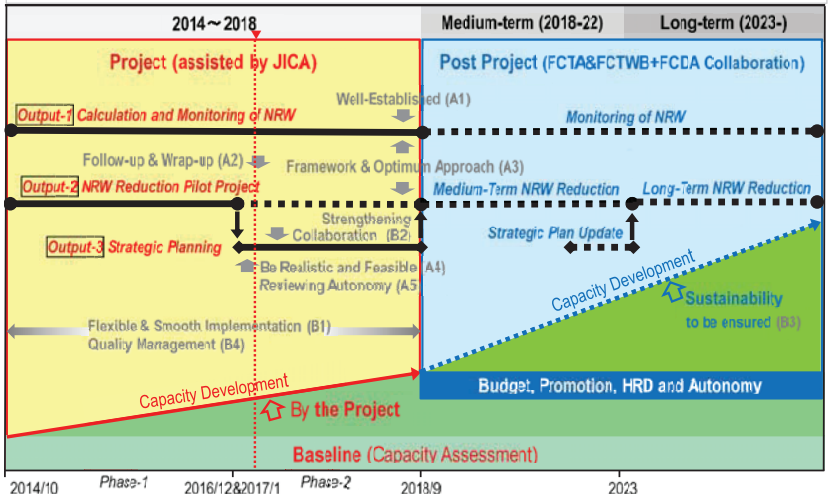

Illegal Connection Survey (Bypass)


Customer Consumption Measurement

Contents

- Timeline of the Project
- Challenges of FCTWB and the Project
- Ideal Situation of FCTWB
- Principles of Project Implementation
- Contents of the Medium-term Strategic Plan (Tentative)
- Timeline and Flow of the Medium-term Strategic Planning

Project Name: The Federal Capital Territory Reduction of NRW Project (Phase-2)
Overall Goal: Level of NRW is reduced at the service area of FCTWB.
Project Purpose: Capacity of FCTWB for NRW reduction is strengthened.
Output-1: Level of NRW of both the service area of FCTWB and water distribution area is monitored regularly.
Output-2: Methodology/operational procedures for effective NRW reduction are established through pilot projects.
Output-3: A medium-term strategic plan of FCTWB for NRW reduction is developed, utilizing Output-1&2.



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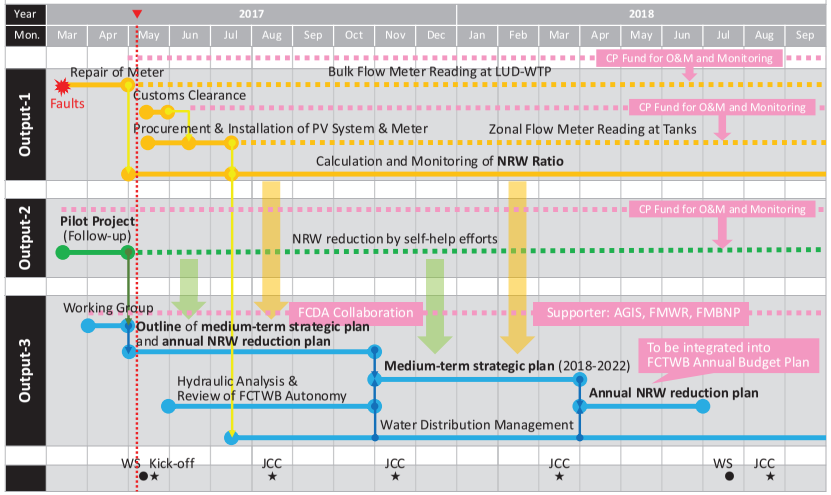

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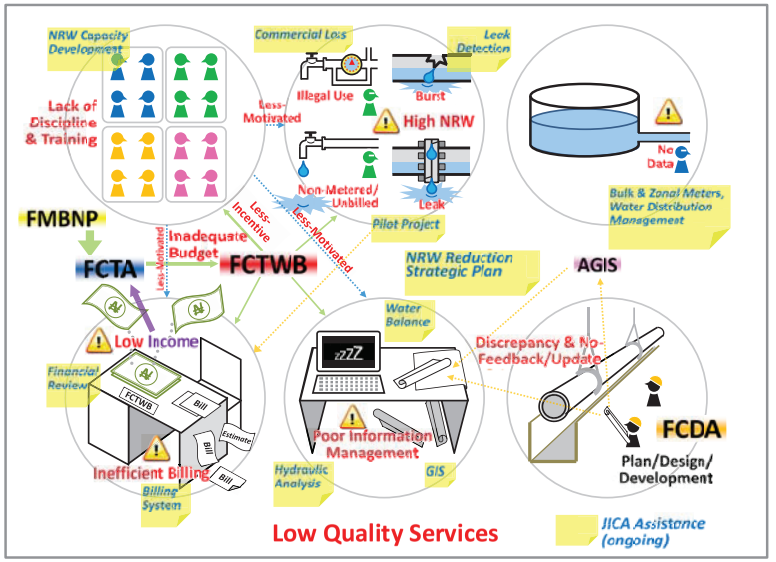
Challenges of FCTWB and the Project



