

セミナー

東京都水道局（以下、東京水道）の知見を DJB に紹介する技術移転セミナーが 6 回開催された。

第 1 回セミナー

2013 年 8 月 30 日に、メトロポリタンホテルで開催された。出席者数は DJB のムケルジー CEO、ナンディ・パルワリ副 CEO、JICA インド事務所の江島真也所長を含む約 70 人であった。発表内容は次の通りであった。

- 1) 東京水道の概要と持続的な運営管理方法について：東京都水道局多摩水道改革推進本部 多摩給水管理事務所八王子給水事務所長 藤川和久所長発表
- 2) 東京水道の施設改良について：東京都水道局北部支所北営業所長 猪狩恒一郎所長発表
- 3) 収入管理システムについて：Mr. B. S. Jaglan、Director (Revenue)発表



SEMINAR FOR “THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT”

Organized By

Delhi Jal Board AND Japan International Cooperation Agency

Date: 30th of August 2013

Venue: Crest Hall, The Metropolitan Hotel, New Delhi

Location: Delhi, India

09:30 - 09:45 AM	Registration
Opening Speech	
10:00 - 10:10 AM	- DJB <i>Smt. Debashree Mukherjee, Chief Executive Officer, Delhi Jal Board</i>
09:55 - 10:10 AM	- JICA <i>Shinya Ejima, Chief Representative of India Office, Japan International Cooperation Agency</i>
Waterworks Bureau Tokyo Metropolitan Government's session. (incl. Q&A)	
10:10 - 11:00 AM	Outline of Tokyo Waterworks and approach for sustainable management <i>Koichiro IGARI, Manager of Kita Service Station, North Branch Office, Bureau of Waterworks, Tokyo Metropolitan Government</i>
DJB's session (incl. Q&A)	
11:00 - 11:30 AM	Revenue Management System <i>B. S. Jaglan, Director (Revenue), Delhi Jal Board</i>
11:30 - 11:50 AM	Tea Break
Waterworks Bureau Tokyo Metropolitan Government's session. (incl. Q&A)	
11:50 AM - 12:40 PM	Facility Improvement of Tokyo Waterworks <i>Kazuhisa FUJIKAWA, Manager of Hachioji Water Supply Office, Tama Waterworks Reform Promotion Center, Bureau of Waterworks, Tokyo Metropolitan Government</i>
Interactive session	
12:40 - 13:00 PM	<i>All Participants</i>
Closing Speech	
13:00 - 13:10 PM	-DJB <i>Ms. Nandini Paliwal, Addl. C.E.O (Project Director)</i>
13:10 - 14:00 PM	Lunch

30th August 31, 2013 Seminar Attendance

Embassy of Japan

1	Yosuihiro SENSUO	First Secretary
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JICA Headquarter

1	Momo FUKUSHIMA	Officer
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JICA India Office

1	Shinya EJIMA	Chief Representative
2	Chihiro FUKUDA	Representative
3	M.P. SINGH	Additional Chief Development Specialist

Tokyo Waterworks

1	Koichiro OGARI	Improvement Water works Management
2	Kazuhisa FUJIKAWA	Asset Management
3	Yosuihiro NAMAKURA	Coordinator
4	Anupam JOSHI	Interpreter

JICA Expert Team

1	Kazufumi MOMOSE	Chief Adviser / Water Supply Planning
2	Minoru IKEI	Deputy Chief Adviser / Pipe- Network (2)
3	Phatta THAPA	Pipe- Network (1)
4	Sanjay PRASAD	GIS Mapping
5	Katayama ALOKKUMAR	Project Coordinator/GIS Mapping (2)
6	Manabu FUKUSHIMA	SCADA
7	Koichiro AZUI	DMA
8	Yoichi YAMAMOTO	Water Supply Management
9	Hiroshi IZUMOTO	GIS Application
10	Yuhei ITO	Project Coordinator/GIS Mapping
11	Hiroshi KOJIMA	Water Supply Management

Delhi Jal Board

1	Debashree MUKHERJEE	Chief Executive Officer
2	Sayed Naiyer Ali NAJMI	Member(Finance)
3	Huzar LOLLEN	Member(Administration)
4	B.M. DHAUL	Member(WS)
5	V.K. BABBAR	Member(Dr.)
6	Nandini PALIWAL	Additional Chief Executive Officer
7	Bipin BEHARI	Secretary(DJB)
8	Sanjam CHIMA	Consultant(PR)
9	Subhash CHAND	C.E. (East)
10	S.C. JAIN	C.E. (West)
12	P. Bhargava	C.E. (South)
13	A.K. JAIN	C.E. (C&N)
14	R.S. TYAGI	C.E. (Dr.) Proj.-I
15	V.K. THIND	C.E. (Dr.) Proj.-II
16	J.P. GOEL	C.E. (Water) Project
17	Uttam KUMAR	C.E. (SDW)N/W
18	V.P. GUNJIYAL	C.E. (SDW)S/E
19	U.B. TRIPATHI	Director (A&P)
20	B.S. JAGLAN	Director (Revenue)
21	D.R. ARYA	Director (T&QC)
22	Sanjay GUPTA	Project Director (Training)
23	Ajay GUPTA	S.E. (Central)
24	Rajesh MITTAL	S.E. (North)
25	Ramesh THAKUR	S.E. (North West)
26	N.K. TOMAR	S.E. (West)
27	S.K. BHARDWAJ	S.E. (South)
28	V.P. SHRMA	S.E. (South West)
29	M.K. JAIN	S.E. (Project)W-II
30	Vikram SINGH	SE (Project) W-III
31	V.K. GUPTA	S.E. (Dr.) Proj. E&NE
32	Shalabh KUMAR	S.E. (Dr.) Proj. N&N/W
33	R.S. NEGI	S.E. (Dr.) Proj. W&C
34	Bir SINGH	S.E. (E&M) W&S S-II
35	R.K. BHALLA	S.E. (WW)-I

36	P.K. JAIN	S.E. (Project) Dr.
37	J.K. SINGH	S.E. (SDW)-II
38	J.C. ATAL	Joint Director (Fin.)-I
39	K.S. SHARMA	Joint Director (Fin.)-II
40	Paras RAM	Joint Director (R) - HQ
41	S.K. MEENA	Joint Director (R) C/N
42	R.S. GODBOLEY	Joint Director (R) E/NE
43	Mahinder KUMAR	E.E. (Central) -I
44	Radhey SHYAM	E.E. (Central) -II
45	B.L. KURU	E.E. (North) -I
46	V.K. SINGH	E.E. (North West) -III
47	K.K. HARIT	E.E. (North West) -IV
48	P.K. TYAGI	E.E. (South West) -III
49	Vineet KUMAR	E.E. (Vig.) -Civil
50	Chander PARKASH	E.E. (Dwarka WTP)
51	Pankaj KR. ATRAY	E.E. (Proj) W-I
52	R.K. SINGHAL	E.E. (Proj) W-II
53	Mukul BHANDULA	E.E. (Proj) W-VI
54	Pankaj GUPTA	E.E. (Proj) W-VIII
55	Ashok KUMAR	Dy. Dir(F&A)-III
56	Arvind KAUSHIK	Dy. Dir(Rev) HQ-I
57	Naresh KUMAR	Dy. Dir(Rev) HQ-II RMS
58	Satya PRAKASH	A.O. (Proj) W-I
59	Nashim KHAMED	J.E.(Civil)
60	Ashokpal PANWAR	J.E.(Civil)
61	Pradeep KUMAR	A.E.(Project)
62	Pukhraj SINGH	A.E.(Civil)

Facility Improvement of Tokyo Waterworks



Key points of today's explanation

- ◇ History of Tokyo waterworks
- ◇ Necessity of planning
- ◇ Maintenance of purification plant
- ◇ Maintenance of pipelines
- ◇ Asset Management

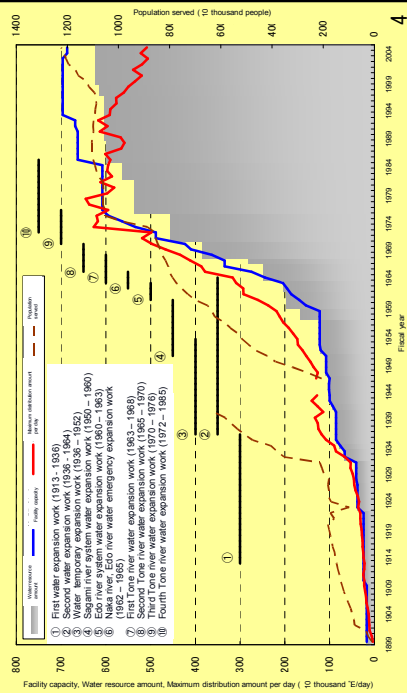
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Tokyo waterworks in the beginning



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Transition of Water resource amount, Facility capacity, Maximum distribution amount per day and Population served



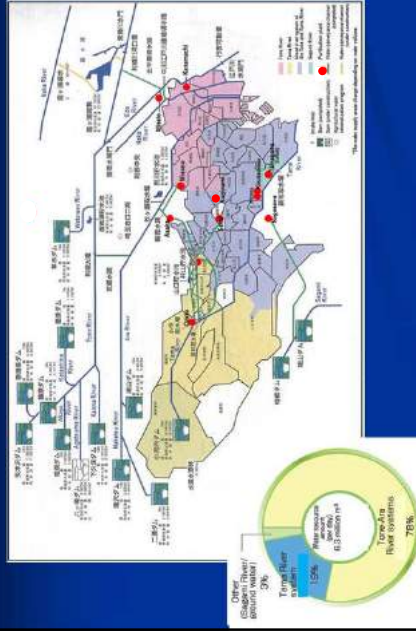
Outline of Tokyo Waterworks

(As of FY 2011)

Operation start	1st, December, 1898
Service area	12.35 km ²
Population served	12.85 million people
Number of service connection	6.99 million cases
Maximum distribution amount per day	4.7 million m ³
Average distribution amount per day	4.2 million m ³
Water resource amount	6.3 million m ³ /day
Facility capacity	6.86 million m ³ /day
Total length of distribution pipes	26,348 km

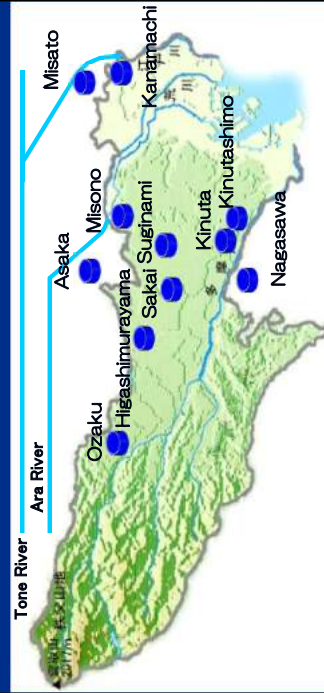
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Outline of water facility



6

Major water purification plants of Tokyo waterworks



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Outline of Water Purification facilities in Tokyo

Water System	Purification Plant	Plant Capacity	Treatment Method
Tone/Ara River Systems	Kanmachi	1,500,000	Rapid filtration/All advanced water treatment
	Misato	1,100,000	Rapid filtration/Partially advanced water treatment
	Asaka	1,700,000	Rapid filtration/Partially advanced water treatment
	Misono	300,000	Rapid filtration/All advanced water treatment
Tama River Systems	Higashi murayama	880,000	Rapid filtration/Advanced water treatment
	Ozaku	385,000	Rapid filtration
	Sakai	280,000	Slow filtration
	Kinuta	315,000	Slow filtration
Sagami River System Ground Water	Kinuta	114,500	Membrane filtration/Slow filtration
	Kokusenjo	70,000	Membrane filtration/Slow filtration
	Tanagawa	152,500	Slow sand filtration/Rapid filtration
Total	Nagasawa	200,000	Rapid filtration
	Suginami	15,000	Disinfection only
Total		6,859,500	-

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Plan of Tokyo Waterworks

東京水道長相構想 STEP II
世界に開かれた水資源
「安全・安心」
東京水道局

東京水道 施設再構築 基本構想
「安全・安心」
東京水道局

東京水道経営プラン 2013
お客さまに届ける水道を再構築して

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Tokyo Waterworks Principal Vision STEP II

Water supporting Tokyo citizens

Water for functions of Capital Tokyo

Commuting

Water for daily living

Japan's capital, Tokyo

Sustaining city functions day and Night (Distribution Main Implementation work)

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Basic visions of Tokyo water facility reconstruction

Directions

- Safe and stable water supply
- Thorough persistent to quality
- Pursuit of energy reduction

Seven goals

- Goal 1 Ensuring water resource to protect capital Tokyo
- Goal 2 Ensuring supply capability for stable supply
- Goal 3 Efficient re-locations of purification plants
- Goal 4 Constructing sustainable purification system
- Goal 5 Ensuring back-up function for future
- Goal 6 Minimization of energy
- Goal 7 Advancement of disaster-resistant functions

東京水道 施設再構築 基本構想
東京水道局 施設再構築部 基本構想課
TEL:03-3542-1111 FAX:03-3542-1112
東京都水道局
〒100-8555 東京都千代田区千代田1-1-1

