

# Water Supply Management in Yangon



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# Yangon Water Supply System

# ဌာနခွဲအလိုက်ခွင့်ပြုအင်အား

အင်ဂျင်နီယာဌာန(ရေနှင့်သန့်ရှင်းမှု)

	အရာထမ်း	အမှုထမ်း	ပေါင်း
( ၁ ) ရေအရင်းအမြစ်နှင့်ရေသန့်စင်စက်ရုံများစီမံခန့်ခွဲရေးဌာနခွဲ	၁၇	၅၁၅	၅၃၂
( ၂ ) ရေပို့ပိုက်လိုင်းကွန်ရက်နှင့်ထပ်ဆင့်ရေတွန်းစက်ရုံများစီမံခန့်ခွဲရေးဌာနခွဲ	၉	၃၄၆	၃၅၅
( ၃ ) အုပ်ချုပ်ရေးနှင့်ရန်ပုံငွေစီမံခန့်ခွဲရေးဌာနခွဲ	၁၃	၁၅၁	၁၆၄
( ၄ ) စီမံကိန်းနှင့်အရည်အသွေးစီမံခန့်ခွဲရေးဌာနခွဲ	၁၈	၃၀၅	၃၂၃
( ၅ ) လျှပ်စစ်နှင့်စက်မှုအင်ဂျင်နီယာဌာနခွဲ	၇	၁၈၈	၁၉၅
( ၆ ) ရေဖျော်ဖြန့်ဖြူးဝေရေးနှင့်ဝန်ဆောင်မှုစီမံခန့်ခွဲရေးဌာနခွဲ	၁၆	၆၅၈	၆၇၄
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( ၈ ) ရေဆိုးဝန်ဆောင်မှုစီမံခန့်ခွဲရေးဌာနခွဲ	၈	၁၆၆	၁၇၄
စုစုပေါင်း	၉၅	၂၄၃၇	၂၅၃၂



## ရည်မှန်းချက် လုပ်ငန်းတာဝန်များ

- ❖ ရန်ကုန်မြို့နေပြည်သူလူထုအတွက် ကျန်းမာရေးနှင့်ညီညွတ်ပြီး သန့်ရှင်းသောသောက်သုံးရေကို နေ့စဉ်လုံလောက်စွာ ဖြန့်ဝေပေးနိုင်ရန်။
- ❖ ရေဖိုးရေခများ အပြည့်အဝ ကောက်ခံရရှိနိုင်ရန်။
- ❖ ရေလေလွင့်ပြုန်းတီးမှုများကို ကာကွယ်ထိန်းသိမ်းနိုင်ရန်။
- ❖ မိလ္လာများ စနစ်တကျ စွန့်ပစ်နိုင်ရေးအတွက် စီမံဆောင်ရွက်နိုင်ရန်။
- ❖ ခေတ်မီနည်းပညာများအသုံးပြု၍ ရေပေးဝေရေးစနစ်နှင့် မိလ္လာစွန့်ပစ်စနစ်များ တိုးမြှင့်စီမံဆောင်ရွက်သွားနိုင်ရန်။

# History of Water Supply System of Yangon

## History of Yangon Water Supply

1842 Started with 30 wells

1879 Kandawgyi Lake

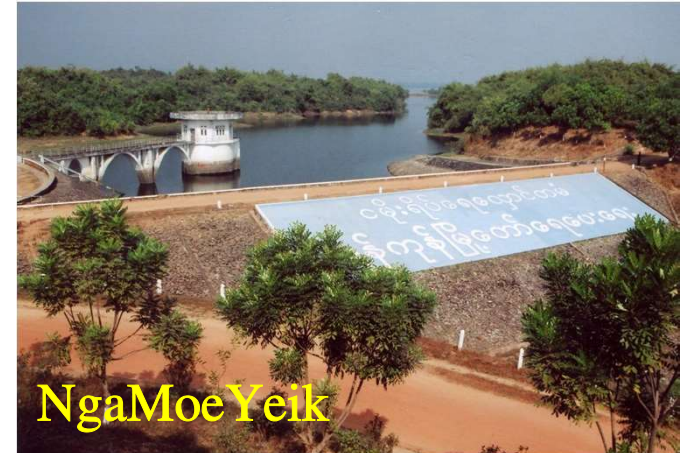
1884 Inya Lake

1904 Hlawga Reservoir

1940 Gyobu Reservoir

1989 Phugyi Reservoir

2005 Nyaungnapin water treatment plant by using Ngamoeyeik reservoir water

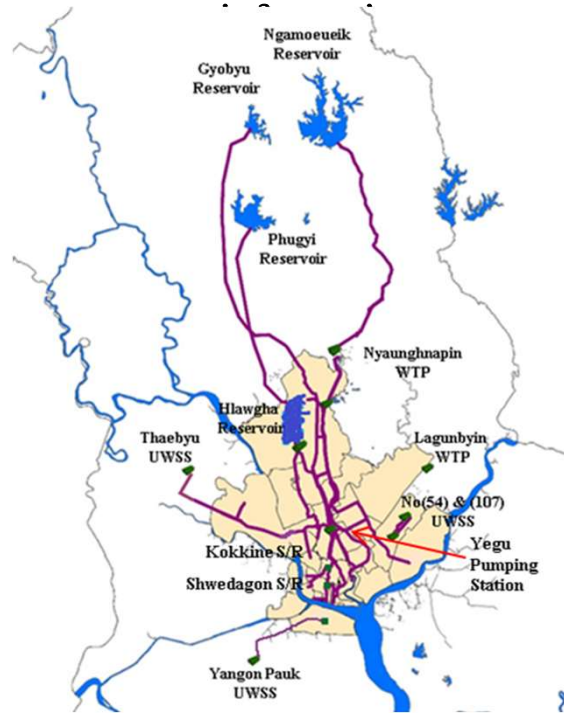


# Water Supply System of Yangon

## Transmissions



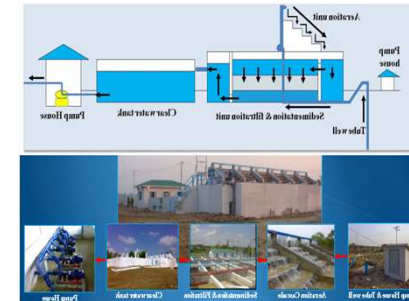
## Current Water Supply System and General



## Surface Water TP



## Underground Water TP



Gyobu (56" Dia; Mild Steel pipe)  
 Phugyi (60" Dia; Concrete pipe)  
 Hlawgha (42" Dia; Cast Iron pipe)  
 Nyaunghnapin (48" Dia; HDPE)

43 miles(Since 1940)  
 16 miles(Since 1989)  
 10.37 miles(Since 1904)  
 11.75

# Current Water Supply Condition

Sr. No.	Performance Indicators	Quantity	Remark
1.	Served Population	2.567 Million	2021-2022 Fiscal Year
2.	No. of Staffs	1927	
3.	Water Supply Volume	210 million gallons /day	
4.	<b>Service Coverage Rate</b>	<b>51%</b>	
5.	No. of Connections	369,360	
6.	Unit Consumption	200 LPCD	
7.	<b>Water Tariff</b> <b>Domestic</b> <b>Commercial</b>	<b>88 (MMK/m<sup>3</sup>) / (0.048 US \$/ m<sup>3</sup>)</b> <b>110 (MMK/m<sup>3</sup>) / (0.059 US \$/m<sup>3</sup>)</b>	
8.	<b>NRW Rate</b> <b>Leakage Rate</b>	<b>50%</b> <b>40%</b>	
9.	Ratio of no. of Staffs per connections	5.6 Staffs / 1000 connections	
10.	<b>Water Supply Duration</b>	<b>13 Hours on Average</b>	
11.	<b>Water Pressure</b>	<b>0.5 Bar in Distribution Network</b>	
12.	Collecting Ratio	80%	
13.	Length of Transmission Length of Distribution	313 Miles 2532 Miles	
14.	Metering Ratio	88 %	