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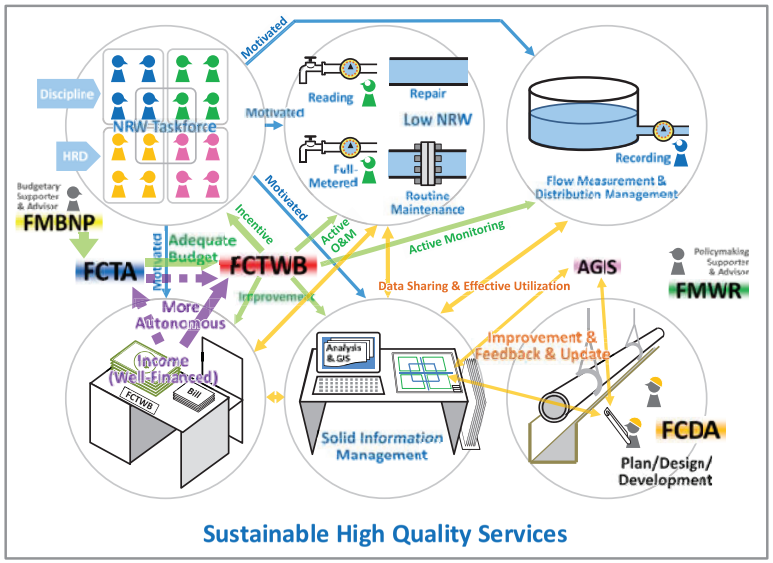
Ideal Situation of FCTWB



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Principles of Project Implementation (Phase-2)

Technical-1(A1): Well-established quantitative NRW monitoring

As Output-1, the Project realizes quantitative NRW monitoring by installing bulk flow meters and zonal flow meters at outlet of water treatment plant as well as outlet of main service reservoirs, and also modifying existing billing system for calculation of monthly water consumption data. The Project promotes the establishment of comprehensive measurements of both distribution and billed water volume by developing measuring and monitoring system, preparing standard operating procedures and manuals, etc.

Technical-2(A2): Follow-up and wrap-up of the Pilot project

Through the prompt and intensive follow-up activities in the Pilot projects, the Project wraps up the pilot projects implementation at earlier stage of Phase-2.

(* Presented in this Workshop)

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Principles of Project Implementation (Phase-2)

Technical-3(A3): Development of framework for effective and efficient NRW reduction

Before the Project was launched, FCTWB had not conducted NRW reduction operations systematically and actively. Thus, the Project develops a framework covering command/communication system among managers and staffs in charge, practical procedures and methods of NRW reduction operations, data measurement/recording/check, water balance analysis, feedback and so on. The Project assists FCTWB to identify causes of NRW in PMAs and examine approaches to NRW reduction suitable for characteristics of service areas, then proposes effective and efficient NRW reduction in medium-term strategic planning.

As Output-2, the Project demonstrates effects, cost-effectiveness and importance of NRW reduction through Pilot projects. Considering conditions of FCTWB including implementing structure, service/management infrastructure, budget, etc., the Project also examines technically the balance between entire/zonal NRW monitoring in Output-1 and NRW reduction in Output-2.

Principles of Project Implementation (Phase-2)

Technical-4(A4): Realistic and feasible strategic planning

As Output-3 based on the results of Output-1 and Output-2, the NRW reduction medium-term strategic plan for five years and annual NRW reduction plan are developed by the Working Group, which should be realistic and feasible in consideration of cost of NRW reduction and certainty of budgetary allocation. The medium-term strategic plan includes the policy to expand NRW reduction into the entire water service area of FCTWB drawing water from Lower Usuma Dam (LUD), review of organization structure, human resources development, infrastructure development (pipe replacement, etc.). The Project sets timeline and priority by issues in consideration of capacity and structure of each department, and then develops a implementation plan (including target values), an organization and human resources development plan and a distribution pipe replacement plan. In addition, the Project designs new department or cross-organizational taskforce on NRW reduction as a successor to the NRW Management Team and/or Action Team to be established in order to continue NRW reduction operations routinely and sustainably.

Principles of Project Implementation (Phase-2)

Technical-5(A5): Review of autonomy and assistance in promotion

Autonomy of FCTWB based on the legal framework is the key to achieve sound management of water supply services, adequate operation and maintenance, and sustainable NRW reduction. However, the FCTWB Bill for autonomy has not been approved by the Parliament since the former administration.

In the Phase-2, the Project reviews the Bill, analyzes the financial situation, conducts examination on the effect and impact of autonomy, and considers the organizational picture suitable for FCTWB. In anticipation of promoting NRW reduction, the Project prepares documents to be presented to the FCT Minister if necessary.