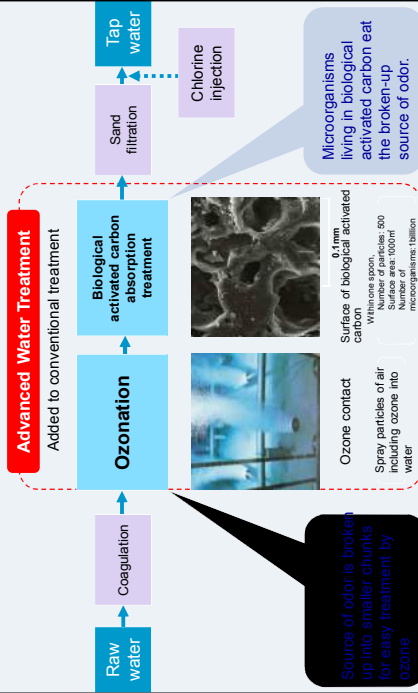
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Tokyo Waterworks Management Plan 2013

- 1 Stable supply of water
- 2 Countermeasure against earthquake
- 3 Safe, better tasting water
- 4 Wide-ranging business operation
- 5 Communicating with our customers
- 6 Energy/environment-related measures
- 7 International Contribution
- 8 Reinforcement of management base

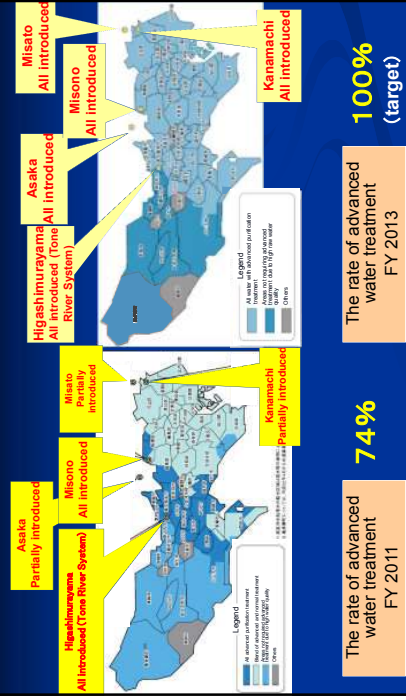
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Mechanism of Advanced Water Treatment



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Implementation of advanced water treatment



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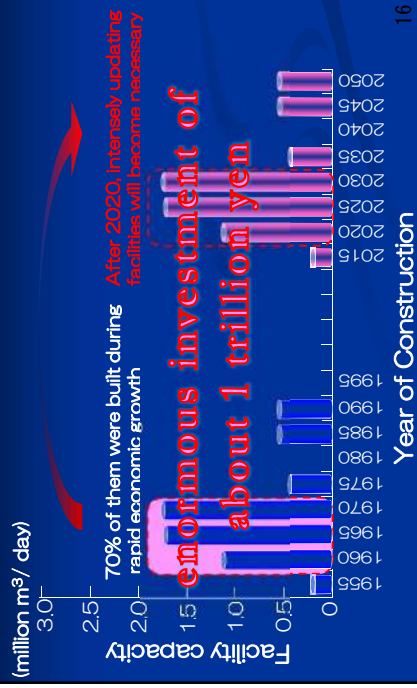
The Way of Thinking about Renewal

- There is nothing alternative to Waterworks in future.
- Accident risk will increase, if you delay the renewal only because facilities still function well.
- When you try to renew at one time, significant capacity decline and huge cost will happen all together.
- If you decide to reduce water charge now, current customers are pleased but it will burden on future customers more.

Water Utilities have a responsibility for future customers as well.

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Prospect of annual maintenance and upgrade of water purification plant



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Distributing upgrading period and securing substitution capability

Establishing Replacement Water Purification Plant

686 (*10000 m³/day)

original capacity of running system

Risks during the upgrade

Substituting plant

water quality management improvement and repair constructions

reconstruction accidents or disasters

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Securing capability for stable water supply

- Maintenance of alternative purification facility to prepare for a large renewals of the plants
- Securing the capability of purification facility to address risks of disaster or accidents

◆ Higashimurayama purification plant (1,265 million m³/day)

◆ Kanamachi purification plant (1.5 million m³/day)

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Raw water connecting pipe with mutual flexibility

Facility Outline	
Year of installation	1964
Extension	16.7 km
Diameter	2,200 mm
Material	Steel pipe 8.9 km ductile iron 7.8 km
Operation volume (Max)	880,000 m ³ /day
Reverse way	1,000,000 m ³ /day

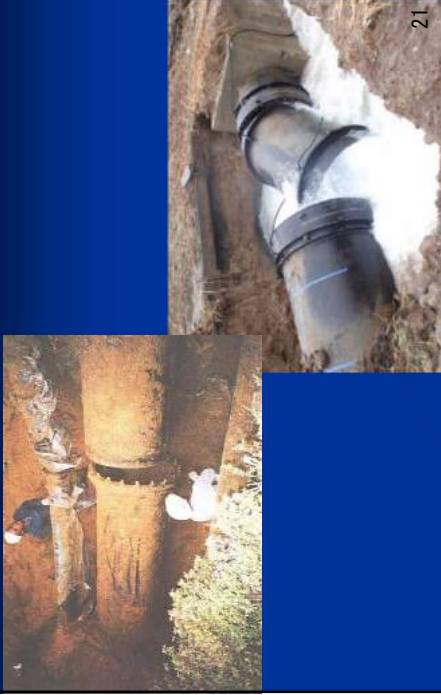
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Improvement of water transmission pipe network

- Stable and efficient water supply operation
- In accident or emergency, stronger back-up functions required

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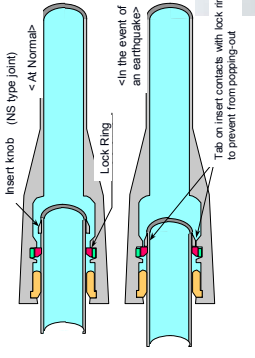
Popping-out damage of pipelines



21

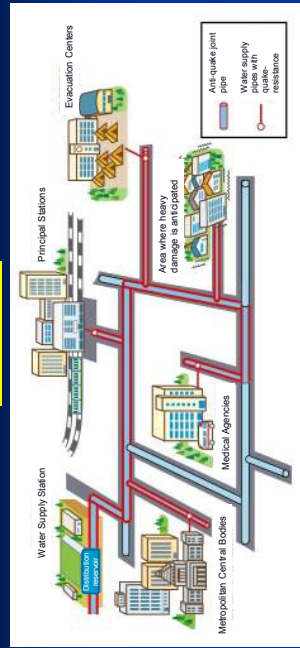
Earthquake-resistant pipelines

Example of earthquake-resistant joints with anti-popping-out function



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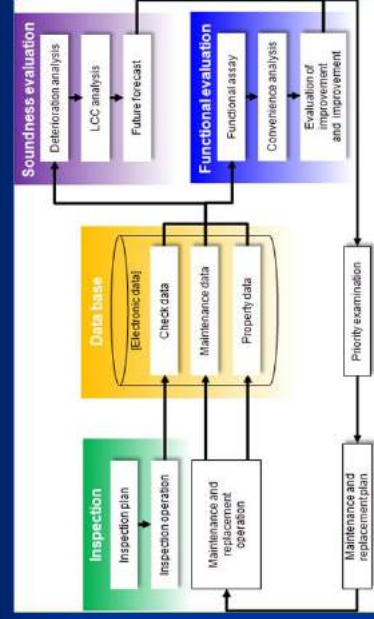
Building disaster-response capabilities of waterworks



- Considering scenario earthquake movement, liquefaction risk and progress in replacing anti-seismic joint, places with high priority have been implemented first.
- Besides capital area and medical institutions, evacuation centers and major train stations were newly added.

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Tokyo Waterworks Asset Management



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Inspection Research



Photo-1 in basin



Photo-2 delamination

With unified criteria
Concrete structures :crack-density / width / length , delamination density (Table 1),etc.

Pipes : number of corrosion / leakage, soil characteristics, etc.

Table 1 : Evaluation Criteria of Concrete Structures

Grade	Cracks		Delamination	
	Crack density (value)	Delamination density (value)		
A	Not exceeding 0.01 ml/l	Not exceeding 0.10 ml/l		
B	0.01 ~ Not exceeding 0.03 ml/l	0.01 ~ Not exceeding 0.25 ml/l		
C	0.03 ~ Not exceeding 0.25 ml/l	0.25 ~ Not exceeding 0.50 ml/l		
D	0.25 ~ Not exceeding 0.50 ml/l	0.50 ~ Not exceeding 1.00 ml/l		
E	0.50 ml/l or more	1.00 ml/l or more		

Database

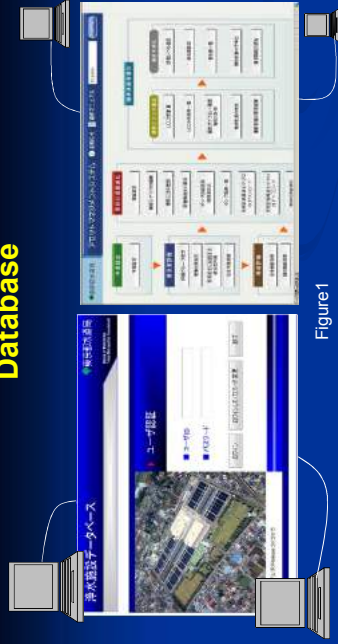


Figure 1

Electric Database , possible to access by any staffs.
(inspection research data , repair histories , asset ledger , financial data , operation and management data, etc.)
Facilities :concrete structure and equipments
Pipes :distribution pipes. (linked with Mapping System)

Assessment of Soundness

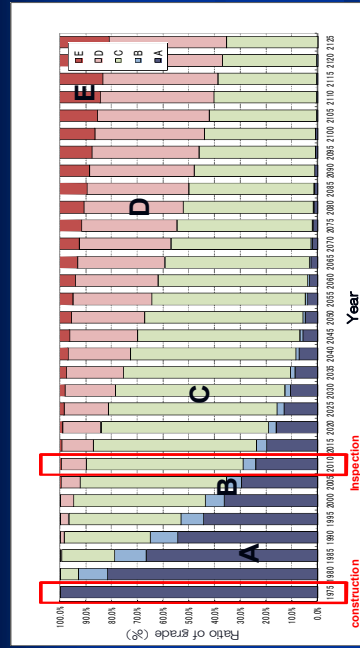


Figure2:Crack Density predict

Relations LCC Analysis and Renewal plan

$$LCC = (Y1 + Y2) + (R1 + R2) - B$$

Y1: Construction Cost, Y2: 1st Renewal Cost(Y2)

R1: Running Cost, R2: Running Cost after 1st Renewal.

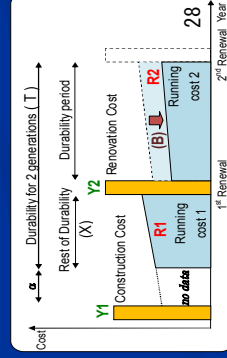
B: Benefit by Renewal (saved cost of electric power, chemical consumption, repair frequency, and including recovery capacity etc.)

$$\sum ATC = \sum \min [LCCn / Tn]$$

$\sum ATC$:sum of Annual Total Cost

LCCn : Life Cycle Cost for 2 generations

Tn :Durability for 2 generations

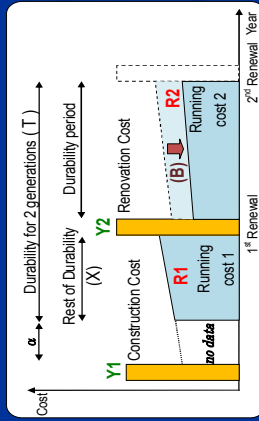


Annual Total Cost

The total of construction and running cost divided by the durability for 2 Generations Is Annual Total Cost. The formula used actually is next.

$$\text{Annual Total Cost (ATC)} = (Y_1 + Y_2) / (T + \alpha) + (R_1 + R_2 - B) / T$$

Y1: Construction Cost, Y2: 1st Renewal Cost, R1: Running Cost, R2: Running Cost after 1st renewal, B: Benefit by renewal, T: Durability for 2 generations



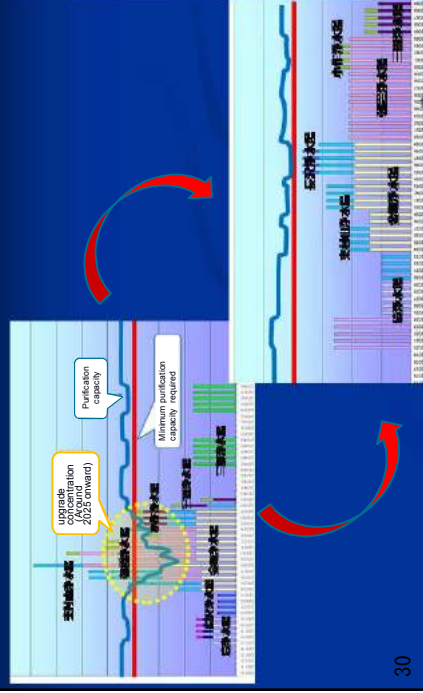
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Goals of people involved in water supply business

- ◇ So far, we have focused on improving water facility to meet water demand. In addition to this, we need water facilities which can constantly supply water in the event of accident or disaster.
- ◇ To do this, it is necessary not only to improve individual facility to be more quake resistant but also to make system duplication or networking. With this, water facility will be able to improve overall safety by substituting water supply from another facility in the event of stopping.
- ◇ These activities require long time and enormous budget, so it is important to make a mid-to-long-term plan to address it steadily while securing a budget.
- ◇ To promote the renewals and improvements, data of current facility is required such as function, degree of importance, passed years, deterioration condition, repair history, etc.
- ◇ By utilizing AM, the facility data will be taken and saved regularly, with which daily operation and maintenance should be effectively managed.
- ◇ As a result, facility renewals in the future can be done more smoothly and efficiently.