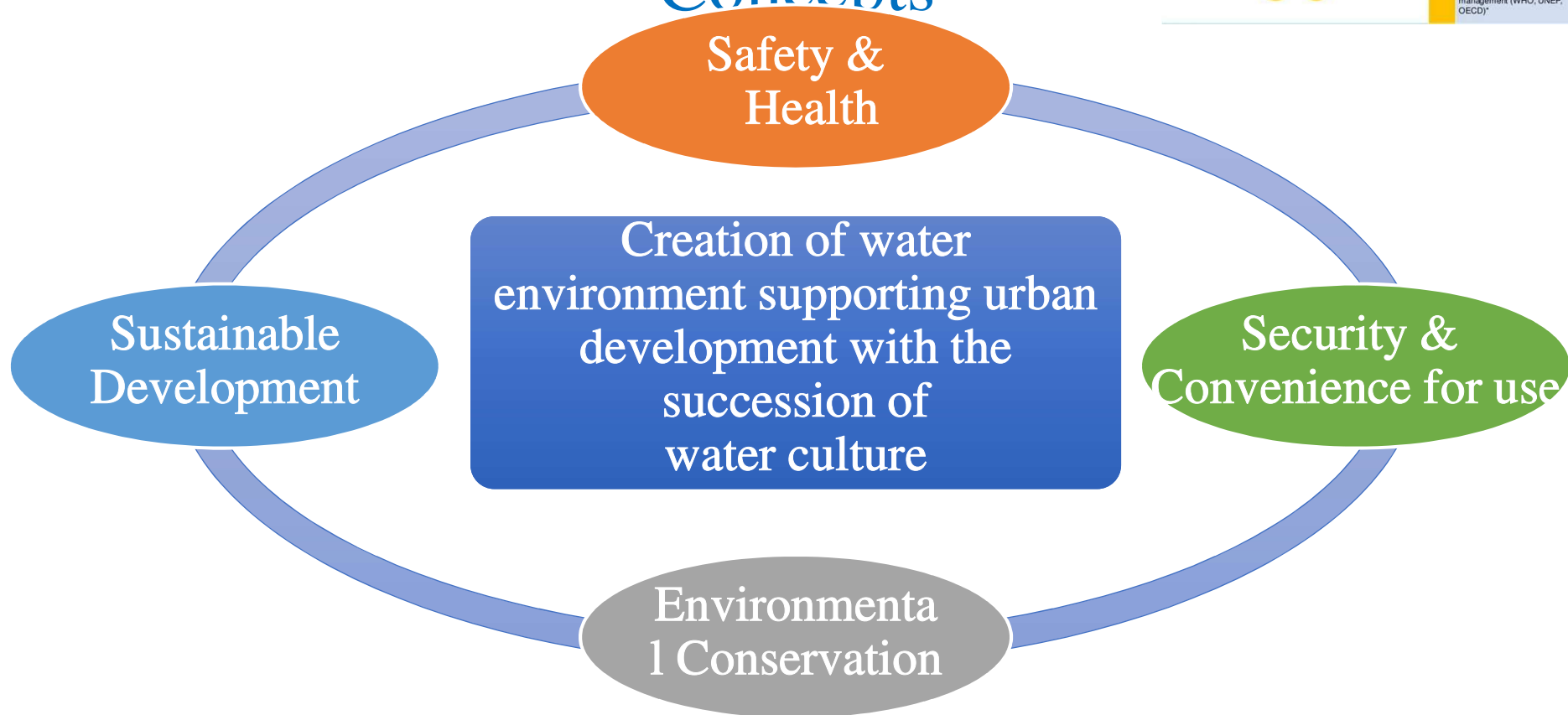
# Water Vision and Master Plan



# Water Vision



## Basic idea & 4 Concepts



### SDG 6 global indicators



6.1.1	Safely managed drinking water services (WHO, UNICEF)*
6.2.1	Safely managed sanitation and hygiene services (WHO, UNICEF)*
6.3.1	Wastewater safely treated (WHO, UN-Habitat, UNSD)**
6.3.2	Good ambient water quality (UNEP)***
6.4.1	Water use efficiency (FAO)***
6.4.2	Level of water stress (FAO)**
6.5.1	Integrated water resources management (UNEP)**
6.5.2	Transboundary basin area with water cooperation (UNEP, UNESCO)**
6.6.1	Water-related ecosystems (UNEP)***
6.a.1	Water- and sanitation-related official development assistance that is part of a government coordinated spending plan (WHO, UNEP, OECD)*
6.b.1	Participation of local communities in water and sanitation management (WHO, UNEP, OECD)*



# Future Targets of Master Plan

	unit	2011	2022	2025	2030	2035	2040
Population	person	5,142,000	5,076,129	6,660,536	7,481,701	8,158,018	9,003,859
Served population	person	1,920,000	2,567,889	3,729,900	4,713,472	5,792,193	7,023,010
Water coverage rate	%	37	51	56	63	71	78
Unit consumption	LPCD	95	200	209	237	264	292
Non-Revenue Water rate	%	66	50	35	26	20	15
Leakage rate	%	50	40	25	18	13	10
Daily maximum water demand	MGD (m <sup>3</sup> /day)	148 (673,100)	210 (954,687)	267 (1,213,806)	342 (1,554,763)	433 (1,968,457)	554 (2,518,534)
Water pressure	MPa (bar)	0.075 (0.75)	0.005 (0.5)	More than 0.15 (1.5)			
Supply duration	hours	8 on average	13 on average	24			
Water quality		Not drinkable	Not drinkable	Drinkable			

Source: JICA M/P in  
2014

# Master Plan (2040)



## Lagunpyin Project

### River Source Project:

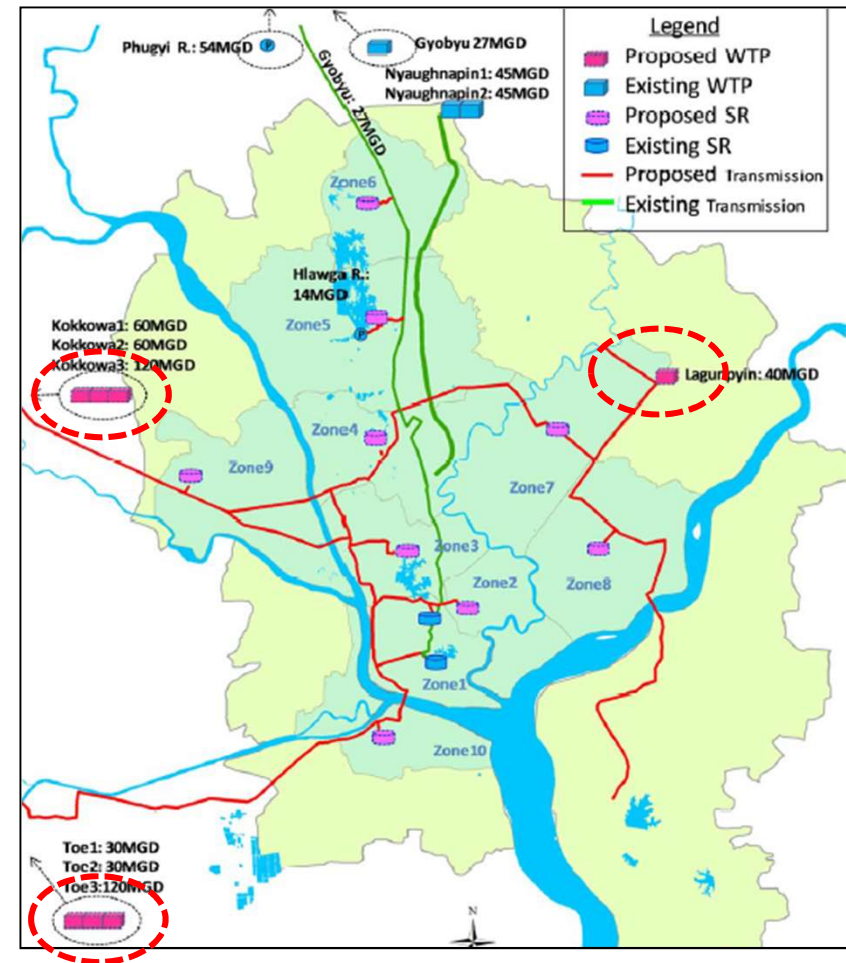
1. Kokkowa River
2. Toe River

### Zoning System:

10 Zones with Service Reservoirs

### Ground water:

0 in 2025



ရန်ကုန်မြို့ပြရေပေးဝရေးတိုးမြှင့်မှုစီမံကိန်း(လွှန်းပင်ရေပေးဝရေးစီမံကိန်း)  
Greater Yangon Water Supply Improvement Project Phase – I (MY-P5)



လွှန်းပင်ရေသန့်စင်စက်ရုံ( YCDC ရန်ပုံငွေဖြင့်ဆောင်ရွက်ပါသည်။)