Principles of Project Implementation (Phase-2)

Operational-1(B1): Flexible and smooth implementation of the Project

For successful implementation of the Project, framework/approaches of activities, that is, the Project Design Matrix (PDM) should be modified flexibly according to political, social and security situations, organizational reform of organizations concerned and their performance. Thus, the Project recognizes cases early and monitors them, which may impact on implementation, and seeks solution through close information sharing, smooth communication and coordination with among organizations concerned.

In order to carry out the Project as planned, the Project secures a communication system that functions efficiently and timely.

Principles of Project Implementation (Phase-2)

Operational-2(B2): Cooperation with organizations concerned for implementing the strategic plan

To make the NRW reduction medium-term strategic plan be functional properly, support and understanding by the organizations concerned and adequate budget allocation are the key. The Project strengthens practical cooperation among the organizations concerned for sustainable development and improvement of water supply services of FCTWB through periodical meetings, discussions and approaches.

In this process, the financial situation of FCTWB, problems and issues of operation and maintenance including NRW reduction, financial and technical effects and impact of NRW reduction, establishment of feedback system, the necessity of developing the service/management infrastructure should be shared appropriately and timely.

* FCTA, FCDA (Water & Sewage, Design & Evaluation), AGIS, FMWR, FMBNP, etc.

Principles of Project Implementation (Phase-2)

Operational-3(B3): Promotion of self-sustainable development after the Project

(1) Establishment of Cross-Organizational Unit and Task Force
In order to strongly and continuously promote the development and improvement of NRW reduction and the service/management infrastructure in the short-, medium- to long- terms, a mandatory and dedicated cross-organizational unit or task force (with certain discretion) is required. With consideration of this, the Project establishes "NRW Reduction Working Group" is to implement Phase-2 more effectively.

(2) Motivation and Initiative of FCTWB Staff
In the Phase-2, the Project makes full use of the motivated staff and their initiative based on knowledge obtained and awareness in the Phase-1.

(3) Capacity Assessment and Capacity Development Plan
Based on the Capacity Assessment (CA) and Capacity Development (CD) plan which were conducted and prepared in the Phase-1, the Project monitors status of capacity development quantitatively, conducts follow-up, and reviews CD plan.

Principles of Project Implementation (Phase-2)

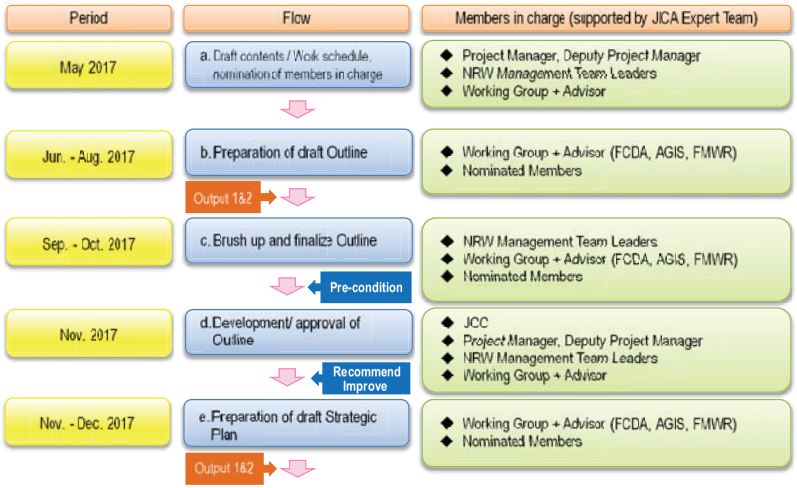
Operational-4(B4): Quality Management of Project Implementation

The Project looks after various records of communication, activities, manuals and documents including reports, and then secures quality through review, validation and verification. Particularly, Project Monitoring Sheet is utilized and improved as an effective tool of progress control. The Project applies the Plan-Do-Check-Act (PDCA) cycle so that the knowledge obtained and the lessons learned through activities can be fed back to the Project during implementation for achievement of substantial results at the end of the Project.

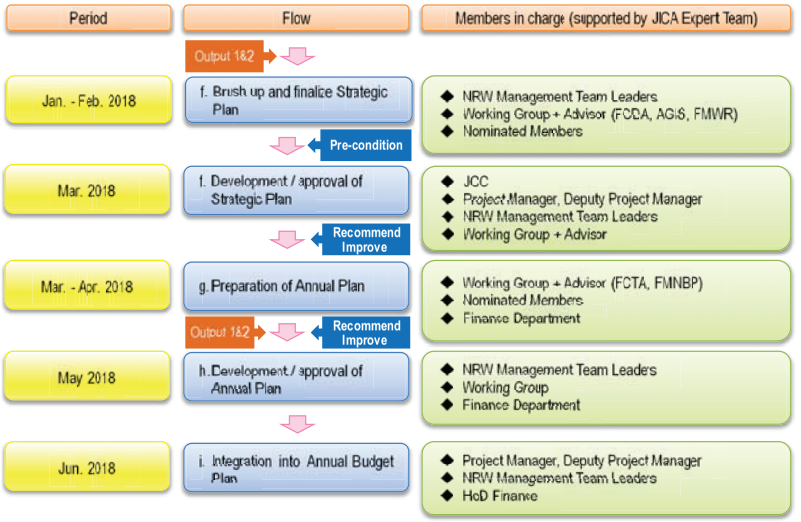
Contents of the Medium-term Strategic Plan (Tentative)