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Image of Renewal plan (sample)




Outline of Tokyo Waterworks And Approach for Sustainable Management

Seminar at Delhi

Koichiro IGARI
Director of Kita Service Station
Bureau of Waterworks,
Tokyo Metropolitan Government






Tokyo Metropolitan Government, Bureau of Waterworks

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Introduction




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Japanese Administrative Organization




Central Government

Local Government
2-layer Structure

Prefectural Government

Municipal



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Japanese Administrative Organization

Prefectural Government


Wide-Area Local Government
: 47

City, Town, Village

Fundamental Local Government
: 1,742



Waterworks is managed by City, Town and Village



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The Number of the Waterworks Business Operators in Japan

	Prefecture	City, Town Village	Total
Retail	5	2,056	2,061
Wholesale	22	51	73
Total	27	2,107	2,134

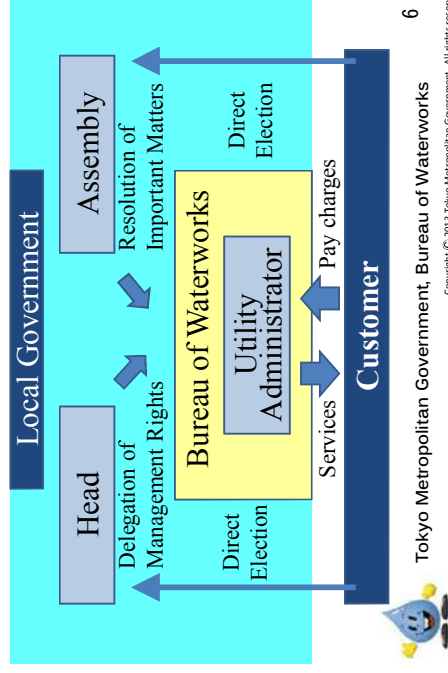


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Management Form of Waterworks

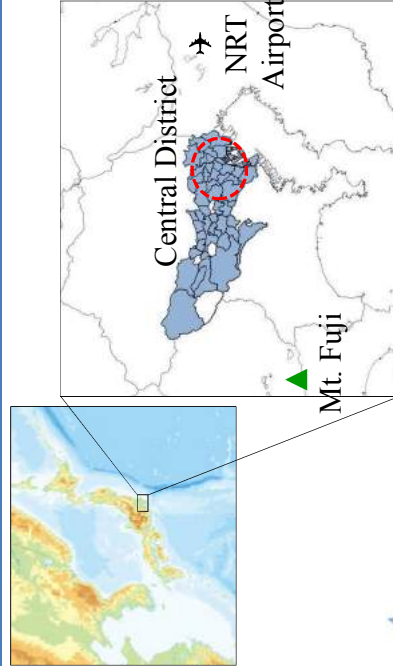


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Position of Tokyo and Water Supply Area



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Outline of the Tokyo Waterworks

Started to supply	December 10, 1898
Service Area	1,235 km ²
Population Served	12.8 million people
Connection	6.99 million cases
Diffusion Rate	100%
Facility Capacity	6.86 million m ³ /day
Number of Staff	3,965
Revenue	2,873 million \$



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History of Tokyo Waterworks

1898 Started to Supply

Facility Capacity 170 million m³/day
Population About 80 million
Diffusion Rate 5.6%

1932~37 Extension by M&A

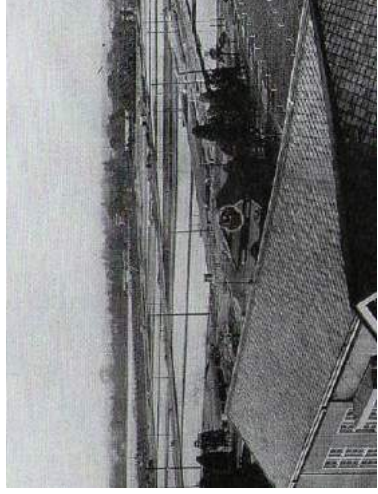
1939~45 World War II



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Yodobashi Purification Plants
(Running to first in Tokyo)



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History of Tokyo Waterworks

1945 End of War

Equipments was destroyed severely
Rate of leakage 80%




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History of Tokyo Waterworks

1950's~70's High Economic Growth

Water demands increased rapidly.  3.2-times in 20 years
Lack of water resources and frequent water shortage



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History of Tokyo Waterworks

1990~ Stable Economic Growth

Increase in water demand and charge revenue stopped
Needs to improve the quality.



**Water quality (safety, taste)
Stability**

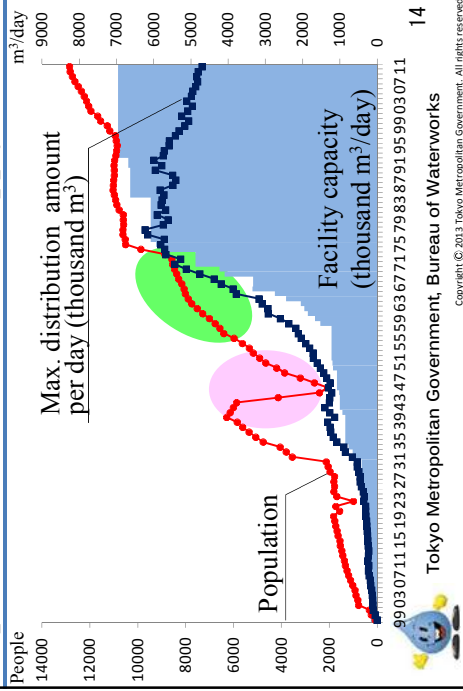


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Population, Amount of water supply



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Tokyo Waterworks at the present day

As the largest supplier in Japan

As one of the world's leading supplier



We will contribute to lead
the world's waterworks.



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Management of Tokyo Waterworks



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Purpose of Waterworks

Purity

Inexpensive

Sufficient

Contribute to improvement of sanitation and living environment



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Principle of Waterworks Management


Economic Efficiency

Economic efficiency is required same as private company

Self-supporting System

Public Nature

Improvement of public welfare that is the original purpose of the waterworks




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Self-supporting System

Payment using charge receipts income for service operation costs

Optimization of Resource Allocation

- ◆ Effective use of water resources
- ◆ Appropriate investment in facility
- ◆ Efficient management




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Management Policy of Tokyo Waterworks

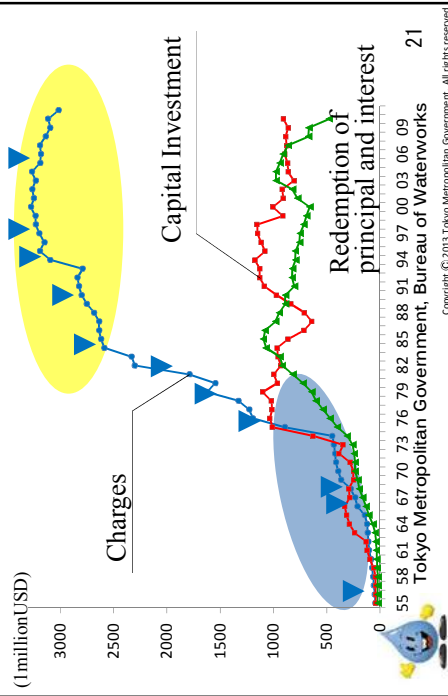
Tokyo Waterworks is determined to work hard on effective management as the lifeline to support the everyday life of Tokyoites and the urban activities of the capital to provide a safer and steadier supply of water services that bring satisfaction on all customers.

Further, we will aim for sustainable business management, paying due attention to the future, and hand down the tradition of Tokyo Waterworks to the next generation.

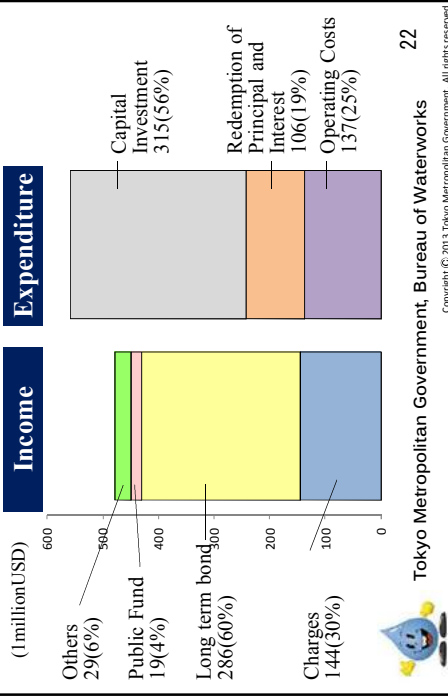


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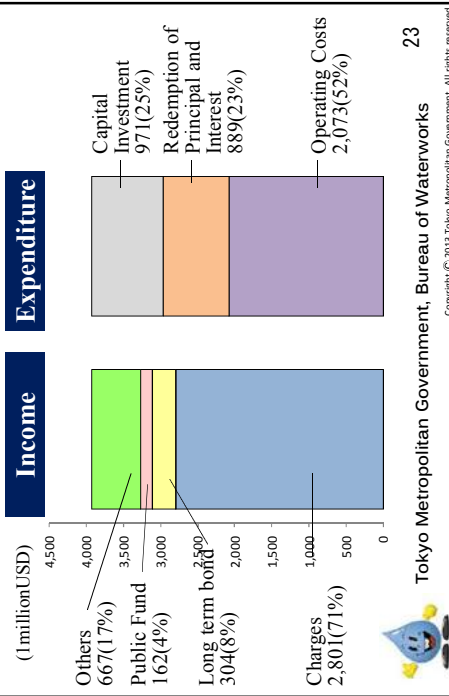
Charges and Capital Investment



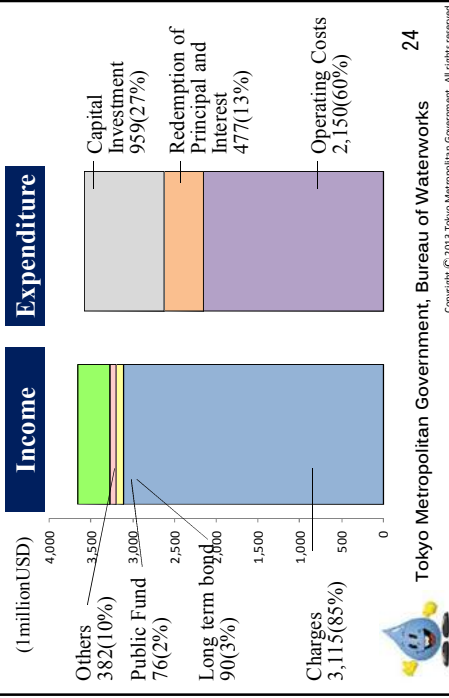
Income and Expenditure (1965)



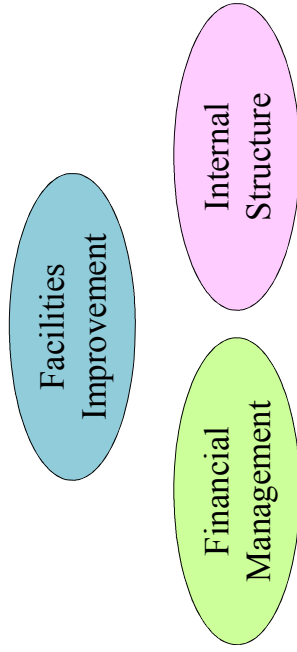
Income and Expenditure (1990)



Income and Expenditure (2011)

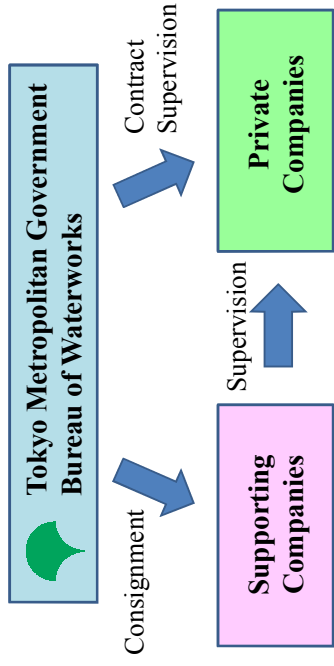


Three Important Elements



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Operating Structure



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Supporting Companies

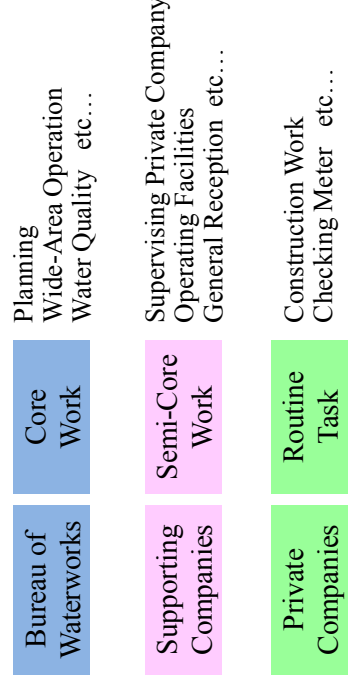
Supporting Companies have high technique and experience.