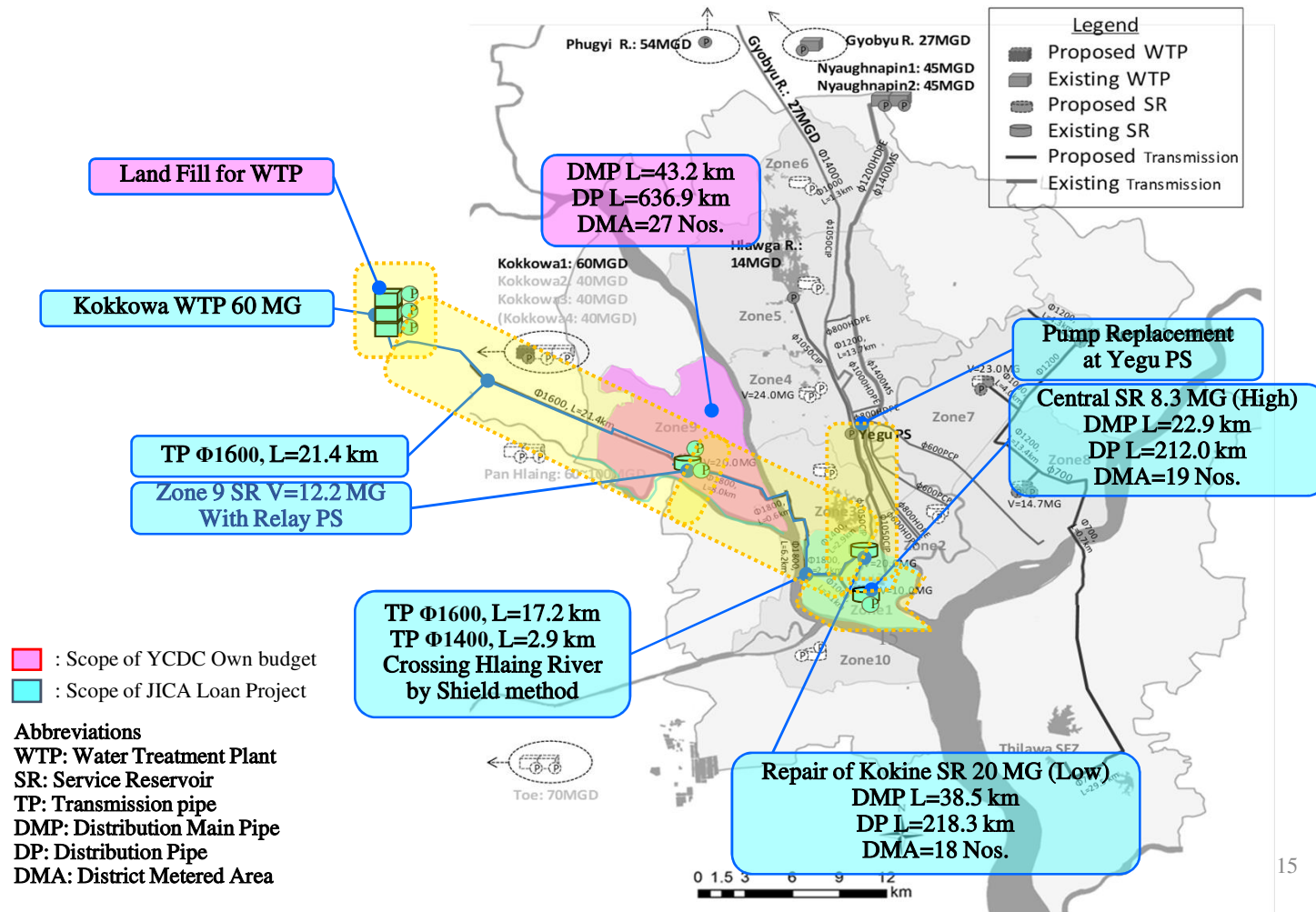


# လှိုင်မြစ်-လှော်ကား ရေအားဖြည့်စီမံကိန်း



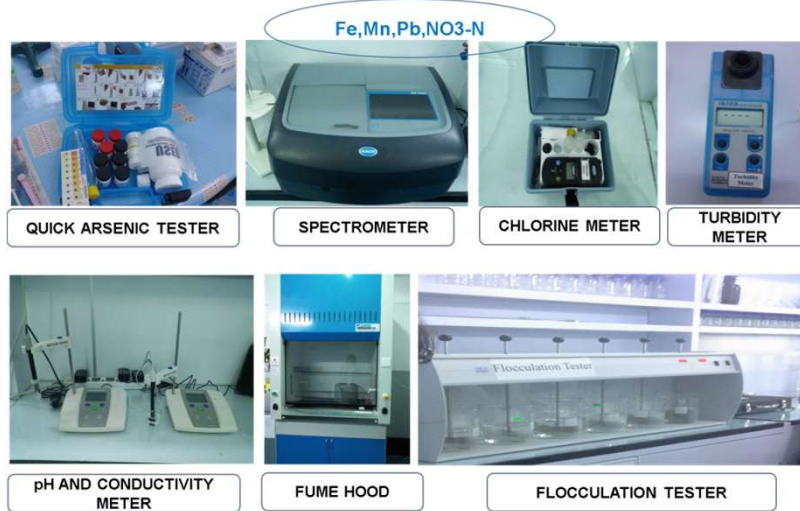
SEDIMENTATION BASIN & CLEAR WATER RESEVOIR တည်ဆောက်ခြင်းလုပ်ငန်မှတ်တမ်း

# Kokkowa Water Supply Project





# Water Quality Management



Tap water sampling



On Site Water Quality Monitoring



Residual Chlorine Monitoring



No	Measurable Parameters	Units
1	Total Coliform	MPN/100ml
2	Fecal Coliform	MPN/100ml
3	Taste	mg/l
4	Odor	mg/l
5	Color	TCU
6	Turbidity	NTU
7	Arsenic	mg/l
8	Lead	mg/l
9	Nitrate	mg/l
10	Manganese	mg/l
11	Chloride	mg/l
12	Hardness	mg/l
13	Iron	mg/l
14	pH	mg/l
15	Sulfate	mg/l
16	Total Dissolved Solids(TDS)	mg/l
17	Calcium	NTU
18	Magnesium	TCU
19	Nitrite	mg/l
20	Ammonia Nitrogen	mg/l
21	Electrical Conductivity	μS/cm
22	Total Alkalinity	mg/l
23	Salinity	psu
24	Zinc	mg/l
25	Residual Chlorine	mg /l

Mini-Laboratories in Reservoirs, WTP & PS



# Disinfection- Chlorination

JJ

Operation Hours = 24 hr

Maximum Dosing = 2ppm ( WHO: max. 5 ppm)

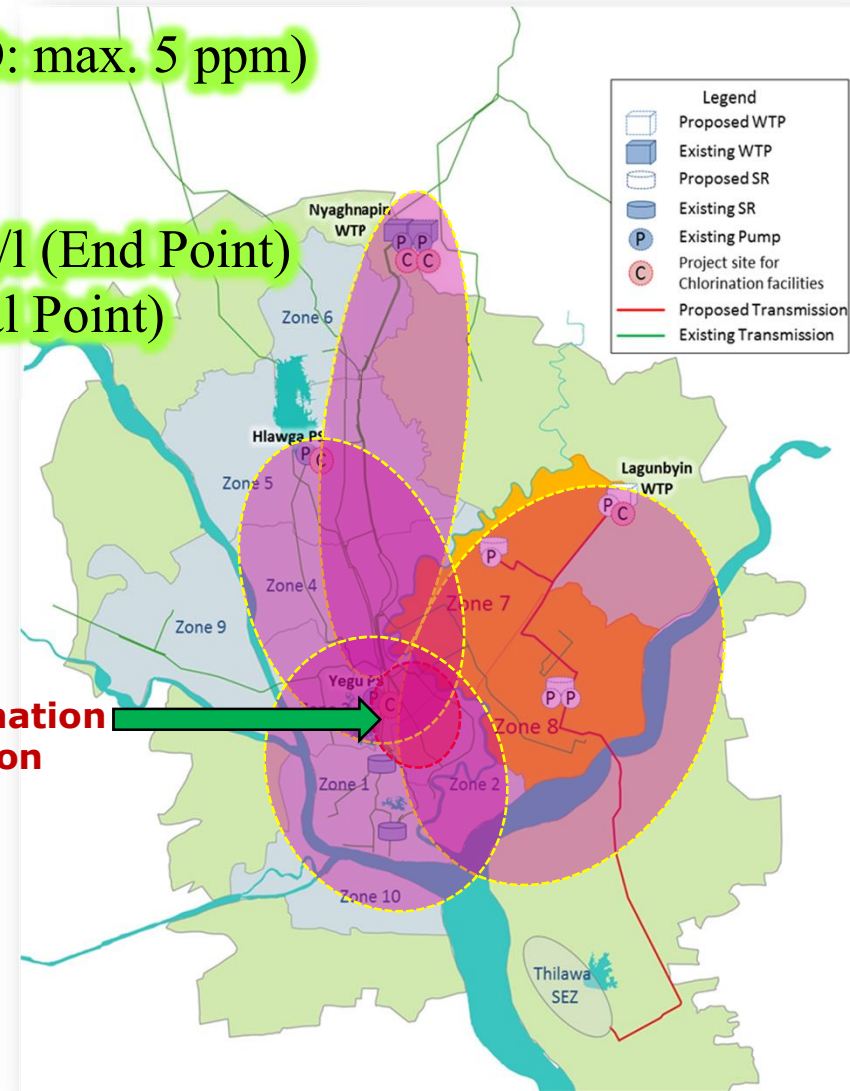
Design of Capacity = 10 kg/hr.

Design Concentration = 8 %

Residual Chlorine = 0.1 ~ 0.2 mg/l (End Point)

1 mg/l (Initial Point)

**Pilot  
chlorination  
injection**



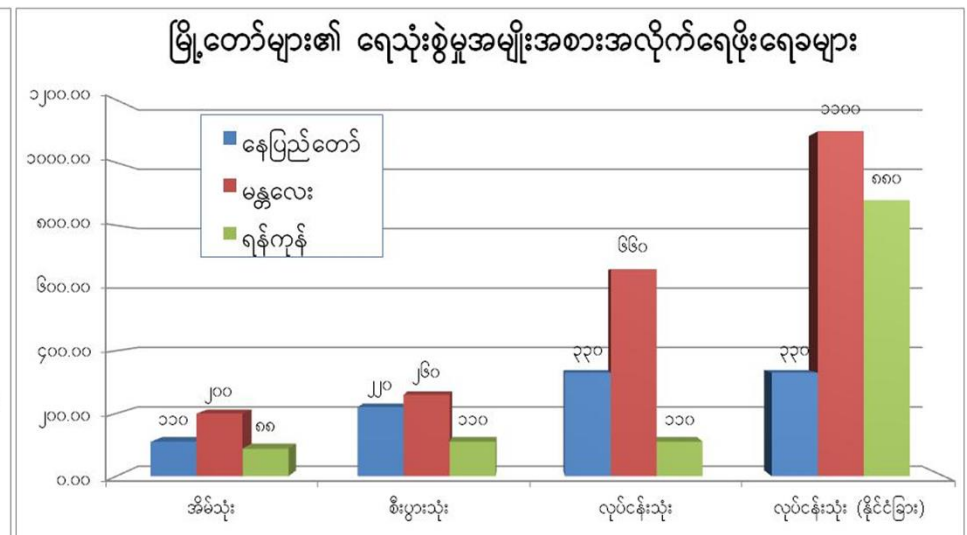
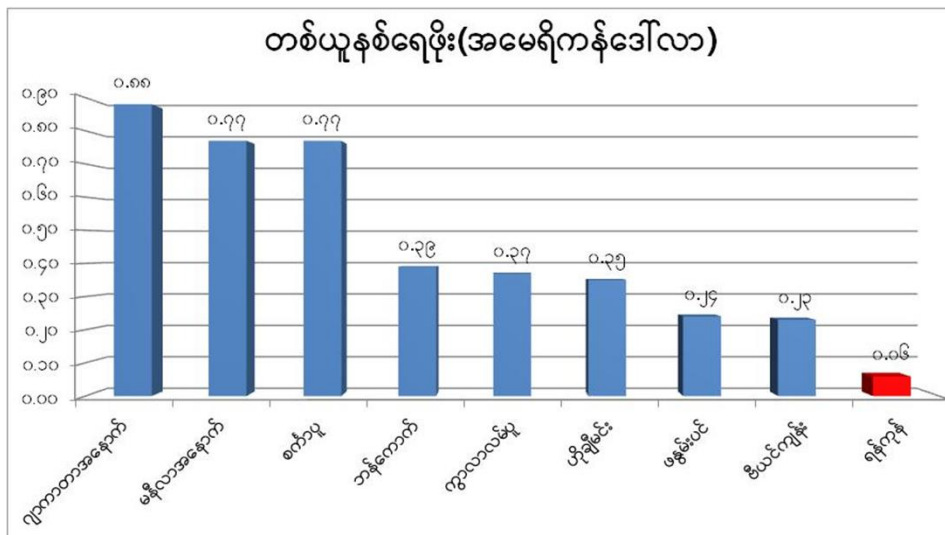
# ရန်ကုန်မြို့တော်ရေဖိးရေခအား နိုင်ငံတကာနှင့် ပြည်တွင်းရေဖိးရေခနှိုင်းယှဉ်ဖော်ပြချက်

မြို့တော်	နိုင်ငံ	တစ်ယူနစ်ရေဖိး (အမေရိကန်ဒေါ်လာ)	တစ်ယူနစ်ရေဖိး (မြန်မာကျပ်)
ဂျာကာတာအနောက်	အင်ဒိုနီးရှား	၀.၈၈	၁၃၂၀
မနီလာအနောက်	ဖိလစ်ပိုင်	၀.၇၇	၁၁၅၅
စင်ကာပူ	စင်ကာပူ	၀.၇၇	၁၁၅၅
ဘန်ကောက်	ထိုင်း	၀.၃၉	၅၈၅
ကွာလာလမ်ပူ	မလေးရှား	၀.၃၇	၅၅၅
ဟိုချီမင်း	ဗီယက်နမ်	၀.၃၅	၅၂၅
ဖနွမ်းပင်	ကမ္ဘာ့အေးဒီးယား	၀.၂၄	၃၆၀
ဗီယက်ကျန်း	လာအို	၀.၂၃	၃၄၅
<b>ရန်ကုန်</b>	<b>မြန်မာ</b>	<b>၀.၀၆</b>	<b>၈၈</b>