A. **Introduction to NRW and approaches**
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. **Workflow of NRW reduction**
H. **NRW reduction operations plan** : Network drawings and data, Design and creation of DMA or equivalent, Prioritization in NRW reduction, Replacement plan of existing pipelines, Field examination of existing valves and etc., Installation of flow meter, Measurement of Minimum Night Flow, Leakage detection, Repair of leaks and recording, Customer listing, Meter reading, 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. **Implementating schedule**
J. **Estimation of total and annual costs**
K. **Estimation of total and annual benefits**
L. **Recommendations on facility development /improvement and its model**
M. **Recommendations on autonomy and improvement in financial situation**
N. **Manual for equipment**

Timeline and Flow of the Medium-term Strategic Planning (2017)



Timeline and Flow of the Medium-term Strategic Planning (2018)



The Federal Capital Territory
Reduction of NRW Project (Phase-2)

Working Group for
NRW Reduction Planning

9th May 2017

Engr. A. A. Nahuche
Technical Manager, HoD Distribution, FCTWB

Working Group for NRW Reduction Planning

Sub-Group: Working-Level (Tentative)

Leader
1. Engr. Moh. Kabir Rabiu (HoU: NRW, Distribution/HQs)

Sub-Leader
2. Engr. Abdullahi Masaud (HoU: Metering General, Distribution/HQs)
3. Mrs. Rose Akpan (HoU: Billing, Commerce/HQs)

Members:
4. Mr. Danjuma Isah (HoU: Monitoring and Detection, Commerce/HQs)
5. Mr. Shehu Suleiman (HoU: GIS, Distribution/HQs)
6. Mr. Habib Ahmed Kiru (A.M./Gudu)
7. Mr. Muhammed A. S. Ramat (A.M./Jabi)
8. Mr. Adesoji Adenuga (A.M./Garki I)
9. Mr. Abdulrahman Muhammed (NRW Unit, Distribution/HQs)
10. Mr. Igbinosa Courage (NRW Unit, Distribution/HQs)
11. Mr. Mohammed Dauda (Pipeline Unit, Distribution/HQs)
12. Mr. Abubakar Ubale Abubakar (AMR Unit, Distribution/HQs)
13. Mr. Abdulrahman Shehu Sani (Prepaid Unit, Distribution/HQs)
14. Mr. Abdul Ozumi (Assistant A.M., Distribution/Gudu)

* **Other members:** To be co-opted when necessary.
* **Regular Meeting:** at FCTWB's Conference Rooms at least twice a month or.

Working Group for NRW Reduction Planning

Sub-Group: Advisory-Level (Tentative)

FCTA
1. Mr. Sani Pai (Director, EPRS), Chairperson
2. Mr. Lawal Abubakar (Deputy Director, EPRS)

FCTWB
3. Mr. Hudu Bello (Director)
4. Engr. A. A. Nahuche (HoD, Distribution)
5. Mr. Adis S. Muhammad (HoD, Commerce)
6. Mrs. Hafsat Ahmed Lawi (HoD, Finance)
7. Mr. Sunday Agbonthane (HoD, Reservoir and Production)
8. Mrs. Lola Okobi (HoD, Quality Control)
9. Engr. Abolade R. Lawal (HoU, Special Projects, Distribution)
10. Mr. Dele Olatunji (HoU: Multilateral Relations)
11. Mrs. Bunmi Olowookere (HoU: Planning, Research and Statistics)
12. Mr. Musa Dikko (HoU: Pipeline/Distribution)

Suggested Nominee from FCDA
13. Engr. F. O. Ezeoha (Deputy Director: Water & Sewage, Engineering Service)
14. Engr. J. U. Osayande (Deputy Director: Design & Evaluation, Engineering Service)

Suggested Nominee from FMWR
15. Engr. ***** ***** (Water Supply)

* **Regular Meeting:** Once a month or on an as-needed basis.