Technical work	TSS Co, Ltd 水源から蛇口まで 東京水道サービス株式会社
Rate Calculation and Customer Service	PUC 株式会社PUC Public Utility Services Center Co.,Ltd



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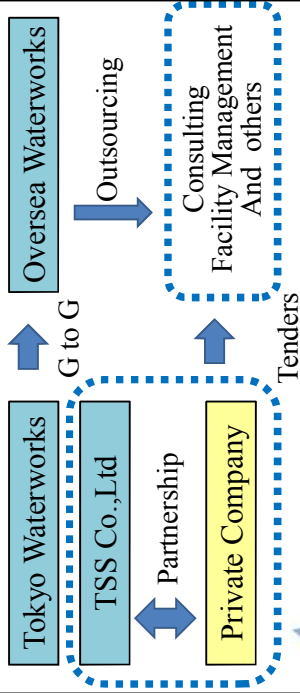
Division of Roles



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International Contributions

Increasing expectations for high technologies of the Tokyo Waterworks



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Challenges for the future

Earthquake Preparations

Large-Scale Facilities Updates



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Earthquake Preparations



The Great East Japan Earthquake (11th January 2011)

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Earthquake Preparations

Possibility of the great earthquake

The probability of 70% within 30 years

Damage estimation

Dead	9,600
Building Damage	300,000
Water Outage	45%



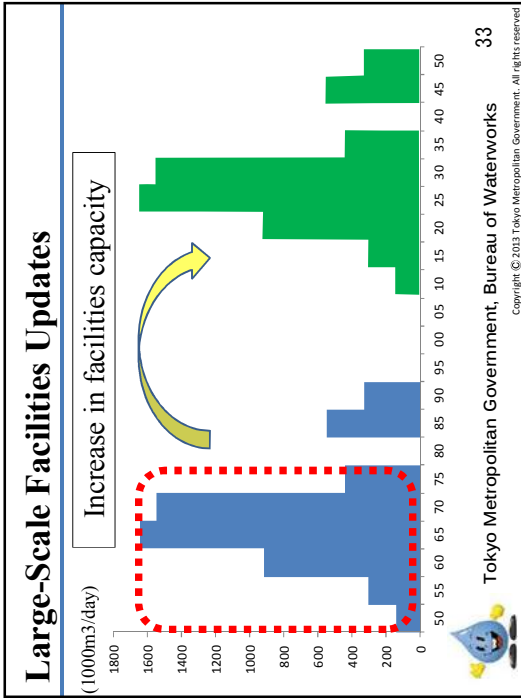
Earthquake reinforcement is urgent task

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The Difficulties That We Overcame

- Recovered from the Devastation of WW II
- High Economic Growth To Correspond Rapid Increase in Water Demand
- Stable Economic Growth Changing Customer's Needs ~From Amount to Quality

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- ### Upcoming of This Seminar
- 1 Financial Plan and Fiscal Management
 - 2 Self-Supporting System and Public Fund
 - 3 Rate System for the Sustainable Management
 - 4 Rate System in Consideration for Customers
 - 5 Rate Calculation and Billing
-
- Tokyo Metropolitan Government, Bureau of Waterworks 35
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1 Financial Plan and Fiscal Management

Tokyo Waterworks Management Plan 2013

Determination : February 2013
Period : 2013~15

Management Stand in the Middle and Long Term Standpoint

Information disclosure to customers

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1 Financial Plan and Fiscal Management

Sound Fiscal Management



Timely and Appropriate Rate Revision

Funding in Accordance with the Contents of the Capital Investment

Internal Structure for Efficient Management



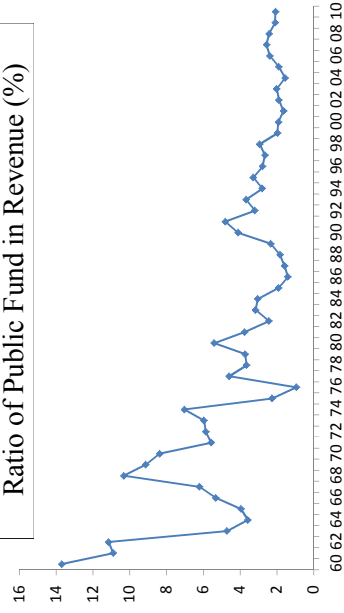
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2 Self-Supporting System and Public Fund

Ratio of Public Fund in Revenue (%)



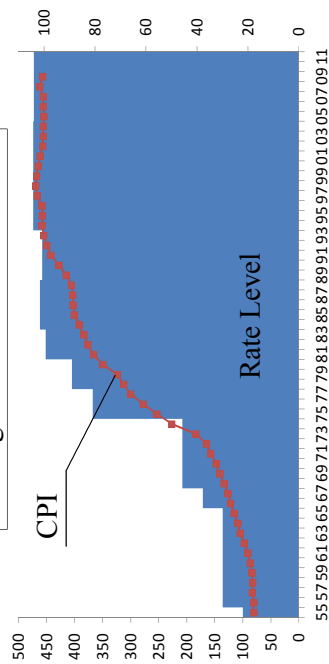
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3 Rate System for the Sustainable Management

Change of Rate Level (%)



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3 Rate System for the Sustainable Management

Principle of Rate Making

1 Fairness

2 Cost Basis

Rate Level

Rate System

Full Cost Basis

Individual Cost Basis

3 Sound Management

Reinvestment Funds



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4 Rate System in Consideration for Customers

The feature of Tokyo waterworks rate system

- Two-Part Tariff** Stabilization of management
- By Meter Size** Fairness
- Progressive** Consideration of the domestic water
Suppression of large demand



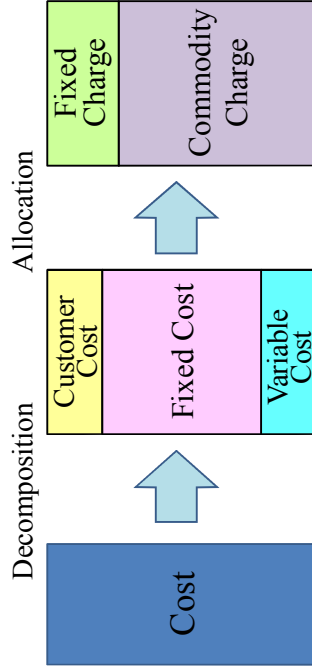
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4 Rate System in Consideration for Customers

Separation and Allocation of the Cost



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5 Rate Calculation and Billing

Billing Flow

- Reception** Customer Center
- Reading Meter** Outsourcing
- Calculation** } Support Company
- Sending Bill** } Calculation Center
- Payment** Our Office, Bank, Store etc...
- Demanding** Our Office



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5 Rate Calculation and Billing



Customer Center



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5 Rate Calculation and Billing



Payment Desk of Our Office



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For Friendly Relationship



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Revenue Management System

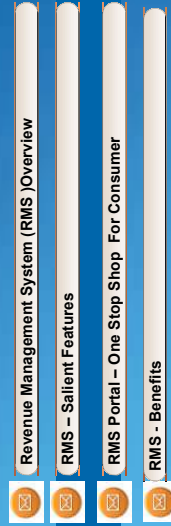
BS JAGLAN
Director (Revenue)
Delhi Jal Board
August, 2013

About Delhi Jal board

- DJB established on 6th April, 1998 by an Act of Delhi Assembly
- Supplies potable water to 18.0 million population
- Water sources- Yamuna, Bhakhra storage, upper Ganga and Sub- surface
- Treatment and disposal of water
- Introduction of New Revenue Management System
- PPP projects in water sector

3

Presentation Overview



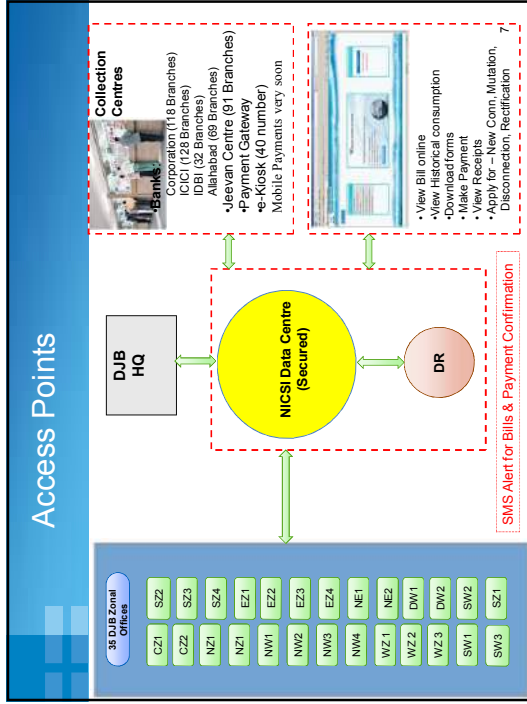
RMS Overview

- ❖ Automation of Metering, Billing, Collection and Customer Care functions for DJB
- ❖ Document Management System for digitization and storage of old water connection files (20 million pages)
- ❖ Infrastructure setup and Networking across 35 Zonal offices
- ❖ GIS Interface – Address Standardization, Customer Mapping & GIS Application
- ❖ RMS launched in July16, 2012

4

RMS Objective

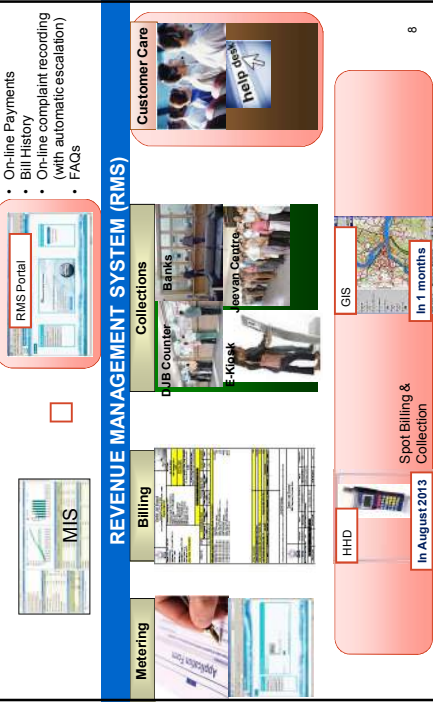
- ✓ Replace existing "off-line mode" billing based on Foxbase billing software with latest advanced "On-line mode" billing software
- ✓ Modernization of all Zonal offices to ensure Consumer Friendly environment
- ✓ Recording real time transactions at a central server
- ✓ Deliver efficient & quality services: Increase BE & CE
- ✓ Host of payment options: No queuing up at D.J.B counters
- ✓ Facilitate decentralized decision-making by making information and knowledge readily available and accessible at Zonal levels



RMS - Salient Features

- ❖ **RMS Portal – One Stop Shop** for Delhi Jal Board Consumers for all their needs
 - ✓ Apply online for New Water or Sewerage connection
 - ✓ Request for Disconnection or Reopening online
 - ✓ Raise Mutation request online
 - ✓ View Bill details and make Payment
 - ✓ Raise Grievance and Track Status
- ❖ **New touch points** introduced for consumer interaction
 - ❖ Web/Portal,
 - ❖ Bills on Emails,
 - ❖ SMS Alerts,
 - ❖ Helpdesk
- ❖ **Handheld devices** introduced to facilitate **Meter Reading, Spot Billing and Collection at the consumer premise**
- ❖ **New modes of collection** introduced - **Net Banking, Credit and Debit cards**

RMS Today



Bill Front Side

Delhi Jal Board
 142, Naraina Pocket II, New Delhi - 110028
 Phone: 011-26101111, 26101112, 26101113
 Fax: 011-26101114, 26101115, 26101116
 E-mail: djb@delhi.gov.in, djb@delhi.nic.in
 Website: www.djb.delhi.gov.in

Customer Details
 Consumer No: 123456789
 Meter No: 123456789
 Billing Cycle: 27-JAN-2013 to 27-FEB-2013
 Billing Period: 27-JAN-2013 to 27-FEB-2013
 Billing Amount: ₹ 12345.67
 Billing Status: PAID

Meter Reading
 Meter No: 123456789
 Reading: 123456789
 Meter Status: OK

Detailed Calculation Lines
 Description: Water Consumption Charge
 Unit: Litres
 Rate: ₹ 12.34 per litre
 Quantity: 1000000
 Amount: ₹ 12345678.90

Bill History to show last 6 Bills

Payment History to show last 6 payments

BI Generation Date

Records - to avoid forgery faster collection

Current Consumption days displayed

Delhi Jal Board
 Bill Payment Gateway
 142, Naraina Pocket II, New Delhi - 110028
 Phone: 011-26101111, 26101112, 26101113
 Fax: 011-26101114, 26101115, 26101116
 E-mail: djb@delhi.gov.in, djb@delhi.nic.in
 Website: www.djb.delhi.gov.in