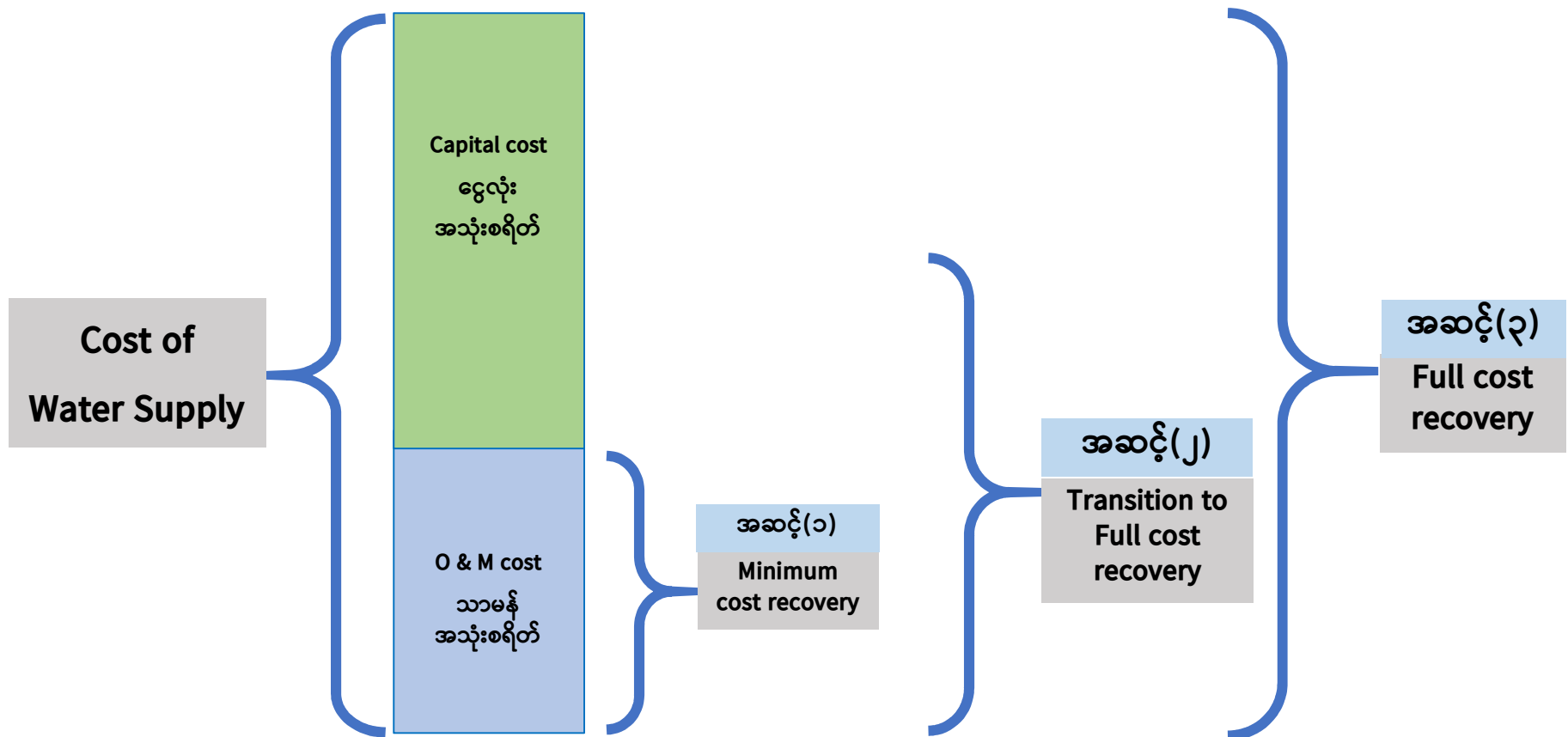
လက်ရှိရေဖိးရေခနှုန်းထားများ (နေပြည်တော်)		
စဉ်	မိတာနှုန်း	ရေဖိးရေခနှုန်းထား (ကျပ်/ယူနစ်)
၁။ အိမ်သုံး (ပြည်သူ)		၁၁၀
၂။ စီးပွားသုံး (ရုံးရုံး)		၂၂၀
၃။ စီးပွားသုံး (ဟိုတယ်)		၃၃၀

လက်ရှိရေဖိးရေခနှုန်းထားများ (မန္တလေး)		
စဉ်	မိတာနှုန်း	ရေဖိးရေခနှုန်းထား (ကျပ်/ယူနစ်)
၁။ အိမ်သုံး (ပြည်သူ)		၂၀၀
၂။ စီးပွားသုံး (ရုံးရုံး)		၂၆၀
၃။ လုပ်ငန်းသုံး (ပြည်တွင်း)		၆၆၀
၄။ လုပ်ငန်းသုံး (နိုင်ငံခြား)		၁၁၀၀

လက်ရှိရေဖိးရေခနှုန်းထားများ (ရန်ကုန်)		
စဉ်	မိတာနှုန်း	ရေဖိးရေခနှုန်းထား (ကျပ်/ယူနစ်)
၁။ အိမ်သုံး		၈၈
၂။ စီးပွားသုံး		၁၁၀
၃။ နိုင်ငံခြား (အိမ်သုံး)		၄၄၀
၄။ နိုင်ငံခြား (စီးပွားသုံး)		၈၈၀



# သာမန်အသုံးစရိတ်ကာမိစေရန်အခြေအနေမှအသုံးစရိတ်အားလုံးကာမိစေရန် ရည်မှန်းချက်မူဝါဒ အဆင့်(၁)၊ (၂)၊ (၃)



## Measures for NRW Management in Yangon



# Management for NRW Reduction

We are trying to provide Safe and Clean Water to more Citizens with Appropriate Volume, Pressure and Price.



## To Reduce NRW

- Implementing Master Plan
- Rehabilitating Distribution Networks and Facilities
- Initiating NRW Reduction Measures
- Capacity Building
- International Cooperation
- Implementing Water Quality Improvement



# SWOT

## Strengths

- Master Plan & DMA constructions are already started
- Enough Water Resources
- Supports from International Cooperation
- Almost ready to measure the system input volume
- Already organize the NRW Management Section & Laboratory

## Weaknesses

- Aging Facilities  
Frequent Pipe Break, High Leakage
- Un systemic Distribution Network  
Unstable Water Pressure, Intermittence water Supply
- Requirement  
High Non-Revenue Water (NRW), FOC connections, Damaged Meters, Spaghetti Service Pipes, Illegal connections, Meter in-accuracy, Poor Database
- Low Service Coverage,
- Low level of water tariff (Cannot cover Electricity Charges)
- Limited computerization in billing, customer database management and accounting
- No independent/corporate accounting system

## Opportunities

- Availability of New Water Resources
- Continuous Supports from International Cooperation

## Threats

- Unstable Power Supply
- Increasing Water Demand Coz Population Growth
- Difficult to Stand on Own Budget



# IWA Standard Water Balance

<u>System Input Volume</u>	Authorized Consumption	<u>Billed Authorized Consumption</u>	Billed Metered Consumption	Revenue Water
			Billed Unmetered Consumption	
		Unbilled Authorized Consumption	Unbilled Metered Consumption	Non- Revenue Water (NRW)
			Unbilled Unmetered Consumption	
	Water Losses	Apparent Losses	Unauthorized Consumption	
			Customer Metering Inaccuracies	
		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 Metering	

**NRW = System Input Volume – Billed Authorized Consumption**

$$\text{NRW (\%)} = \frac{\text{System Input Volume} - \text{Billed Authorized Consumption}}{\text{System Input Volume}}$$

# Components NRW

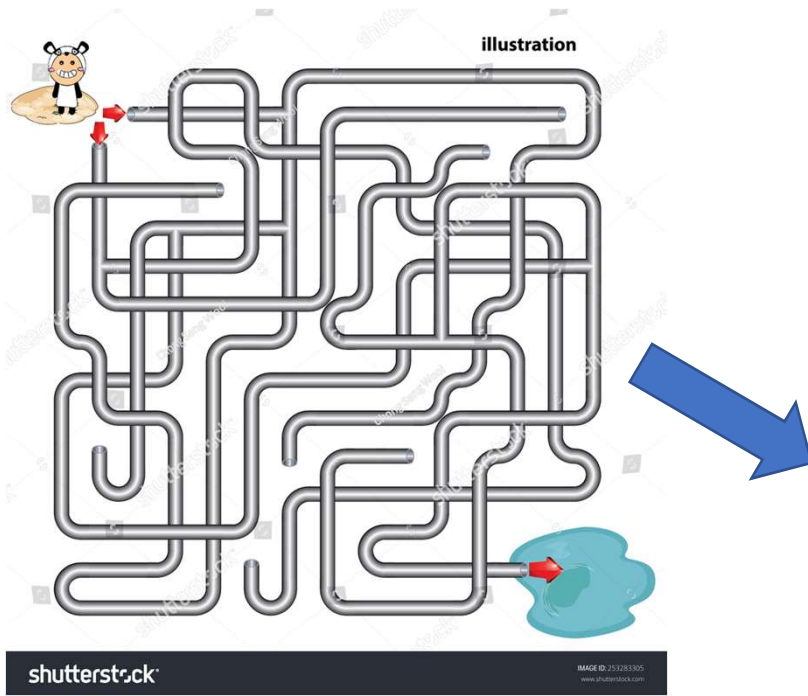
Non-Revenue Water	Unbilled Authorized Consumption	Such as Pipeline Flushing, Fire Fighting, Utility Use(FOC)		
	Water Losses	Real (Physical) Losses	Leakage on Transmission and/or Distribution Mains	
			Leakage on Service Connections up to Customers' Meters	
			Leakage and Overflows at Utility's Storage Tanks	
		Apparent (Administrative/ Commercial ) Losses	Unauthorized Consumption	Illegal Connection
				Meter by-Pass
				Meter Tampering
			Metering Inaccuracies	Under-Registration
				False Reading
				Data Handling Errors