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 SEMINAR

Venue: Bolton White Hotel & Apartments, 7 Gwandu St., Opposite Sahad Stores, Area11, Garki 2, Abuja
Date: Monday, 22nd October 2018
MC: Engr. A. R. Lawal (HoD Distribution)

9:00 - 9:30	Registration of Participants
9:30 - 9:35	Opening Prayer
9:35 - 9:45	Welcome Address (Project Director, Mr. Sani Pai, Director: EPRS/FCTA)
9:45 - 9:55	Goodwill Message (Engr. K. A. Ali, Chairman, the Governing Board of FCTWB)
9:55 - 10:05	Keynote Address (Mr. Katsutoshi Komori, Chief Representative, JICA Nigeria Office)
Session 1	**The Medium-Term Strategic Plan for NRW Reduction (2019-2023)**
10:10 - 10:25	Current Status of Water Services and FCTWB (Mr. Bamidele Olatunji)
10:25 - 10:35	Project Outline (Engr. Aliyu Usman, Deputy Director, FCTWB)
10:35 - 11:20	The Medium-Term Strategic Plan of NRW Reduction (Engr. M. Kabir Rabiu)
11:20 - 11:30	Approval of the Medium-Term Strategic Plan of NRW Reduction and Driving Force of implementing NRW Reduction (General Manager, Engr. A. A. Nahuche, FCTWB)
Group Photo Session	
Session 2-1	**Results and Impact of the Federal Capital Territory Reduction of Non-Revenue Water Project**
11:40 - 11:55	NRW Calculation/Estimation and Monitoring (Engr. Abdullahi Masaud)
11:55 - 12:25	Results of NRW Reduction Pilot Projects (Engr. Ozumi)
12:25 - 12:45	Distribution Management (Engr. Abdulrahman)
12:50 – 13:45	Tea/Coffee Break
Session 2-2	**Results and Impact of the Federal Capital Territory Reduction of Non-Revenue Water Project**
13:50 - 14:10	Findings and Lessons learnt (Engr. M. Kabir Rabiu)
14:10 - 14:30	Case Sample of Voluntarily-initiated NRW Reduction (Engr. Masaud & Engr. Ozumi)
Session 3	**Questions & Answers, Discussion and Way Forward**
14:35 - 15:05	Questions & Answers, and Discussion
15:05 - 15:15	Way Forward
15:15 - 15:25	Closing Remarks (Project Manager, General Manager, Engr. A. A. Nahuche, FCTWB)
15:25 - 15:30	Closing Player
15:35 -	Lunch

ORGANIZATION: AFRICAN DEVELOPMENT BANK

S/N	NAME	POSITION	TELEPHONE	EMAIL ADRRESS
1	Tom Mugoya	Water & Sanitation Engineer		
2	Bashiru Ibrahim	Water&Sanitation		

ORGANIZATION: WORLD BANK

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS
3	Chinedu Umolu	Water Resistance Specialist		
4	Khairy Al-Jamal	Sr. Water Supply		

ORGANIZATION: USAID

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS .
5	Adeyemi Mark Adeyemi	Team Leader		
6	Dr Joachim Ezeji	Wash Manager USAID		

AGENCE FRANCAISE de DEVELOPMENT

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS
7	Virginie Diaz	Project Manager AFD		

ORGANIZATION: JAPAN EMBASSY

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS
8	Solomon Ogedegbe	Economic Advisor		
9	Tatsuya Imamura	Development		

ORGANIZATION: WATER CORPORATION TARABA STATE

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS
10	Eng. M. B Bashir	Project Manager		
11	Engr. Musa Bisiam	Water Supply Agency		
12	Engr. Elijah M. Kungwa	Senior Water Supply Engineer		
13	Musa Tanko Yusuf	Asst. Director NRW		
14	Edwin-Ayana Chrinus	NRW/GIS Network		
15	Bulus Nyikobten R.	GIS Network office		
16	Buba N Billeya	Programme Analyst		
17	Kunyao Garboa	GIS/ Network officer		

ORGANIZATION: WATER CORPORATION OYO STATE

S/N	NAME	POSITION	TELEOHONE	EMAIL ADDRESS
18	Abdulsalam A Abdulrahman	W& S		
19	Oyelamu Olawale Moses	Director O&M		
20	Adegenro Tokunbo M.	Monitoring and Evaluation		
21	Sangoseni Adedotun I.	NRW Manager		

ORGANIZATION: WATER COOPERATION PORTHARCOURT

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS
22	Judith Warmate	Water and Sanitation Engineer		
23	Chief Ibibia Walter	MD/CEO		
24	Ndah Moses	SA/ Logistics		
25	Nnanna S. Ozor	CEO SSS Group		

ORGANIZATION: EPRS/ ABUJA INVESTMENT/FCDA

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS
26	Emmanuel Obi Okonkwo	Representative Director EPRS		
27	Yakubu R Nuhu	Abuja Investment Company Ltd		
28	Engr. S.T Udo	Dept. Engineering services FCDA		