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Bill Backside

Current Tariff detail

List of collection centres

ZRO phone numbers

Delhi Jal Board
 Bill Payment Gateway
 142, Naraina Pocket II, New Delhi - 110028
 Phone: 011-26101111, 26101112, 26101113
 Fax: 011-26101114, 26101115, 26101116
 E-mail: djb@delhi.gov.in, djb@delhi.nic.in
 Website: www.djb.delhi.gov.in

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DJB Portal Home Page

Revenue Management System
 Delhi Jal Board

Welcome to Delhi Jal Board

Facilities for Registered Consumer

- View/Print Bills/Receipts
- Submit and Track Grievance
- Receive Bills/Receipts on eMail
- Alerts on mobile

Save Water Save Life

Delhi Services

- New User Registration
- Forgot Password
- Forgot Username
- Forgot Email
- Forgot Mobile
- Forgot Address
- Forgot Phone
- Forgot Email
- Forgot Mobile
- Forgot Address
- Forgot Phone

Delhi Services

- New User Registration
- Forgot Password
- Forgot Username
- Forgot Email
- Forgot Mobile
- Forgot Address
- Forgot Phone
- Forgot Email
- Forgot Mobile
- Forgot Address
- Forgot Phone

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View and Pay Bill Online

Revenue Management System
 Delhi Jal Board

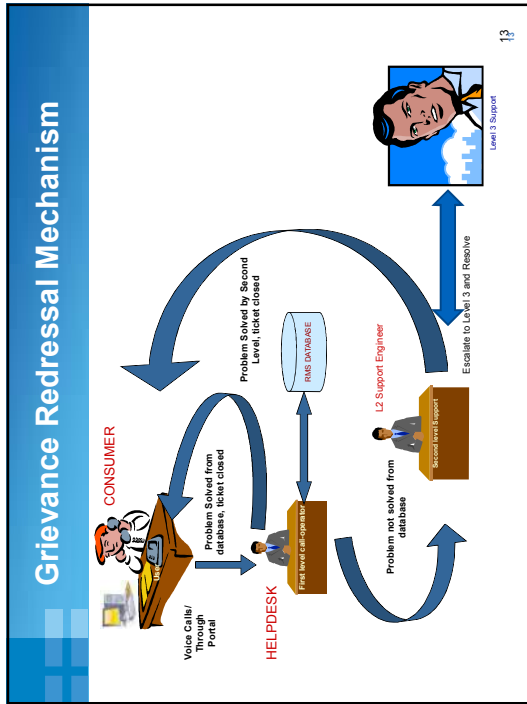
Payment Gateway Service Provider List

Service Provider	Charges
Netbanking (SBI, ICICI, Axis, HDFC, State Bank of India)	Debit Payment: ₹. 5 per transaction for transaction payment amount of upto Rs. 100. Internet Payment: ₹. 10 per transaction for transaction payment amount of Rs. 100 and more. Debit Card Payment: ₹. 10 per transaction (for transaction payment of any amount). Credit Card Payment: 1.00% of the Credit Payment Amount subject to minimum of Rs. 5 per transaction.

Delhi Services

- New User Registration
- Forgot Password
- Forgot Username
- Forgot Email
- Forgot Mobile
- Forgot Address
- Forgot Phone
- Forgot Email
- Forgot Mobile
- Forgot Address
- Forgot Phone

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WATER TARIFF (w.e.f. 1.1.2012)

❖ **DOMESTIC (CATEGORY-A)**
Rates for water charges (Rupees per month)

Monthly Consumption (Kilolitre)	Volumetric Charge (in Rs.)	Service Charge (in Rs.)
0-10	2.42	60.50
10-20	3.63	121.00
20-30	18.15	181.50
>30	30.25	242.00

Plus sewerage maintenance charge: 60% of the volumetric

❖ **MIXED USE CATEGORY (CATEGORY-B)**

Service Charge	This will remain same as under Category-A
Volumetric Charge	The rates will be twice the rates applicable to Category-A

Plus sewerage maintenance charge: 60% of the volumetric charge.

Situation before and after

Feature	Previous System	RMS
I DJS Services on doorstep of consumers through the Portal • Pay Online • New Connection • Mutation • Reopening • Disconnection • View Bill • Log Grievance	●	●
II Payment Posting at DJS counters in one Database – no delay in posting	●	○
III New 3 rd Party Collection Agencies introduced 1. ICICI Bank 2. Allahabad Bank 3. IDBI Bank 4. Corporation Bank 5. E-Kiosk	●	○
IV Posting of 3 rd Party Payments on the same day, provided no delay in receipt of payment file from 3 rd parties	●	○
V Complaint Resolution happening nearer to consumers premise – at respective Zonal Offices	●	●
VI Immediate acknowledgement through SMS on registered mobile numbers on receipt of payments from consumers etc.	●	○
VII HDD for Spot Billing and Collection	●	○

CHALLENGES DURING IMPLEMENTATION OF RMS

- Data Migration from Legacy system
- Errors of Legacy system
- Cleansing of Data Under Process
- Change Management
- Global Approach in Implementation
- Integration with 3rd Parties
- Consumer Grievance Management
- Surprises during implementation of RMS

Contd...

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RMS Benefits

Effective, Efficient and Prompt Services

Benefits to Citizens

- ❖ Shorter turnaround time in issuing New Water or Sewerage connection
- ❖ Spot Billing and Collection
- ❖ New payment modes for Collection introduced – Credit, Debit Cards, Net Banking
- ❖ Quick grievance redressal through Portal, Customer Care

Benefits to DJB

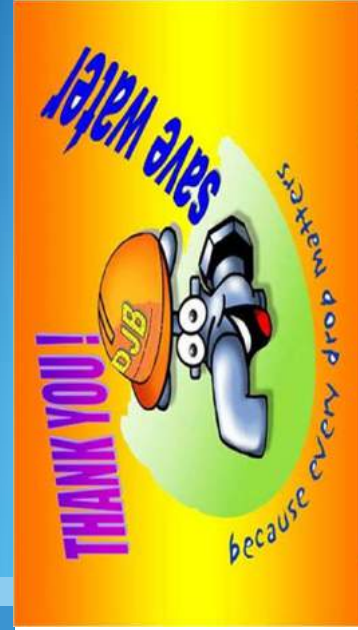
- ❖ Widen the coverage of Billing and Collection
- ❖ Real time update of Meter Reading in the field or consumer premise through Handheld device
- ❖ Reduced reading to bill and bill to collection cycle
- ❖ Configurable Tariff Structure; Easy to change

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CHALLENGES DURING IMPLEMENTATION OF RMS

- Contd..
- Staff Training
 - Hand Holding Staff provided by vendor not competent
 - Different modules of applications not available
 - No provision of accepting few payments under new system till date

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Contact details: jaglanbs@gmail.com

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第2回セミナー

2014年3月6日に、Indian Habitat Center で開催された。出席者数は DJB のビジェイ・クマール CEO、ビーエム・ダウル 理事、JICA インド事務所の江島真也所長を含む約 70 人であった。発表内容は次の通りであった。

- 1) 中長期的視点による経営方針と財務管理：東京都水道局北部支所北営業所長 猪狩恒一郎
- 2) 東京水道の施設改善について：東京都水道局東部第一支所給水課長 谷本知之
- 3) DJB の会計システムについて：Mr. K. S. Sharma, Joint Director (Finance & Accounts)



第2回セミナー



第2回セミナー・ディスカッション



Japan International Cooperation Agency

SECOND SEMINAR FOR “THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT” (Scheduled)

Organized By

Delhi Jal Board AND Japan International Cooperation Agency

Date: 6th of March 2014

Venue: Gulmohar, India Habitat Center

Location: Delhi, India

09:30 - 10:00 AM	Registration
Opening Speech	
10:00 - 10:10 AM	- DJB <i>Vijay KUMAR, Chief Executive Officer, Delhi Jal Board</i>
10:10 - 10:20 AM	- JICA <i>Shinya EJIMA, Chief Representative of India Office, Japan International Cooperation Agency</i>
Waterworks Bureau Tokyo Metropolitan Government’s session. (incl. Q&A)	
10:20 - 11:05 AM	“Management policy and financial management through mid and long term perspective” <i>Koichiro IGARI, Manager of Kita Service Station, North Branch Office, Bureau of Waterworks, Tokyo Metropolitan Government</i>
11:05 - 11:50 AM	“Facility improvement of Tokyo Waterworks” <i>Tomoyuki TANIMOTO, Director, Water Supply Section, East Area First Branch Office, Bureau of Waterworks, Tokyo Metropolitan Government</i>
11:50 AM- 12:05 PM	Tea Break
DJB’s session (incl. Q&A)	
12:05 - 12:35 PM	“Accounting System in Delhi Jal Board” <i>K.S.SHRMA, Joint Director (Finance & Account)</i>
Interactive session	
12:35 – 13:35 PM	<i>All Participants</i>
Closing Speech	
13:35 - 13:45 PM	-DJB <i>B.M.DHAUL, Member(W/S), Delhi Jal Board</i>
13:45 - 14:30 PM	Lunch



Japan International Cooperation Agency

SECOND SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center, Gulmohar			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
VIKRANT SINGH	SE (Asst) W ID			
R. S. Tyagi	Member (Asst)			
V. P. Sharma	SE (SW)			
R. K. Singh	EECR			
A. K. Tiwari	CCM A. I. H. ^{SE D}			
Bir Singh	S-E (2/m)			
Sachin Singh	Asst MOEF			
Pawan Kumar	EECS) D			



Japan International Cooperation Agency

SECOND SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center, Gulmohar			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
1. D. R. ARYA	Director (T. & Q. C)			
2. Pukhraj Singh	AE (C) PRWET			
3. Nishim Ahmed	JE (C)			
4. JAIKISHAN	J.E (C)			
5. Ashok Kumar	Asst Dir (Asst)			
6. K. S. Sharma	Jr. Encl. P&S			
7. R. S. Negi	SE (Asst) PRWEC			
8. Subhash Chandra	CE (Asst) DSB			
9. Sanjay Gupta	Asst Dir (Asst)			



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SECOND SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center, Gulmohar			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
RAKESH SAHNI	SE (PR)W-I			
A.K. KAUSHIK	Dy. Director (Ren)			
V. S. THIND	CE(Dr)H-I			
K.K. HARIT	EE(NW)IV			
SHALABH KUMAR	SE (DR) P. N. N. W			
S.C. JAIN	CE (Dr) H-I			
Mohinder Kumar	EE (Central) I			



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Venue: India Habitat Center, Gulmohar			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
M P Singh	Asstt. Chief Dev. Specialist			
S.N. A. NASMI	Member (Finance)			
J. P. GOEL	CE (W) Proj			
A. K. GUPTA	Sr. A.O. (R)W-III			
R.S. GOUDBOLEY	JD (R) HQ			
A.K. JAIN	CE. (C.&N)			
ASHOK PALPANI	JE (C)			
CAJIT KR.	AE-CC			
Sanjay Prasad.	Jica expert team			
PARAS RAM	JT. Director			



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SECOND SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center, Gulmohar			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
Baba Ali	J.E (C)			Baba Ali
V. K. Gupta	EE (EPA)			
P. K. Aray	EE (Pm) W 7			
Y. P. Manchanda	SE (Dr) Pj/Su			
B. S. JAGLAN	Director (Rev) DWS			
Haresh Kumar	J.E (C)			Haresh Kumar
P. K. Tyagi	EE (SW) III			Haresh Kumar
S. L. Meena	CE (WST-1)			
Nareesh Kumar	DAR (IA)			
V. P. GUNTIYAL	CE (SD) SF			



Japan International Cooperation Agency

SECOND SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center, Gulmohar			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
Pankaj Gupta	Special Engineer			
Uttam Kumar	CE			
V. K. BABA	T. A.			
Sandeep Kapoor	Ex. Engineer			
Ajay Gupta	SE (Central)			
X Rajesh Khanna	HEAD SERVICES			
Rajesh Mittal	SE (N)			
Ashok K. CHAUDHARY	SE (W-2)			
P. K. Jain	SE (P) B			
U. D. Tripathi	SECY DSD			



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SECOND SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center, Gulmohar			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
A.K.GUPTA	SE (RWH)	[REDACTED]	[REDACTED]	[Signature]
Alok Kumar Katyan	JICA Study Tea			[Signature]



Japan International Cooperation Agency

SECOND SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center, Gulmohar			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
S K Bhandari	SE South DWB	[REDACTED]	[REDACTED]	[Signature]
VIJAY KUMAR	CEO, DPB			[Signature]
B.M. DHAUL	MEMBER (WS)			[Signature]
Saijan Chinn	Consultant (PR)			[Signature]
MUKUL BHANDARI	EE (R) W V			[Signature]
R.K. SARG	Consultant			[Signature]

Management policy and financial management through mid and long term perspective



6th March 2014

Koichiro-IGARI
 Manager of KITA Service Station
 Tokyo Metropolitan Government, Bureau of Waterworks




Tokyo Metropolitan Government, Bureau of Waterworks ¹

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Outline of Today's Seminar

- 1 Need for Management from a Mid-and Long-Term perspective**
 Why such a perspective is necessary?
- 2 Development of Mid Term Management Plan**
 Points on developing plan, and elements of planning procedures
- 3 Funding And Capital Structure**
 Arrangement of water charge revenue and debt, public fund
- 4 Grant / Public Subsidization**
 General theories and cases of Tokyo Waterworks
- 5 Accounting Information**
 Reliable accounting information to keeping track of current circumstances





Tokyo Metropolitan Government, Bureau of Waterworks ²

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Today's Contents

- 1 Need for Management from a Mid-and Long-Term perspective**
- 2 Development of Mid Term Management Plan**
- 3 Funding And Capital Structure**
- 4 Grant / Public Subsidization**
- 5 Accounting Information**






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Three Important Elements of Waterworks Business Management

- Facility Improvement**
 - ▶ Maintaining enormous facilities good condition
- Financial Management**
 - ▶ Funding for facility improvement and maintenance
 - ▶ Ensuring sound fiscal state
- Internal Structure**
 - ▶ establishing human resource and efficient structure

Tokyo Metropolitan Government, Bureau of Waterworks ⁴

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Facility Improvement with Mid-Long Term Perspective

Features of Infrastructure

- ▶ **Construction period**
It takes long time to complete from commencing construction project. In case of large scale water treatment plant, it takes 5 – 10 years.
- ▶ **Running period**
Waterworks facilities are operated for a long period. In some cases, it takes 50 – 100 years.