# Current NRW Reduction Measures

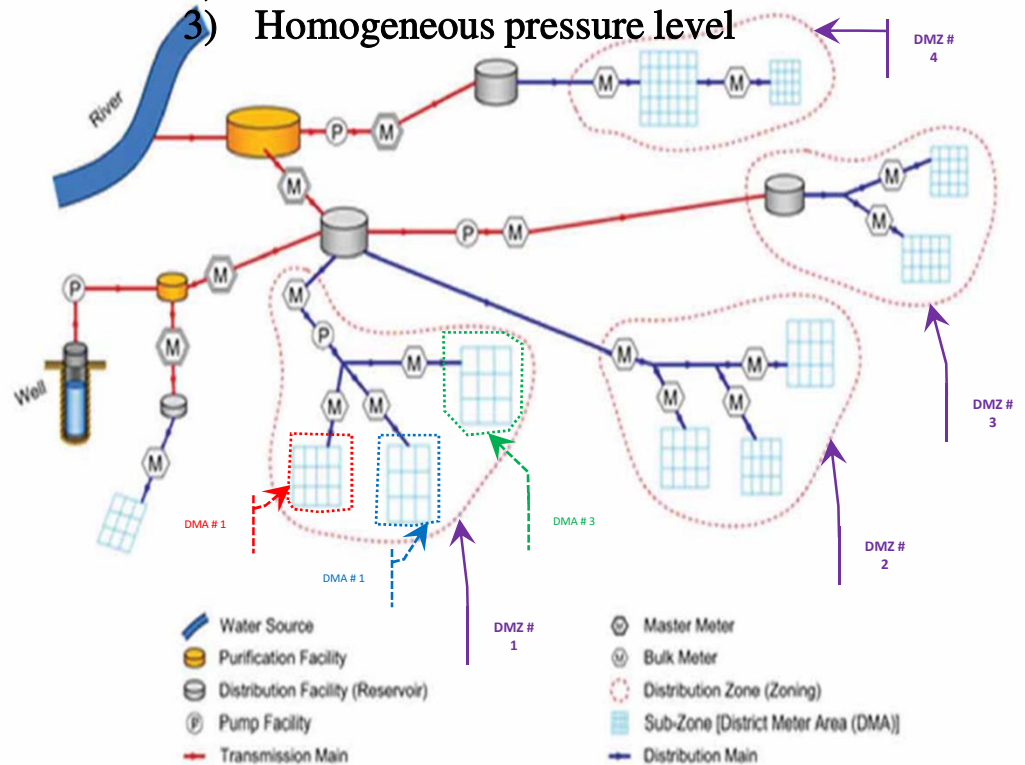
- Yearly Replacement of Aging water facilities and Damaged Meters
  - Average age of pipe > 80 years, not enough flow capacity resulting many booster PS in the city (Frequent Pipe Breaks & Leakage)
- Yearly Construction of DMAs and DMZs
  - Complex Distribution Without Zoning System
- Rehabilitations of Pumping Stations
  - Unstable Water Pressure, Intermittence water Supply
- GIS Data, SCADA, Customer Data, As-built Drawings & Maps
- Upgrading standards, regulations, SOPs and manuals
- Consideration Low level of water tariff (0.05\$/m<sup>3</sup>)
- Initiating Online Billing System & Upgrade Computer Skill
  - Limited computerization for water management & accounting



# DMZ & DMA, Solution for NRW Reduction



- Distribution zones
- DMZ's : Natural subdivisions of Townships
- DMA's : smaller arbitrary subdivisions
  - 1) 5-6 kms kilometers mains
  - 2) 1000 to 2000 connections
  - 3) Homogeneous pressure level



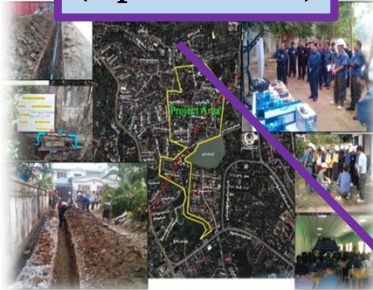
# NRW Reduction Projects (International Cooperation)

	Project name	Location	Completed year	Organizer	NRW Ratio	
					Before	After
1	NRW DMA pilot project in Ward No. 14 Ward, Yankin	Yankin	2014	JICA	75 %	15 %
2	Japanese Grass Root Project in Ward No. 5, Mayangone	Mayangone	2015	Japan consortium	76.59 %	32.2 %
3	Grant Aid Project for Urgent Improvement of Water Supply - Replacement of 42"φ Transmission pipe - Installation of DMA system in Ward No. 2,3 and 4, Yankin	Yankin	2016	JICA, TODA	70 %	8.2 %
4	Pilot District Metered area project for NRW reduction in Yangon City	Insein and South Okkalapa	2017	Manila+ Mitsubishi	52 % 56 %	17.32 % 12.29 %
5	NRW reduction pilot project in Ward No. 13, Yankin	Yankin	2019	JICA, TA	86.18 %	5.46 %
6	NRW reduction pilot project	Mayangone	on-going	Japan consortium	To Reduce >50%	
7	Consultancy Services for Rehabilitation Program of Yangon Water Supply	Tarmwe	On-going	AFD &	To Improve Commercial Loss	