ORGANIZATION: FCT WATER BOARD

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS
29	Engr. Zekeri A Momoh [fnse]	Governing Board Member		
30	Nahuche A.A	General Manager		
31	Dame Joy Okere	H.O.D Admin& Finance		
32	Okobi O.Y	H.O.D Quality Control		
33	Adeyemi Taiwo	HOD Commerce		
34	Hasfat Ahmed L.	HOD F&A		
35	Hamzat T Rusikat	HOU (Audit)		
36	Abbas Ahmed	Head PRO		
37	Abolade Lawal	HOD Distribution		
38	Kabir Rabiu	Head NRW		
39	Mukarram Abdul Kowim	Gwarinpa Area office		
40	Engr. Amos Bulus	Electro-Mech		
41	Kenneth Madu	Distribution		
42	Isah Danjuma	H/Monitoring		
43	Muhammed Dauda	Pipeline Unit		
44	Jane I Iyela	AAM (C) Gwagwalada		
45	Abdullahi Adamu	P.A (GM)		
46	Abdulsamad Abubakar	NRW Unit Intern		
47	Salihu Matthew	Gwarinpa		
48	Shedrack Solomon	Gwarinpa		
49	Mohammed Bello Musa	Asst. Director		

50	Abraham Iorshe	AMM		
51	Sulaiman A Muh'd	Area Manager Jabi		
52	Japher Akor	Asst. Area Manager		
53	Jummai Ugbodaga Akwogi	Asst. Area Manager		
54	Engr. Gambo Y.L	C.E		
55	Alhassan L Moh'd	Asst. Area Manager Asokoro		
56	Ehimen Ehianeta	Asst. Area Manager (commerce)		
57	Abubakar Danladi	Senior Foreman		
58	Engr. Courage Igbinosa	NRW Unit		
59	Abdulrahman Muhammed	S.E		
60	Hasiya N Kuchazi	Member		
61	Mustapha A Abdullahi	Area Manager Kubwa(II)		
62	Ibrahim Umar	Area Manager Gudu		
63	Shehu Sulaiman	Head GIS		
64	Engr. Usman A. Aliyu	DD(Dist)		
65	Christy K Bulus	Asst. Area Manager		
66	Abdulrahman Abdul	Asst.Area Manager Kubwa		
67	J.K Abawonse	Asst. Area Manager Gwarinpa		
68	Dada J.O	AD COM (M&E)		
69	Engr. C.E Ottah	Asst. Area Manager (Dist)		
70	Sakwu A.H	Asst. Area Manager(Comm) Garki 2		
71	Engr. Abdul Ozumi	Asst. Area Manager Area (D) Gudu		
72	Alhamdu J.N	Area Manager Garki II		
73	Segun Kayode	P.R.O		
74	Eze Obiageli	P.R.O		
75	Engr. A.O Akande	HOU (E+M)		
76	Dele Olatunji	HOU (TCP)		
77	Dr Victoria Anyakora	REP-HOD (R&P)		
78	Aliyu Moh'd Chidawa	Asst. Area Manager (D) Kubi		

79	Abdul Yusuf	Sup P&P Estate		
80	Habib Ahmed Kiru	C.P.O		
81	Tuta Y. John	Area Karu/Nyanya		
82	Eng. Abdullahi Masuad	Area Manager Gwarinpa		
83	Joan Abdullahi	HOU (Est)		
84	Nnaji Glory H.O	Head (APD)		
85	Yusuf Yelwa	Area Manager Wuye/Wuse		
86	Choji Pam	HOU CC&R		
87	Leo Yunusa	Metering		
88	Mujilipeeen S	P.R.O		
89	Maimuna Adamu	Asst. Area Gwarinpa		
90	Abdulrahman Aliyu	Asst. Area Manager Katampe		
91	Yusuf Abubakar	Area Manager Commerce		
92	Mohammed T.Onah	Asst. Area (Distribution)		
93	Engr. Aluko Tope	A.C.E		
94	Elisha Dauji	A.C.W.S		
95	Aminu Umal	Area Manager Kubwa		
96	Yakubu Abdullahi	Area Manager Gwagwalada		
97	Idris Mohammed	Asst. Area Manager Gwagwalada (Distribution)		
98	Aliyu Mohammed	P.T Gwarinpa		
99	Abdulrahman Shehus	Head Metering		
100	Engr. Dauda Ibrahim	Elect. Engr.		
101	Bashir Adamu	Asst. Area Manager Gudu		
102	Barr. Abolanle Taiwo	Rep. Legal Adviser		
103	Aliyu Maradun	Area Manager Garki 1		
104	Suleiman Buhari	Commerce		
105	Dauda Musa	Commerce		
106	Rose Akpan	Commerce		
107	Bello Abubakar Tata	Area Manager Asokoro		

ORGANIZATION: MEDIA REPRESENTATIVE

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS
108	Felix Durombah	Abuja Digest		
109	Gbenga Omokhunu	The Nation Correspndence		
110	Abbas Yahaya	NTA Abuja		