◆ Asaka WTP ◆

▶ Considering usage and needs of waterworks after 50-100 years


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Financial Management with Mid-Long Term Perspective

Long term debt for facility improvement
Facility improvement requires enormous capital.

Short term financial resource of reimbursement
The biggest source of income is water charge. These are based on water consumption 1 or 2 month period



▶ Selection and allocation of funding methods
▶ Establish stable rate structure


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Internal Structure with Mid-Long Term Perspective

Need for human resource
Waterworks business requires human resource with various technique or skill. ~ operation and maintenance, construction of facilities, management and inspection of water quality, customer service and so on

Need for efficient organization
limitation of personnel cost, domestic employment situation, public opinion for public officials.



▶ Strategy of human resource (quantity and quality)
▶ Accurate situation of employment and personnel cost

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Need for Mid and Long Term Perspective

Facility Improvement
▶ Considering usage and needs of waterworks after 50-100 years

Financial Management
▶ Selection and allocation of funding methods
▶ Establish table rate structure

Internal Structure
▶ Strategy of human resource (quantity and quality)
▶ Understanding situation of employment and personnel cost




▶ Developing mid term management plan is recommended

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Today's Contents

- 1** Need for Management from a Mid-and Long-Term perspective
- 2** Development of Mid Term Management Plan
- 3** Funding And Capital Structure
- 4** Grant / Public Subsidization
- 5** Accounting Information



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The Objectives of Mid Term Management Plan


Management with mid term perspective

Calculation of full cost

- ▶ Rate level should be based on full cost of providing waterworks service.
- ▶ Revising tariff requires large cost.

Disclosure of management information

- ▶ About cost, management outlook, main policies
- ▶ For customers, Stakeholders,




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Developing Procedure #1 Setting Basic Concept

Analysis of present circumstance → Identifying issue → Setting concept (Direction of resolution)

Angle of analysis


- Domestic Economic Situation**
economic growth, price indicator, interest rate, population and other indicators
- Customer's Needs and Public Opinion**
needs of waterworks service, opinion on public sector and official
- Trends at Other Governments, Companies**
other water suppliers, other lifeline related companies
- Thought of Top Management**



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Developing Procedure #2 Individual Plan for Different Sectors

- Estimation of future water consumption**
basis of facility capacity, estimated by numbers that is correlated with water consumption
- Facility improvement plan**
What facility will be built or install during period of plan?
- Facility maintenance and operation plan**
Specific facility maintenance and repairing, operation of water distribution
- Funding and fund management plan**
What funding should be selected to achieve the facility improvement?
- Personnel and organization plan**
employment and assignment of staffs, considering outsourcing



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Developing Procedure #3 Adjustment Among Individual Plans

Estimation of Income and Expense

Facility Improvement

Operation/Maintenance

Personnel/Organization

Funding

Others

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Developing Procedure #4 Design

Front Cover

Sample of Contents

- Chart, Graph, Picture
- Catch-phrase, Slogan
- Systematization
- Easy Terms
- Professional Designer

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Tokyo Waterworks Management Plan 2013

Period 2013 — 2015 (3years)

Catch-Phrase Aiming to provide waterworks services that satisfy our customers

Main Measures

- 1 Stable supply of water
- 2 Countermeasures against earthquakes
- 3 Safe, better tasting water
- 4 Wide-ranging business operation
- 5 Communicating with our customers
- 6 Energy / environmental related measures
- 7 International Contribution
- 8 Reinforcement of management base

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Tokyo Waterworks Management Plan 2013

Fiscal Income and Expenditure Plan

Unit: Million \$ (1\$=100¥)

	Income		Expenditure			Balance		Accumulation				
	Charge	Debt Grant	Cost	Interest	Redemption	Construction						
2013	3,719	3,126	66	56	3,726	2,372	86	345	921	△695	802	
2014	3,684	3,130	44	57	3,690	2,402	72	312	312	903	△586	216
2015	3,735	3,139	85	74	3,737	2,419	63	243	1,012	△216	0	
Total	11,138	9,395	196	187	11,153	7,193	221	900	2,836	△1,497	—	

Effort to Reduce Costs


Unit: Million \$ (1\$=100¥)

Reduction of the regular number of staff (150 person)	21
Promotion of streamlining of office business	23
Effective use of assets	56
Total	100

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Issue of Funding

※ In case of Public Corporation

- Charge Revenue**
Appropriated for operating cost depreciation, interest expense
- Debt (Long-term Bond)**
Appropriated for facility improvement
- Grant, Public fund**
Depends on policy objectives of government



How to select and mix these three method



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General Theory: Modigliani-Miller theorem

Without Tax

Proposition 1 $V_L = V_U$
= Value of corporation does not depend on capital structure.


Proposition 2 $Y_E = Y_0 + \frac{D}{E}(Y_0 - Y_D)$
= Cost of equity is proportional to debt-to-equity ratio.

With Tax

Proposition 1 $V_L = V_U + T_c D$

Proposition 2 $Y_E = Y_0 + \frac{D}{E}(Y_0 - Y_D)(1 - T_c)$
= There are advantages in funding by debt by the amount of the tax saving.
On the other hand, there are distress cost in debt funding.

There is an optimum point



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Special Characteristics of Public Corporation



※ Assumption of general theory

Private Corporation

- No pricing power in the market
- Freely determination of own leverage ratio
- Corporation tax is charged according to performance

Public Corporation

- Charge is locally monopolistic price
- Not free to determine own leverage ratio
- Corporation tax is not charged (in Japan)

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Problems of Funding

Waterworks facilities run some generations

↑

Viewpoint of Intergenerational Equity

To raise funds by debt, and reimburse during all of useful life.

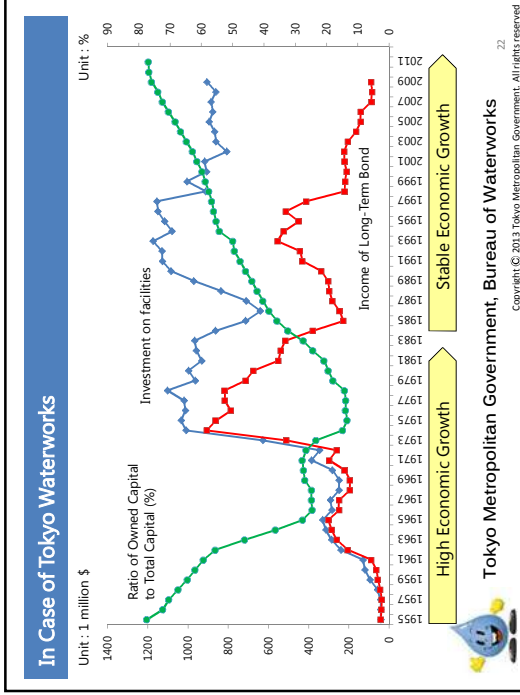
But, there are three problems on debt funding

- ▶ Uncertainty over revenue of charges
- ▶ Uncertainty over the financing of reinvest
- ▶ Heavy interest burden

→

Appropriate measures of funding and capital structure

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4 Grant / Public Subsidization

5 Accounting Information

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Need for Grant / Public Subsidization

Self-Supporting System
To spend operation cost from the earnings of water charges
Water charge revenue doesn't be appropriated other than the costs of providing waterworks services.

If not, grants of public funds are needed

Public Goods

Fire hydrant, emergent water storage tank etc...

Merit Goods

Provision to unprofitable area etc...

External Diseconomies

Deterioration in quality of raw water etc...

Income Redistribution

Reduction and exemption of water charges etc...

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Public Goods

Non Excludability

- Can't exclude non-paying individuals
- High excluding cost

Non Rivalness

- Supplying cost doesn't change

In case of waterworks ... Fire Hydrant
Disaster emergency measures etc...

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Merit Goods

Characteristic

- Can be supplied as private good
- Benefit society using many people

【Example】

- Compulsory education
- Public healthcare

In case of waterworks ... Expansion project (waterworks has not run yet)
Provision in unprofitable area

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External Diseconomies

Definition

- External effect or Technological externalities
- External economies
- External diseconomies

In case of waterworks ... Deterioration of river water

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Income Redistribution

General consideration

Income redistribution using a price of goods and services isn't appropriate.

➔ To impair resource allocation

In case of waterworks ... Expansion project (waterworks has not run yet)
Provision in unprofitable area

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Grant of Central Government

Unit : 1 million \$

Item	2012 Budget	Tokyo
Improvement of small size supplier	235	—
New water resource	70	10.0
Wide-area facility	37	0.6
Reinforcement of earthquake resistance and emergency measure	151	—
Disaster recovery	204	—
Others	25	27.9
Total	722	38.5

0.8% of total amount of general account budget
Enforcement Agency : Ministry of Health, Labor and Welfare




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Grant of Local Government

Unit : 1 million \$



Item	2012 Budget	Detail
Fire hydrant	18	Installing and maintenance
Charge exemption and reduction	28	For poor and facilities of social welfare
Earthquake resistant facilities	3	Emergent water storage tank
Development of new water resources	13	Construction of Dam
Others	12	
Total	74	

0.12% of total amount of general account budget
Ministry of Internal Affairs (MIC) sets the general standards of local government's grants

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Acquisition of Reliable Accounting Information

Necessity

Internal control

Disclosure

Attention



Cash flow management, pricing, planning etc...
Financial status, business performance
To outside stakeholders, customers, government etc...

Comparability from year to year

Comparability with other corporations

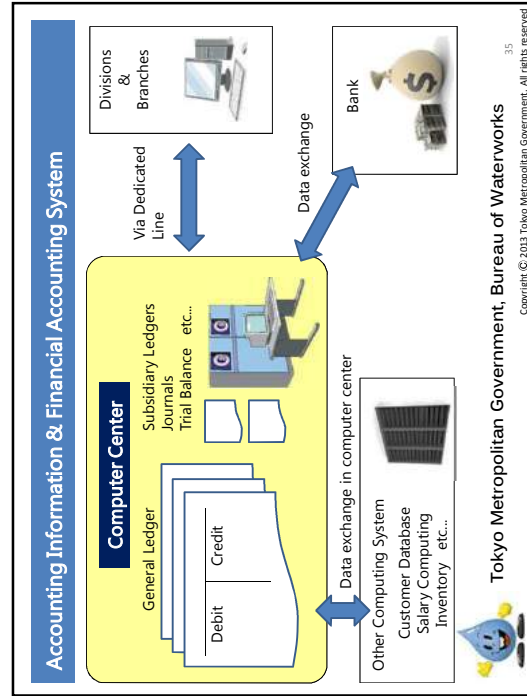
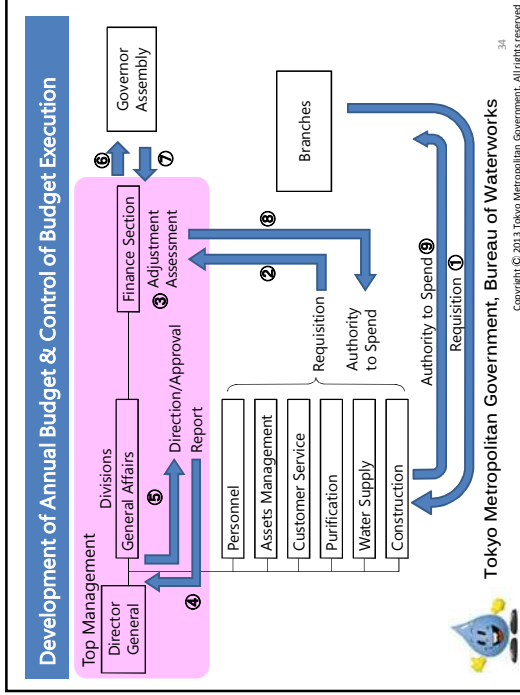
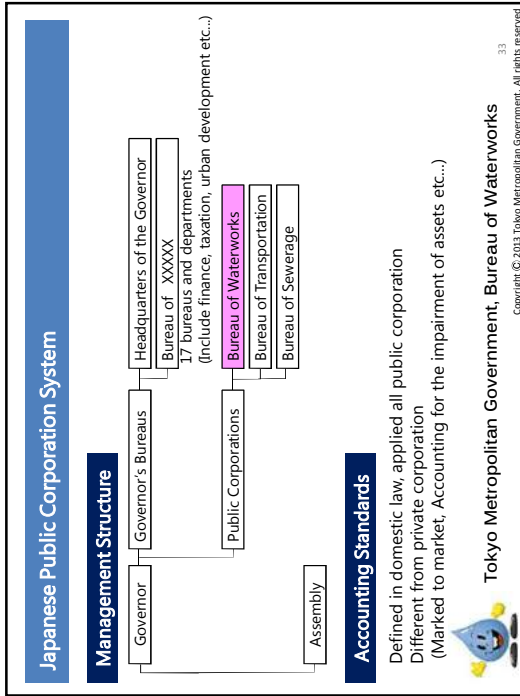
➔