# NRW Reduction Projects

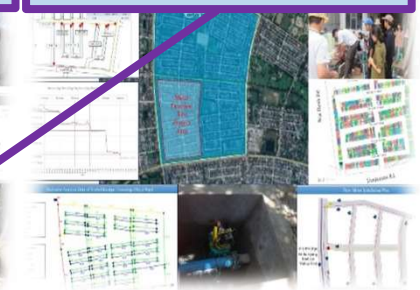
**Mayangone  
(Japanese Grant)**



**North Okkalapa  
(YCDC)**



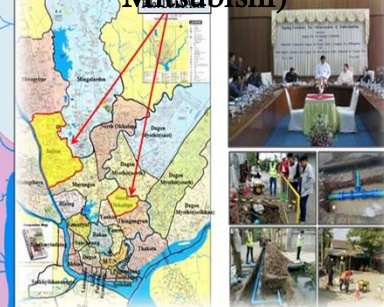
**North Okkalapa  
(YCDC) (Ongoing)**



**Yankin  
(JICA Expert)**



**Insein & South Okkalapa  
(Manila Water -  
Mitsubishi)**



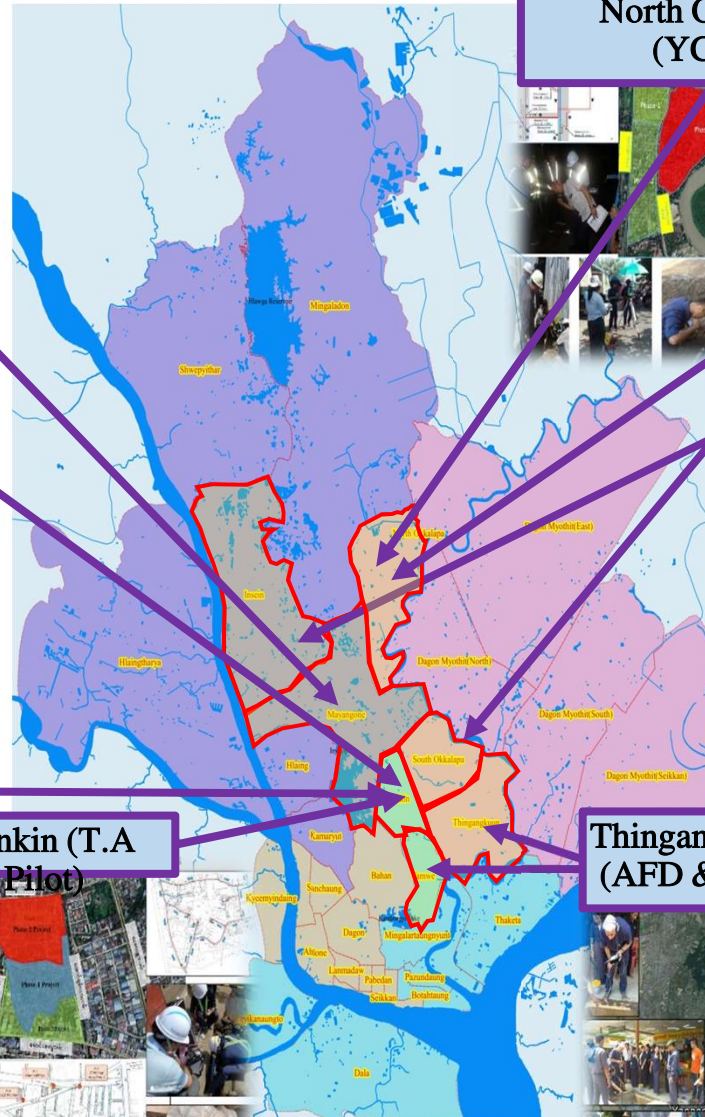
**Yankin  
(JICA Grant Aid)**



**Yankin (T.A  
Pilot)**

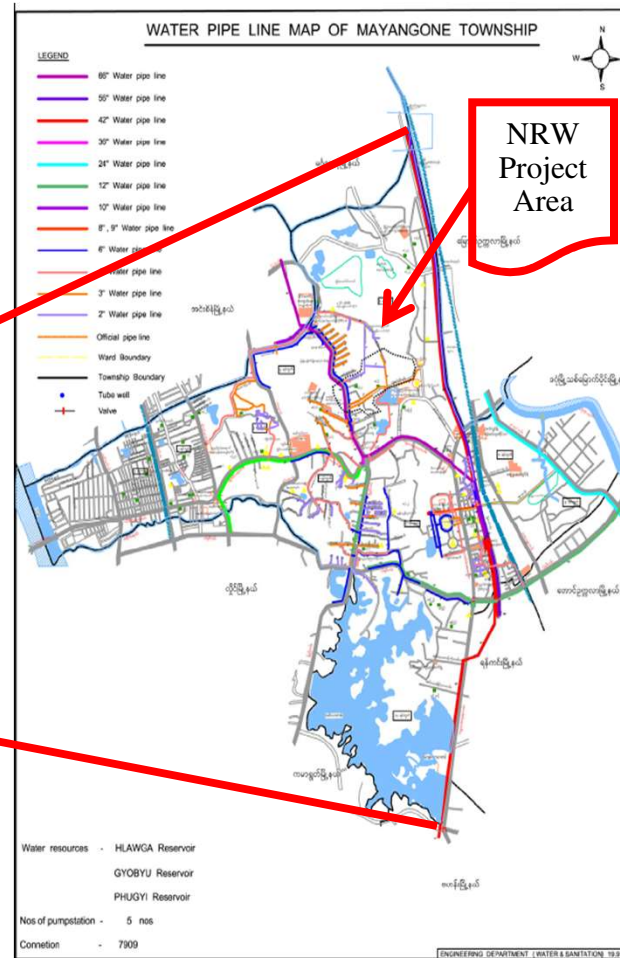
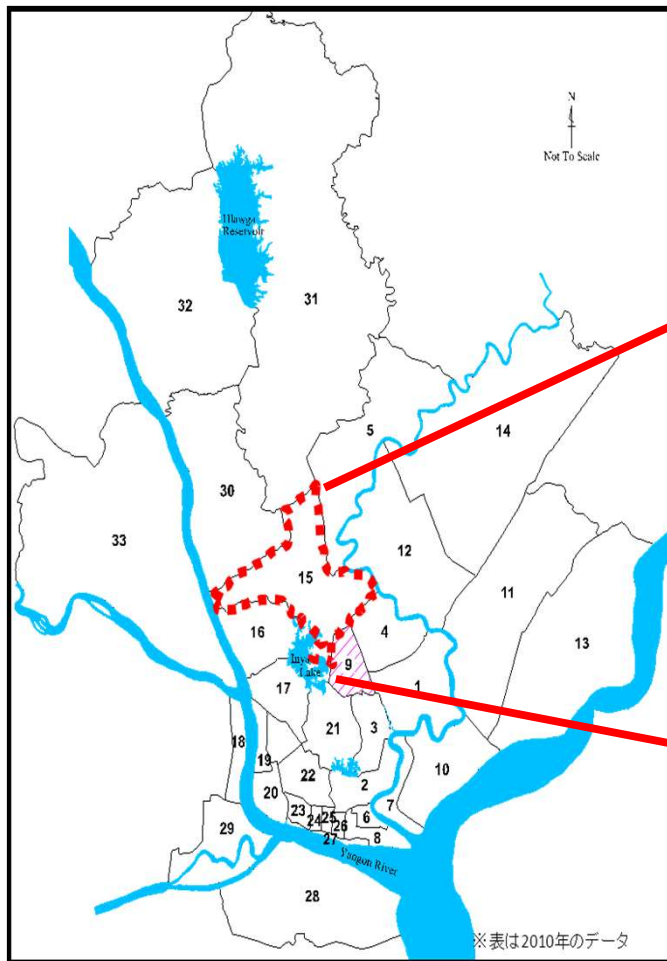


**Thingangyun & Tarmwe  
(AFD & EGIS, France)**





# Japanese Grass Root Project in Ward No. 5, Mayangone



# Japanese Grass Root Project in Ward No. 5, Mayangone

## Before NRW Project

December 2014

## After NRW Project

April 2015

Houses & Buildings:

418

1) Houses:

414

2) Public Buildings:

4

House Meters Installed:

292

1) New Installation:

178

2) Replacements:

114

18,964.8  
m<sup>3</sup>/month

NRW=  
76.59%

Revenue Water  
4,440 m<sup>3</sup>

20,174.4

m<sup>3</sup>/month

NRW=  
32.20%

Revenue Water  
13,680 m<sup>3</sup>  
(including  
schools, religious  
facilities of  
1,059.1 m<sup>3</sup>/mth)

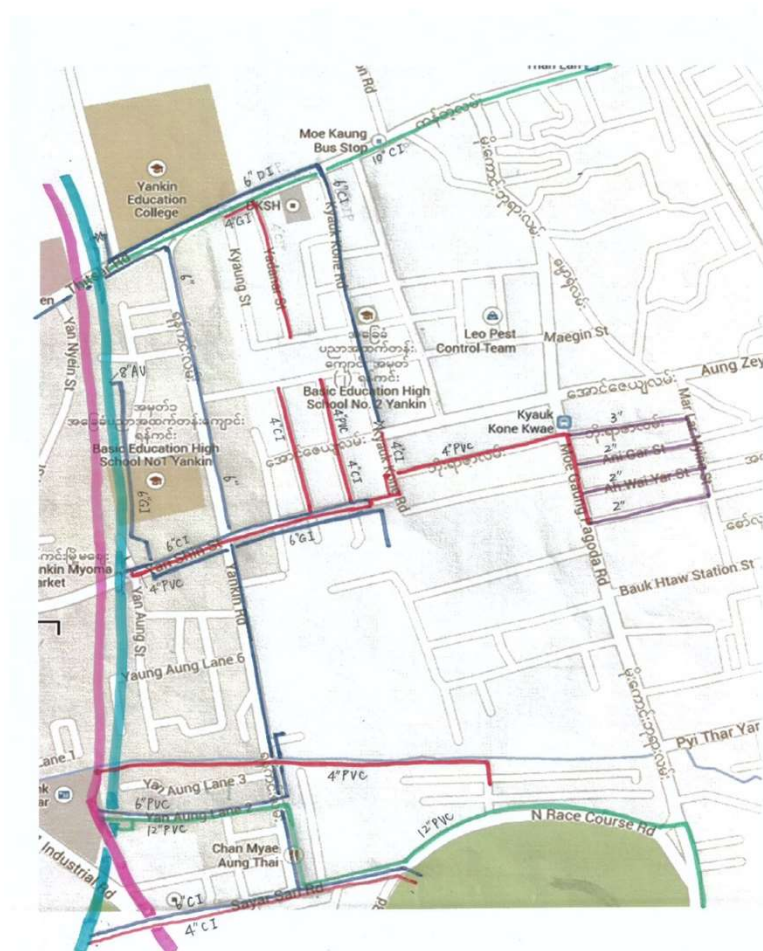
Project Area: Dist. 5, Mayangone  
T/S

Project Term: Oct. '14 to Mar. '15

Distribution Lines:

- 1) Total Length: Approx. 5 km
- 2) Renewal Length: Approx. 1 km

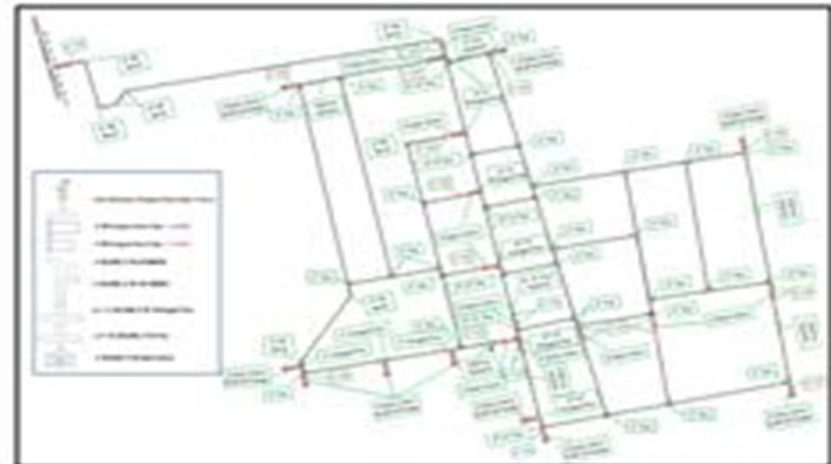
# NRW Reduction Pilot Project in Ward No. 14 Ward, Yankin



Category	Daily unit demand	Water Demand
Domestic*	150 L/Person	150 x 5 persons/family=750L= <u>0.75 m<sup>3</sup></u>
Others*		
Company Compound	60~100 L/Person	60 x 1000 = 60,000 L = <u>60 m<sup>3</sup></u>
Pagoda	10 L/Person	10 x 600 = 6,000 L = <u>6 m<sup>3</sup></u>
Monastery	150 L/Person	150 x 40 = 6,000 L = <u>6 m<sup>3</sup></u>
Church	10 L/Person	10 x 300 = 3,000 L = <u>3 m<sup>3</sup></u>
Islamic Building	10 L/Person	10 x 300 = 3,000 L = <u>3 m<sup>3</sup></u>
Government Market	15~30 L/m <sup>2</sup>	15 x 2,000 = 30,000 L = <u>30 m<sup>3</sup></u>
School	32 L/Person	32 x 200 = 6,400 L = <u>6.4 m<sup>3</sup></u>
Market	15~30 L/m <sup>2</sup>	15 x 2,000 = 30,000 L = <u>30 m<sup>3</sup></u>
	60~100	

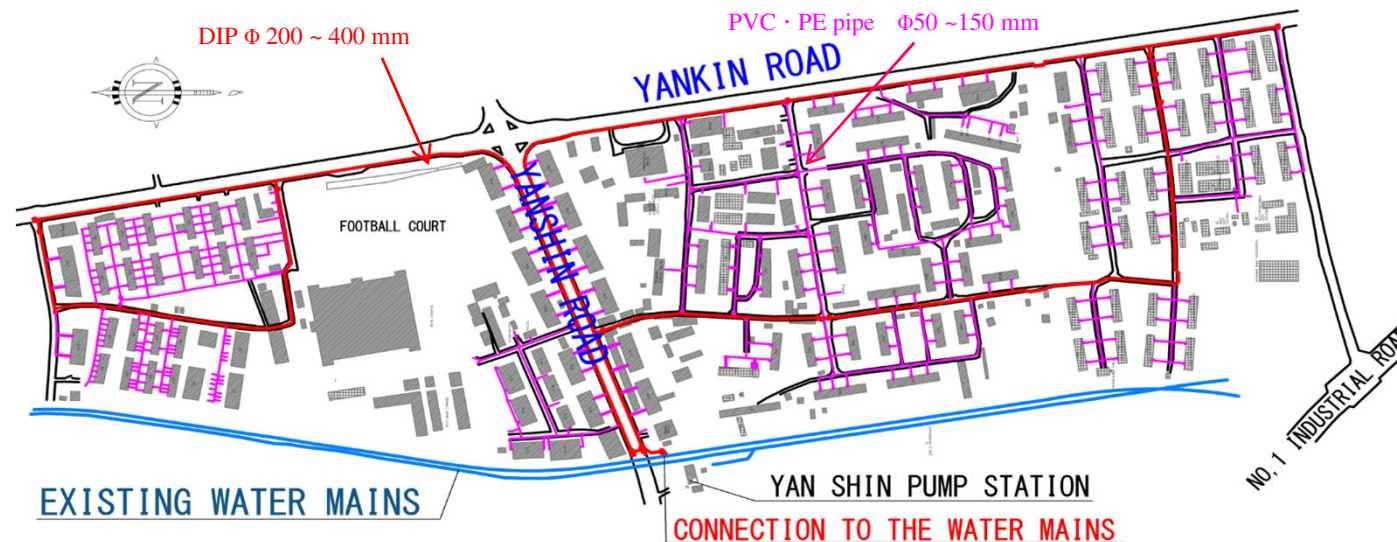


# NRW Reduction Pilot Project in Ward No. 14 Ward, Yankin



- Pipe Length - 5.651 km
- Connections - 317 nos
- Completed Year - 2015
- NRW Ratio - 75% to 15%