ORGANIZATION: JICA NIGERIA Office & JICA EXPERT TEAM PROJECT MEMBERS

S/N	NAME	POSITION	TELEPHONE	EMAIL ADDRESS
111	Makiko Okumura	Snr Rep JICA Nig. office		
112	Masanori Sakamoto	Rep. JICA Nig. Office		
113	Sadiq Gulma	Consultant		
114	Akinori Miyoshi	Chief Advisor NRW Project		
115	Otobo Deborah	Administrative Secretary		
116	Maryamu Williams	Technical Assistant		
117	Jackson Jacob	Driver		

Federal Capital Territory (F.C.T) Water Board

Overview and Present Status

by
Mr Dele Olatunji
(FCTWB)
22/Oct/2018

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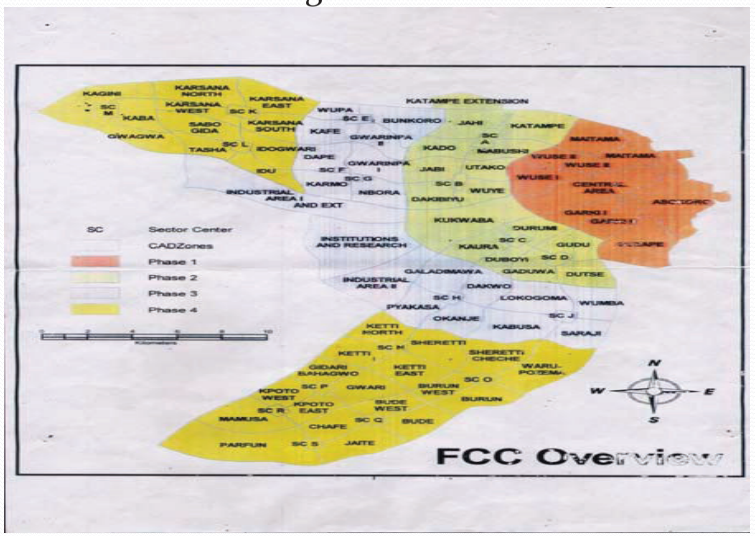
Background

- Overview of FCT, Abuja
  - Created in 1976 covered a land mass of 713 square kilometre
  - The population as at 2006 census was 776,298 but currently it is over 5 million
  - Feasibility studies carried out and documented as the Abuja Master Plan covering all facets of developments in the area of infrastructure (road, water, electricity, transportation, land use, etc).
  - Messrs C. Lotti and Associates Ltd developed the Water Supply Master Plan which has been the guiding principle for implementation for over 30 years.
  - The City is divided into two major areas. The Federal Capital City (FCC) comprising all districts in phases 1 to 4 and Six Area Council where Satellite Towns & Rural populace were located.

Background contd.

- FCC Overview showing all the districts



Background: FCTWB Vision & Mission

- Our Vision & Mission
  - Vision

    To be a second to none Utility which is consistent in Excellent Service Delivery and Uncompromising in the Quality of its product - Potable Water

  - Mission

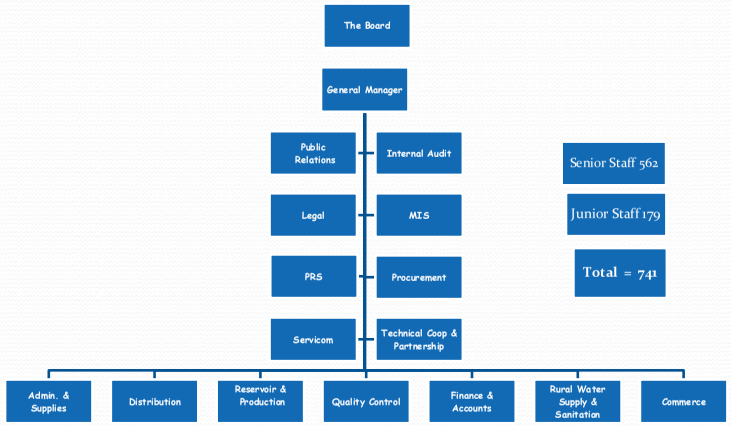
    To provide the residents of the Federal Capital Territory with Potable water using the Best of Industry Technology and a Highly Skilled Workforce to provide Exceptional Services

Background: FCTWB Mandates

- Who We are
  - Statutory Provider of potable water in the FCT
- How We Began
  - Established in Oct, 1989. Previously existed as a part of the Engineering Department of the FCDA
- What We Do (Mandate)
  - Manage & maintain all water works in FCT
  - Harnessing all water resources of the Territory
  - Ensure adequate provision of water supply of right quality & at equitable rates
  - Conduct research for the purpose of our functions
  - Submit reports of the research to the Honourable Minister to aid policy formulations