We should apply generally accepted accounting standards

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Financial Statements of Tokyo Waterworks (FY 2011)

Balance Sheet	
Assets	
Non-Current Assets	26,998
Property, Plant and Equipment	23,378
Buildings	4,462
Plant and Equipment	1,701
Machinery Equipment	14,965
Construction in Progress	1,405
Intangible Assets	2,256
Current Assets	818
Deferred Assets	3,400
Liabilities & Capitals	26,998
Liabilities	2,653
Non-Current Liabilities	1,821
Current Liabilities	1,052
Capitals	24,145
Reserve	15,009
Borrowed Capital (Corporate Bonds)	3,353
Surplus	5,741
Legal Capital Surplus	5,165
Retained Earnings	526

Income Statement	
Operating Revenue	3,155
Water Charge Revenue	2,073
Revenue on Trust, Construction	16
Other Operating Income	24
Operating Expense	2,602
Raw Water Expense	1,05
Water Treatment Expense	256
Water Distribution Expense	1,043
Water Service Expense	241
Trust Construction Expense	16
Customer Service Expense	276
Administrative Expense	160
Depreciation Expense	626
Depletion Expense	35
Other Operating Expense	3
Operating Income	292
Non-Operating Revenue	156
Non-Operating Expense	156
Other Income	292
Extraordinary Loss	21
Surplus	313
Net Income	313
Earned Surplus	0
Unappropriated Earned Surplus	313

unit: 1 million dollars

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Conclusion

Self-Supporting System
 The most important management principle
 Leads optimizations of

- supply and demand of water
- efficient management structure
- rate level and rate system
- resource allocation as whole society

To realize Self-Supporting System ...

1. Mid and Long Term Perspective
2. Development of Mid Term Management Plan
3. Funding and Capital Structure
4. Grant / Public Subsidization
5. Accounting Information






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India in Japan

Instant Curry Roux Mix

Dish up





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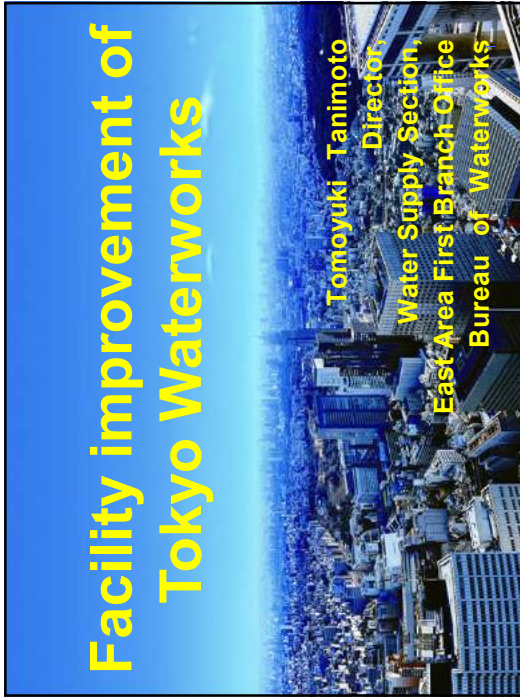
Thank You for Your Kind Attention

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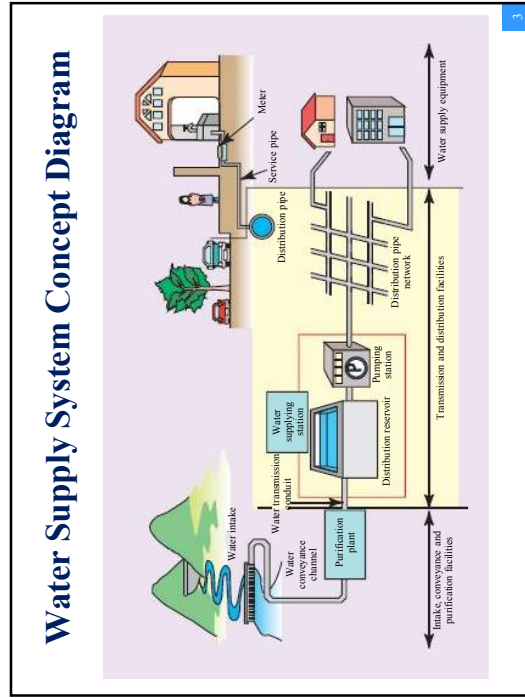


Outline of Tokyo Waterworks

■ General Information

Item	Unit	Amount
Service Area	km ²	1,235
Population Served	million	12.8
Number of Service Connections	million	7.0
Total Length of Distribution Pipes	km	26,348
Daily Distribution Amount	million m ³ /day	4.2

As of March 2012



Conduit Length (Km)

	Wards	Tama	Total
Conveyance channel	98	157	255
Transmission conduit	149	445	594
Distribution pipes	Distribution mains	668	2,365
	Small distribution pipes	14,579	23,983
Total	16,523	10,674	27,197

Types of Conduits (Materials)

- Conveyance channels: Concrete pipes, ductile cast-iron pipes, steel pipes, etc.
- Transmission and distribution pipes: Ductile cast-iron pipes, steel pipes, etc.
- Service pipes: Stainless steel pipes, vinyl chloride pipes, etc.

5

Remaining Aged Pipes

- We still have antiquated pipes that were laid years ago
 - Causes of leaks from pipe damage and turbid water
 - Low degree of seismic-resistance
 - Large danger from pipes laid around by 1965
 - A bottleneck to continuing to provide a stable water supply in the future
- We refer to such antiquated pipes as “aged pipes”

6

Condition of Aged Pipes (Interior Surface Rust)



500mm High-quality cast-iron pipe (water pipe about 40 years old)

7

Vulnerability of Aged Pipes

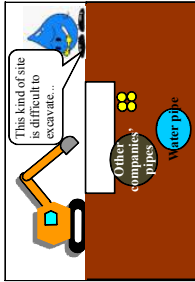


Water pipe pulled apart by the Hanshin-Awaji (Kobe) Earthquake

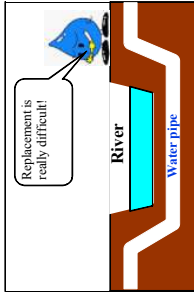
8

Sites Where Aged Pipes Remain

Sites with poor work environment
Under roads where there are many buried objects, or where road width is narrow, aged pipes have been left because work is difficult



Crossing sites under railways, rivers
Aged pipes have been left because there are numerous constraints, and replacement is difficult



Routes with no backup function

There are routes where the water supply can't be shut off to replace the pipes because water cannot be supplied through other conduits

9

Example of Site Where Aged Pipes Remain



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Test dig site photo

11

Leak Accident at Intersection in Front of Station



12



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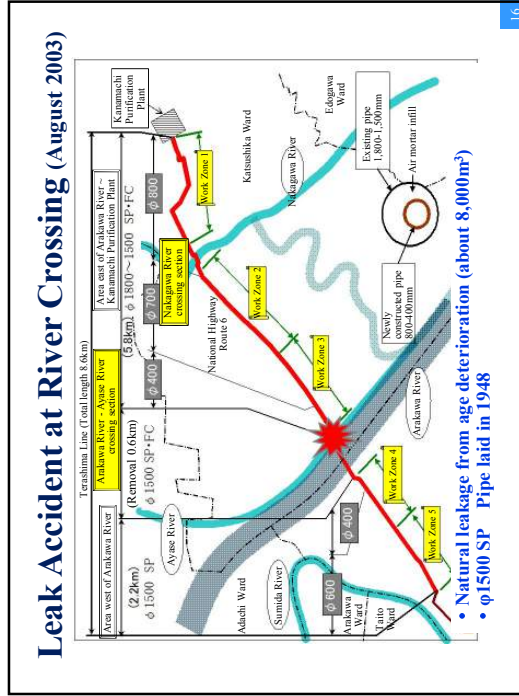
Leak Accident From Age Deterioration (March 2005)

- Natural leakage from age deterioration, etc. (about 5,000m³)
- φ500 FCA Pipe laid in 1960

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Leak Accident at River Crossing (August 2003)

- Natural leakage from age deterioration (about 8,000m³)
- φ1500 SP Pipe laid in 1948

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Leak Accident at Arakawa River Crossing Section



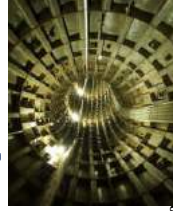
17

Aged Pipe Replacement Status

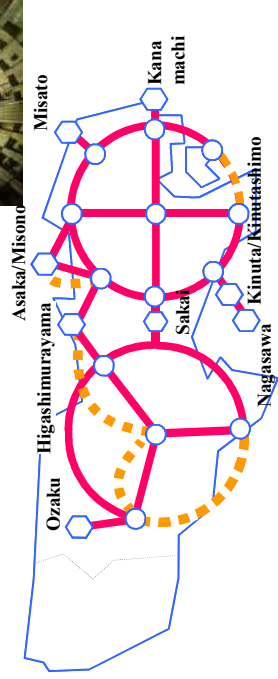


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Improvement of Water Transmission Pipe Network

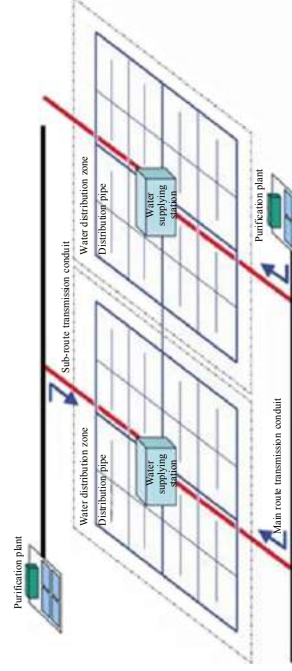


- Stable and efficient water supply operation
- In accident or emergency, stronger back-up functions required



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Duplication of Water Receiving System



By having a duplicate water receiving system, secure a stable water supply when any trouble occurs at purification plant or transmission conduit.

20

10-Year Project to Make Water Pipe Joints Seismic-resistant




Over 10 years we will replace **about 5,000km** of water pipes with pipes that have seismic-resistant joints

How far is 5,000km?
This corresponds to 10 times the distance between Tokyo and Osaka (500km)

Dear City Residents:
To keep damage from disruption of the water supply to a minimum and ensure the water supply to the extent possible, Tokyo Waterworks is now accelerating replacing existing pipe joints, those that have seismic-resistant joints with pipeline to prevent joints from pulling apart.

Seismic-resistant Pipelines



Joints don't pull apart Responds to ground movements

Seismic-resistant joint pipe structure

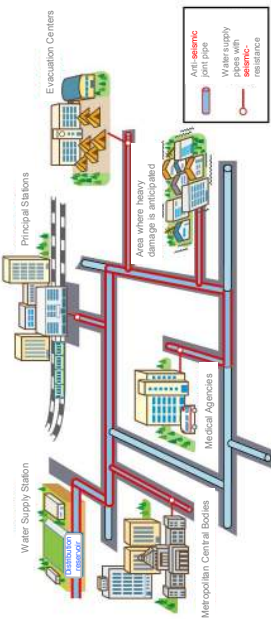
Seismic-resistant joint improvement ratio

Today	29%	After 10 years	54%
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Shortened number of repair days

Today	30 days	After 10 years	18 days
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Building Disaster-response Capabilities of Waterworks



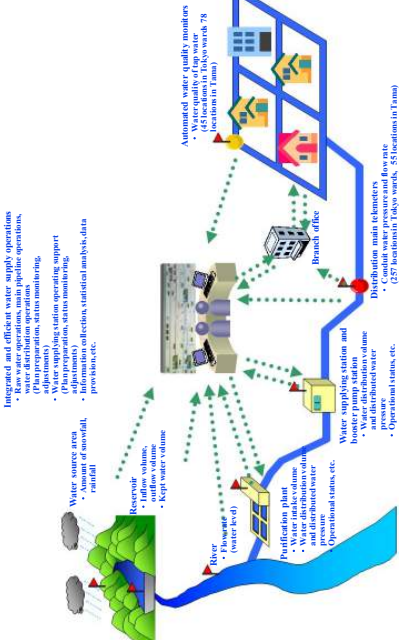
- Water Supply Stations
- Principal Stations
- Evacuation Centers
- Metropolitan Central Bodies
- Medical Agencies

Area where heavy damage is anticipated

Anti-seismic pipe joints pass with resistance

- Considering earthquake movement scenarios, liquefaction risk and progress in replacing anti-seismic joints, sites with high priority have been implemented first.
- Besides the capital area and medical institutions, evacuation centers and major train stations were newly added.