# JICA Grant Aid Project( TODA): Implementation of DMA System in Pilot Area of Yankin Township ( No. 2,3,4 Wards)



- Pipe Length - 8 km
- Connections - 1944 nos
- Completed Year - 2016
- NRW Ratio - 70% to 8.2%

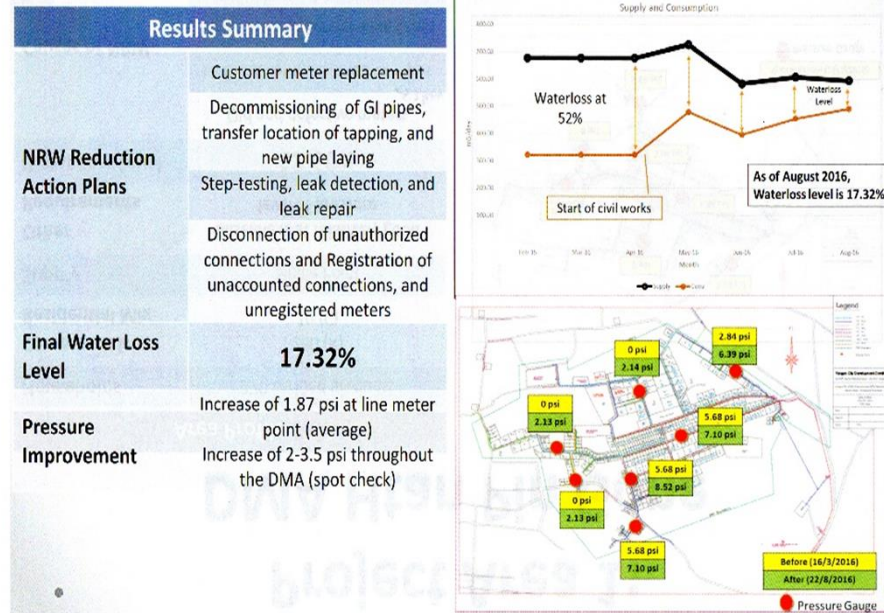


# NRW Reduction Project by Manilar Water & Mitsubishi Corporation

## Insein Township

### DMA Htan Pin Gone

#### NRW Reduction Results



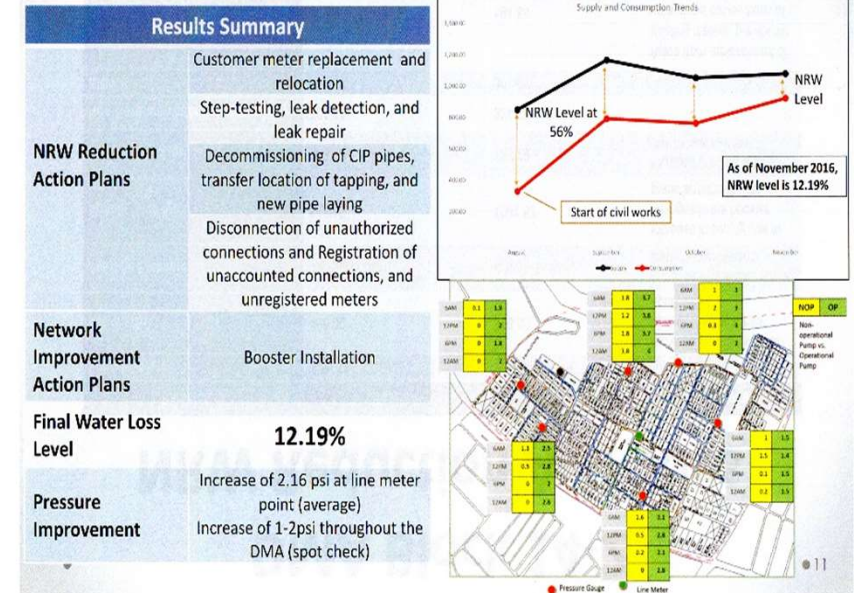
## Insein

- Pipe Length - 5.5 km
- Connections - 315 nos
- Completed Year - 2016
- NRW Ratio - 52% to 17.32%

## South Okkalapa Township

### DMA Block 14-2

#### NRW Reduction Results



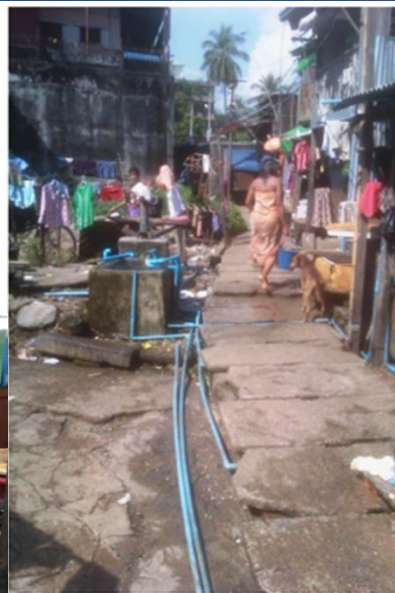
## South Okkalapa

- 5.6 km
- 496 nos
- 2016
- 56% to 12.29%

# NRW Reduction Project in Thingangyun & Tarmwe with Egis (France)



- |                                     |   |
|-------------------------------------|---|
| <b>MoU agreement</b>                | - 9.5.2014  |
| <b>Feasibility Study</b>            | - Thingangyun, Tamwe, Tarketha townships  |
| <b>Project Progress (Phase – 1)</b> | - Study Report ( Submitted on 31.3.2015)  |
| <b>Activities</b>                   | - Evaluation on NRW condition, GIS system utilization, capacity development on staffs,                    |
| <b>Future Activity</b>              | - Under discussion ( Euro 1.25 million for assistance on pilot area of Pyaryegone block, Tamwe township ) |





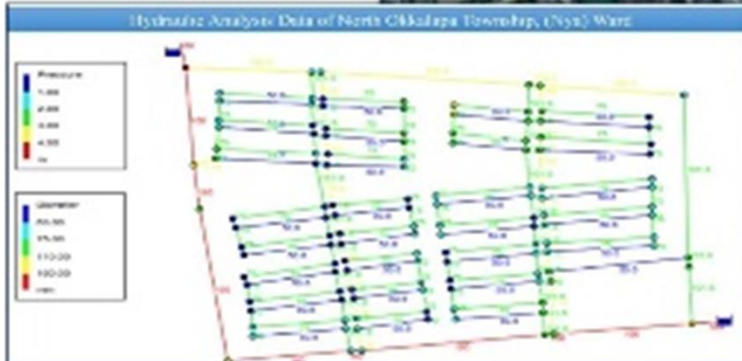
# NRW Reduction Projects Implemented by YCDC

- Pipe Length  
67481 ft  
(20.57 km)
- Connections  
2670 nos
- Completed Year  
2018
- NRW Ratio  
-  
51.17% to 7.12%



# NRW Reduction Projects Implemented by YCDC

## North Okkalapa Township, Nya Ward, NRW Reduction Project





# NRW Reduction Projects Implemented by JICA & YCDC

## Yankin Township, No.(13)Ward, NRW Reduction Project





## Basic Point Mentioned by AFD

“It is important to remember a basic point: reducing NRW requires investments but requires above all Management. The investments are tools necessary either to correct the situation or to allow the future control, but these investments alone are insufficient: if adequate management does not accompany them, water losses will increase again, and the benefits will not be sustainable. For this fundamental reason, the NRW strategy which has been devised gives a lot of importance to the organization and management to ensure the long-term success of the program.”

Section	Team	Duties for long-term success
NRW Planning and Monitoring (3)		<ul style="list-style-type: none"> <li>☞ Study and analysis of Revenue &amp; Non-Revenue water rates <ul style="list-style-type: none"> <li>• To study and analyze "Metered consumption", "Unmetered consumption", and "Ineffective water" etc.</li> </ul> </li> <li>☞ Planning of specific survey and study for NRW management</li> <li>☞ Formulation of NRW management plan and monitoring the progress of plan <ul style="list-style-type: none"> <li>• To formulate 5 year/10year NRW management plan and monitor the progress of plan, if required the plan should be revised.</li> </ul> </li> </ul>
Commercial loss management (4)		<ul style="list-style-type: none"> <li>☞ Checking and study on the causes of inaccurate monthly meter reading data and guidance for collection <ul style="list-style-type: none"> <li>• To check the accuracy of the data of meter reading of each Township with Township staff, and prescript and perform corrective actions.</li> </ul> </li> <li>☞ Study of water charge collection rate of each Township <ul style="list-style-type: none"> <li>• To check the water charge collection rate and the reason of nonpayment through the monthly meter reading data. Study and give guidance on how to collect the water charge, etc.</li> </ul> </li> <li>☞ Analysis of water meter condition and reporting</li> <li>☞ Quarterly Analysis of revenue water on the basis of monthly meter reading <ul style="list-style-type: none"> <li>• To analyze Revenue &amp; Non-Revenue water from the data of monthly meter reading and leakage volume, and report the outcome quarterly, and provide the results to NRW Planning and Monitoring Section.</li> </ul> </li> </ul>
Physical loss (Leakage) Management (16)	Water Flow Measurement (3)	<ul style="list-style-type: none"> <li>☞ Water flow measurement of main distribution system <ul style="list-style-type: none"> <li>• To measure water flow (by Ultrasonic flow meter) at fixed points periodically by main water distribution system in the city.</li> <li>• To analyze the water balance between the water supply and demand, and provide the information to "NRW Planning and Monitoring Section".</li> </ul> </li> <li>☞ Establishment of "Model district for water flow measurement" <ul style="list-style-type: none"> <li>• To measure water flow and leakage and the change of water flow volume resulting from leakage repair etc. To collect and analyze the information above to estimate Non-Revenue water rate in other areas.</li> </ul> </li> </ul>
	Leakage Detection (8)	<ul style="list-style-type: none"> <li>☞ Leakage patrol and detection <ul style="list-style-type: none"> <li>• To formulate an annual leakage detection plan.</li> <li>• To detect leakage visually in the daytime and by using detector in the nighttime.</li> </ul> </li> </ul>
	Leakage Repairing (5)	<ul style="list-style-type: none"> <li>☞ Instruction of leakage repair and inspection on site <ul style="list-style-type: none"> <li>• To instruct township to repair the leakage detected, and inspect the repairing work according to guidelines prepared.</li> </ul> </li> <li>☞ Leakage repairing</li> </ul>