Organogram of FCT Water Board

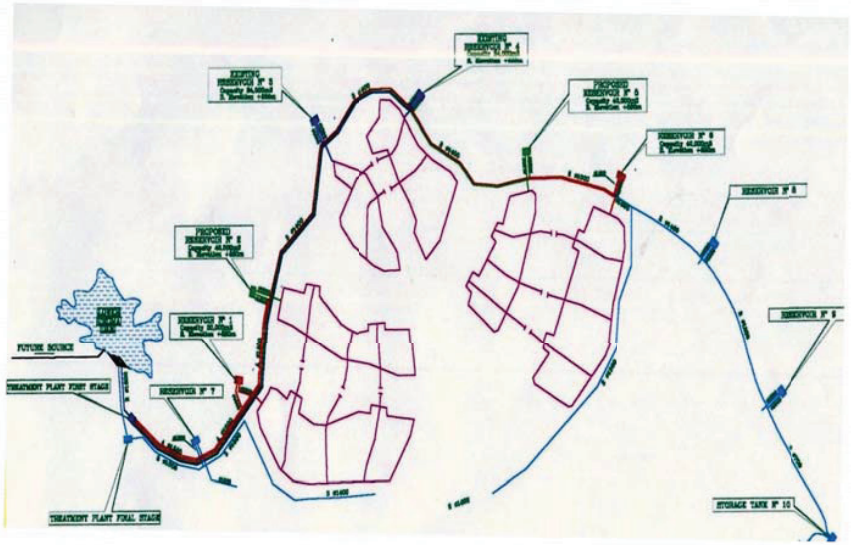
- Our Structure



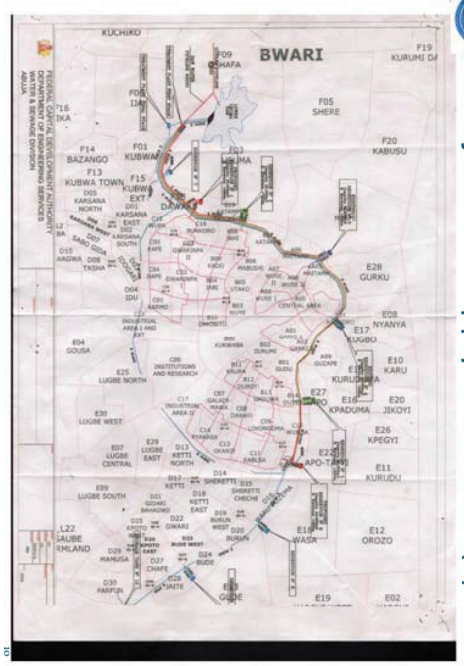
Abuja Water Supply Master Plan

- Raw Water Source (LUD & Gurara Dams)
- Construction of 12 modules WTP in 2 stages having combine output of 60m3/hr (Phases 1, 2, 3 & 4 completed & operational).
- Associated Trunk Mains (Sizes: 600mm – 1500mm diameter and total length at completion 200km)
- Distribution Network (sizes: 50mm – 500mm diameter)
- 10Nrs Storage Tanks at periphery of the City.
- Booster stations for high elevation
- FCDA & FCTWB are carrying out the implementation of the water supply master plan

Abuja Water Supply Master Plan(1)



Abuja Water Supply Master Plan(2)



Facilities

- Our Facilities
  - Raw Water Source
    - LUD (100mcm) for gravity & pumping feeding of the WTPs - Operational
    - Gurara Water Transfer Scheme (850mcm) (Buffer/Augment): gravity feeding of LUD – Operational
  - Water Treatment Plants (WTPs)
    - Two (2nr.) 5000 m3/h Treatment Plants: Constructed in 1987 & 2000 respectively. Collective designed production capacity= 10,000m3/h, but producing at about 70% due to age.
    - Two (2nr) 10,000m3/h Treatment Plants : In used since 2015, with total capacity of 20,000m3/hr but producing at about 30% due to lack of conveyances (transmission lines)

Facilities (2)

- Water Transmission and Storage
- Transmission
  - About 29km 1500mm – 1000mm DI pipe to Tanks 3 & 4 (24,000m³ each), for Phase I (Completed & Operational)
  - About 39km 1500mm – 1000mm DI pipe to Tanks 2 & 5(45,000m³ and 40,000m³ respectively), for Phase II (Completed & Operational)
  - 2 lines of Combined lengths of 62km to Tanks 1 & 6 (40,000m³ each, originally 30,000m³ and 40,000m³), for Phase III (Ongoing)
  - 3 lines to feed Tanks 7, 8, 9 and 10 (40,000m³, 45,000m³, 45,000m³ and 24,000m³), for the Fourth and Final Phases
- Storage
  - Four (4nr.) Storage Tanks: Tanks 2, 3 , 4 & 5 are actively engaged, and they feed the distribution lines in the City currently. Tanks 1 & 6 are not yet completed.
  - Eight (8nr.) Booster Stations: The stations are designed to boost water supply to highly elevated areas in the City like Maitama, Asokoro and Wuse II. The stations have a total of 25nr. high lift pumps, but only 7nr. are barely operational.
  - Bore holes & solar pedal flow water system in the rural settlements