# Activities for Overall Management

## Activities for Institutional Management



Interview to YCDC Training Center



Problem analysis and solution



Discussion and suggestion

## Activities for Non-Revenue Water Management



Problem analysis and solution



Training on software application



Ground survey on customers

## Activities for Water Quality Management



Seminor on Quality Monitoring



# Inauguration of Laboratory for Water Quality Monitoring

No	Measurable Parameters	Units
1	Total Coliform	MPN/100ml
2	Fecal Coliform	MPN/100ml
3	Taste	mg/l
4	Odor	mg/l
5	Color	TCU
6	Turbidity	NTU
7	Arsenic	mg/l
8	Lead	mg/l
9	Nitrate	mg/l
10	Manganese	mg/l
11	Chloride	mg/l
12	Hardness	mg/l
13	Iron	mg/l
14	pH	mg/l
15	Sulfate	mg/l
16	Total Dissolved Solids(TDS)	mg/l
17	Calcium	NTU
18	Magnesium	TCU
19	Nitrite	mg/l
20	Ammonia Nitrogen	mg/l
21	Electrical Conductivity	$\mu\text{S/cm}$
22	Total Alkalinity	mg/l
23	Salinity	psu
24	Zinc	mg/l
25	Residual Chlorine	mg /l

ESTABLISHED IN 2014 JULY





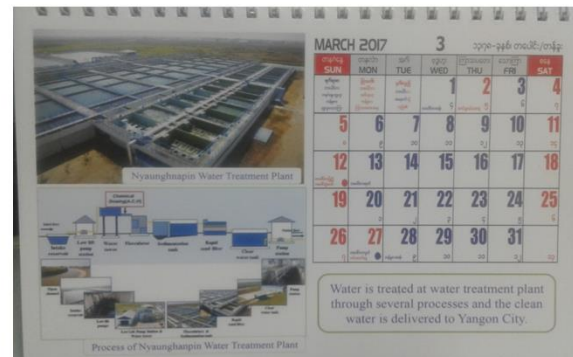
# Human Resources Development

## Number of Training and Participants during 2016 to 2020 DEC.

No.	Course	Number of Courses	Number of Participants
1	New Staff for Engineer	8	159
2	New Staff for Clerk	5	100
3	Refershment for Engineer	1	40
4	New Staff for Worker	7	210
5	Basic PC Scale	10	118
6	Pump Operator	3	60
7	Township Officer	2	40
8	Deputy Township Officer	4	67
9	NRW Training	2	34
10	GIS Level-1	1	12
Total		43	840



# Public Awareness Program

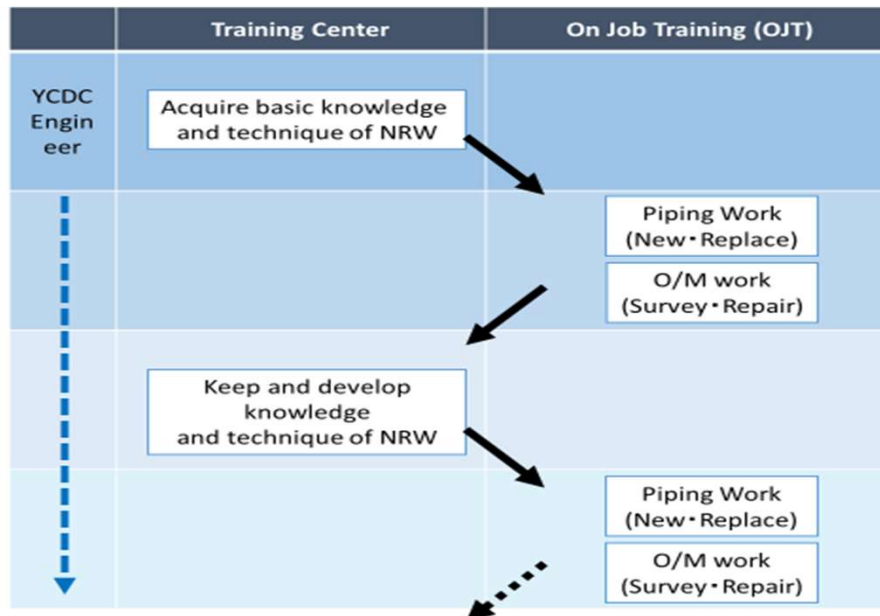


FIFT  
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23 February 2022 • via Zoom



# Implementation of Training For NRW Management



## Training for

- Water Leak Detection & Branching Method
- Pipe Jointing & Management of Regulating Valves
- Water Pressure Test & Leakage Repair
- House Connection Jointing & Water Meter Installation



## Proposed Plans towards Digitalizing the Water Supply System



# Future Vision (အနာဂတ်မျှော်မှန်းချက်)

## ရေရရှိရေးနှင့်ရေပေးရေးလုပ်ငန်းတာဝန်ခံအဖွဲ့၏ ရည်မှန်းချက်

- ❑ ကျန်မာရေးနှင့်ညီညွတ်ပြီးသန့်ရှင်းသောသောက်သုံးရေကို ရန်ကုန်မြို့ရှိ ပြည်သူလူထုသို့ နှစ်စဉ် ပေးဝေနိုင်ရန်။
- ❑ ရေဖိုးရခေ အပြည့်အဝကောက်ခံနိုင်ရန်။
- ❑ ရလေလွှင့်ဆုံးရှုံးမှုကို လျှော့ချနိုင်ရန်။
- ❑ အဆင့်မြင့်နည်းပညာများဖြင့် ရေပေးဝေရေးစီမံခန့်ခွဲမှုတိုးတက်လာစေရန်။
- ❑ ခိုင်မာသော ရန်ပုံငွေစီမံခန့်ခွဲမှု တိုးတက်လာစေရန်။

ကာလလယ်/ကာလရှည် စီမံကိန်းများ = ရေရရှိရေးနှင့်ရေပေးရေးလုပ်ငန်းတာဝန်ခံအဖွဲ့၏ အနာဂတ်မျှော်မှန်းချက်

ရလေလွှင့်ပျက်တီးခြင်းစီမံခန့်ခွဲမှုစနစ်အား အကောင်အထည်ဖော်သွားရန်နှင့် ရလေလွှင့်ပျက်တီးမှုလျော့ချရေး စီမံချက်အား စဉ်ဆက်မပြတ်ဆောင်ရွက်သွားရန်။

ရလေလွှင့်ပျက်တီးခြင်း  
စီမံခန့်ခွဲမှုဆိုင်ရာ  
ဖွံ့ဖြိုးတိုးတက်ရေး

ရေအရည်အသွေးနှင့်ပတ်သက်သည့် ပြဿနာများကို ရှာဖွေဖြေရှင်းကာ ပြည်သူများထံ သန့်ရှင်း၍ယုံကြည်စိတ်ချရသည့် သောက်သုံးရေများ ဖြန့်ဝေပေးနိုင်ရန်။

ရေအရည်အသွေး  
စီမံခန့်ခွဲမှုဆိုင်ရာ  
ဖွံ့ဖြိုးတိုးတက်ရေး

ရေပေးဝေရေးလုပ်ငန်းတိုးတက်လာစေရန် ဝန်ထမ်းများ၏  
စွမ်းဆောင်ရည်ကို စဉ်ဆက်မပြတ်မြှင့်တင်ရန်။

ရေဆွဲထားသည့် စည်းမျဉ်းစည်းကမ်း၊ စံစနစ်၊ နည်းဥပဒေ၊  
လုပ်ထုံးလုပ်နည်း၊ လမ်းညွှန်ချက်များ အပေါ် အခြေခံ၍  
ရေပေးရေးလုပ်ငန်းကို စီမံခန့်ခွဲသွားရန်။

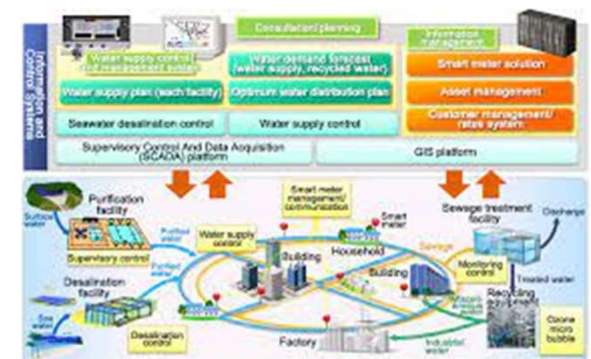
အဖွဲ့အစည်း  
စီမံခန့်ခွဲမှုဆိုင်ရာ  
ဖွံ့ဖြိုးတိုးတက်ရေး

စွမ်းဆောင်ရည်ပညာရေးကိန်း(PI)များအပေါ်တွင် အခြေခံ၍ အနာဂတ်  
အစီအစဉ်များ(Planing)အား ရေဆွဲခြင်းဖြင့် စီမံခန့်ခွဲသွားရန်။

ရေပေးရေးလုပ်ငန်းကို ဘဏ္ဍာရေးအရ လုံလောက်၍ လွတ်လပ်သော  
ရေပေးရေး အဖွဲ့အစည်း တစ်ခုအဖြစ် စီမံခန့်ခွဲနိုင်ရန်။

# Towards Developing A Smart Water Supply System

- Transform to AMI Water Meter System
- Improve SCADA and GIS
- Strengthen International Cooperation
- Continue Capacity Development & PR
- Integrate Water Resources Management
- Sustainable Development
- Resilience of water Facilities





Thank You for Your Kind Attention