Water Supply Operations



Water source area

- Water source area
- Water source area
- Water source area

Reservoir

- Water volume
- Water volume
- Water volume

Purification plant

- Water makes volume
- Water makes volume
- Water makes volume

Water supplying station and house pump station

- Water supplying station
- Water supplying station
- Water supplying station

Distribution main network

- Water supplying station
- Water supplying station
- Water supplying station

Automated water quality monitors

- Water quality
- Water quality
- Water quality

What are “Water Supply Operations”?

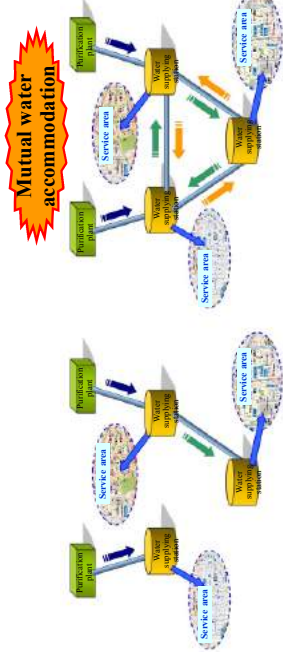
- **Definition of water supply operations**
Water supply operations refer to the control of operations for raw water, treatment water, water transmission and water distribution while measuring mutual accommodation among facilities in order to ensure optimal operations based on the status of each of these factors
- **Basic thinking concerning water supply operations**
Water supply operations must use raw water efficiently and achieve optimization of the water transmission, and contribute to economic efficiency
- **Necessity of water supply operations**
To provide an impartial water supply, large-scale and complex water distribution network facilities extending over a broad region must be operated efficiently

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Tokyo Waterworks Characteristics

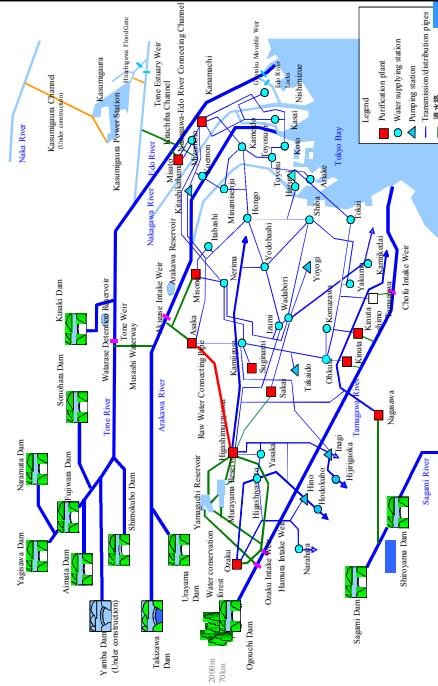
Typical water transmission and distribution system (image)

Tokyo Waterworks water transmission and distribution system (image)



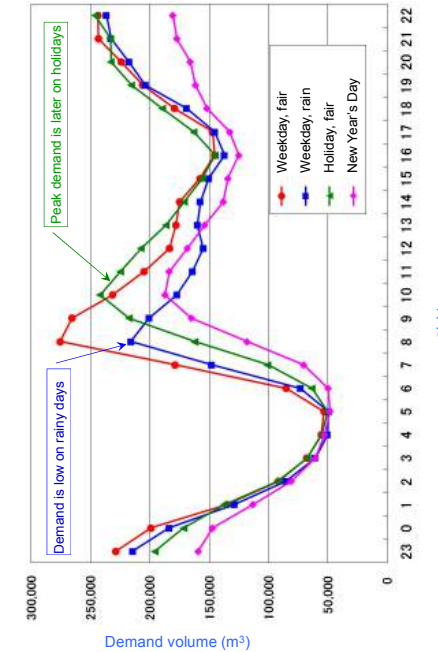
26

Water Sources and Main Facilities



27

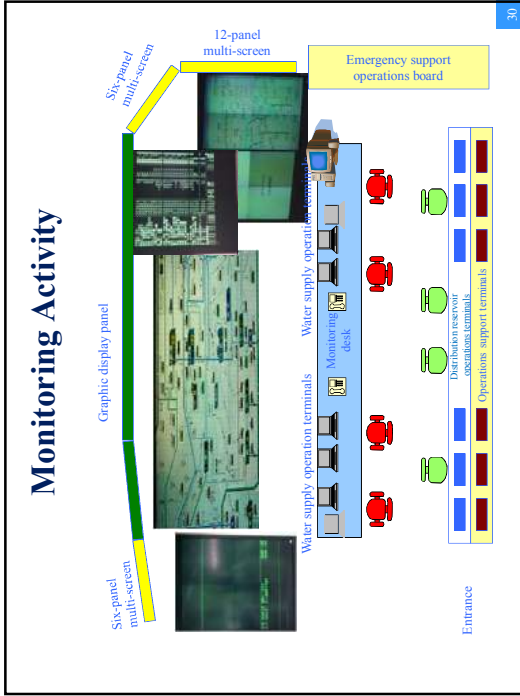
Fluctuation in Water Supply Volume by Time of Day



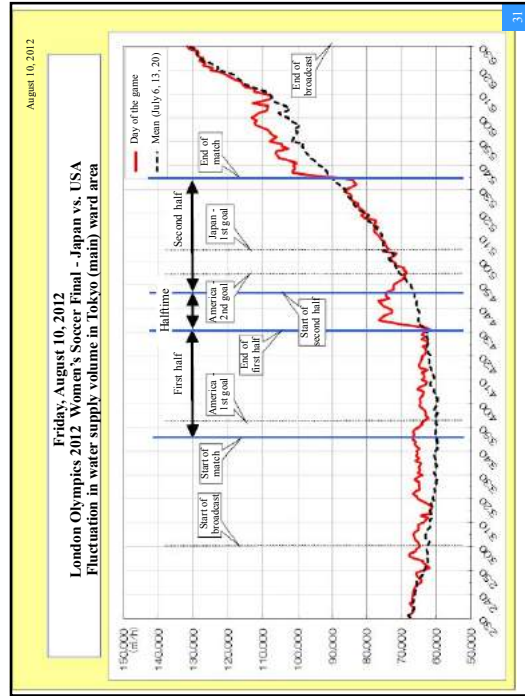
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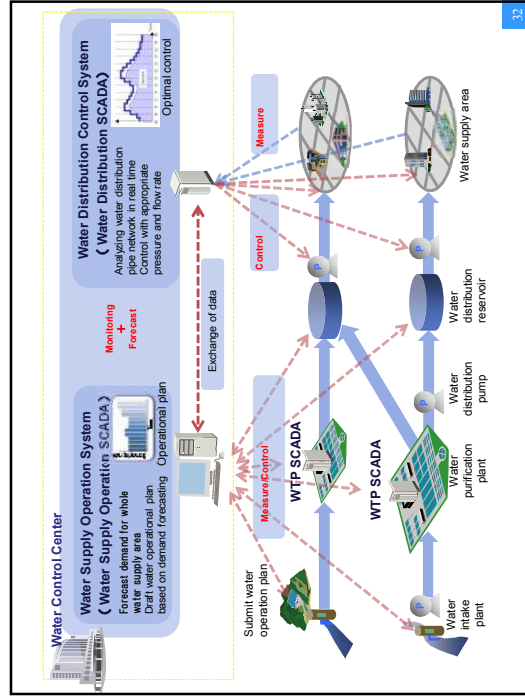
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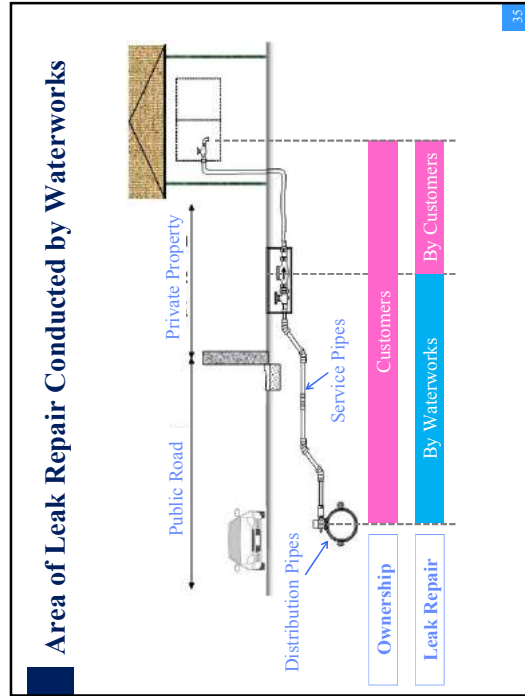
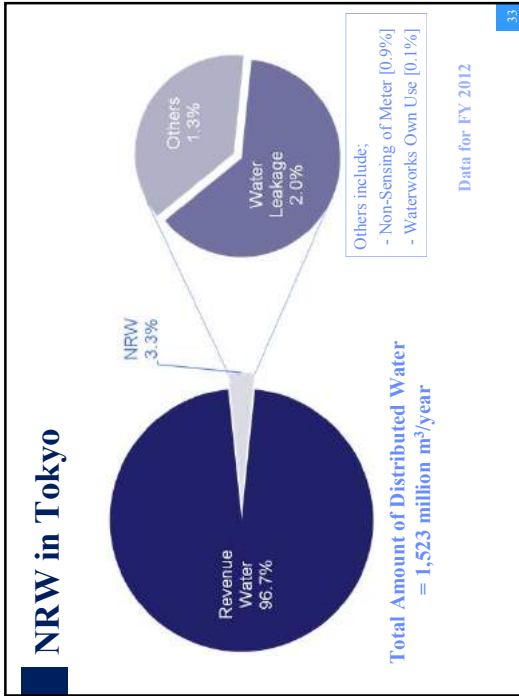
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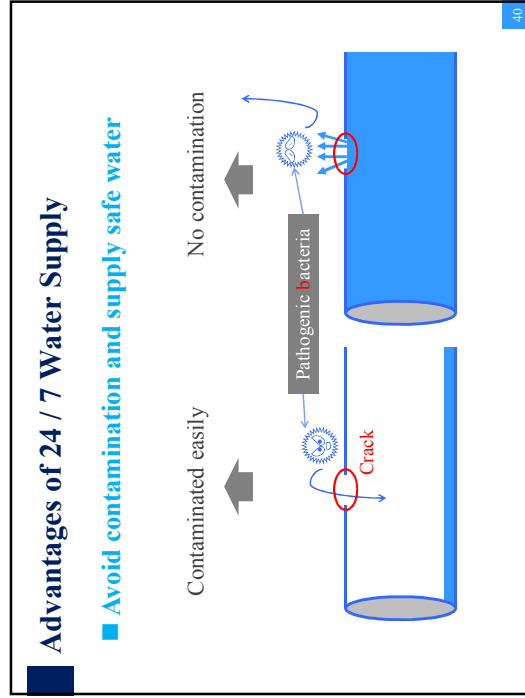
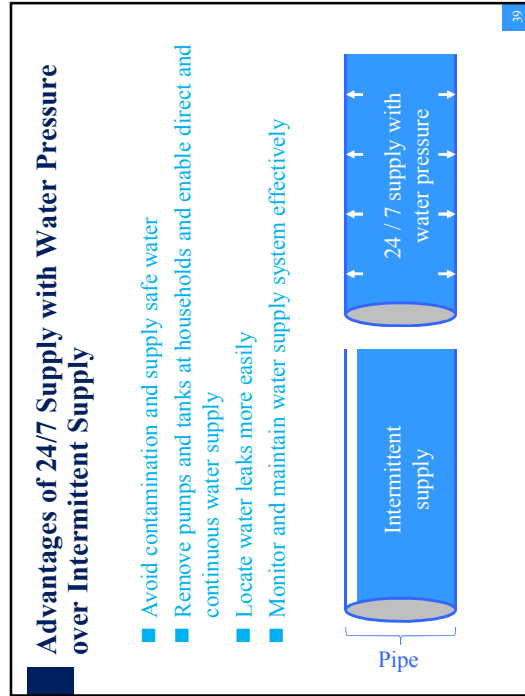
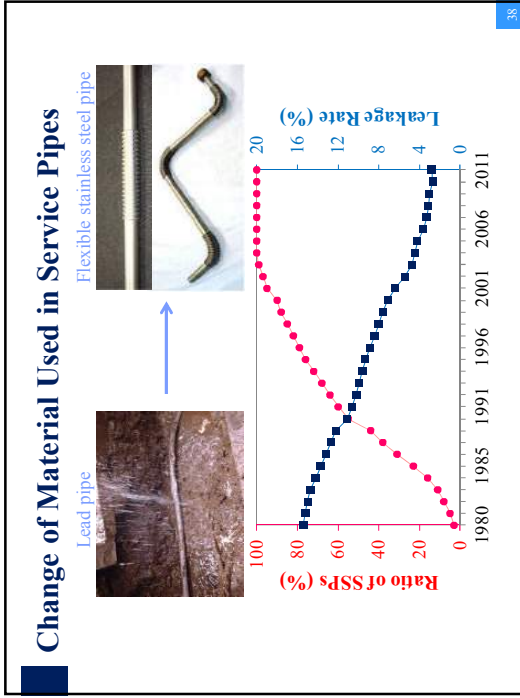
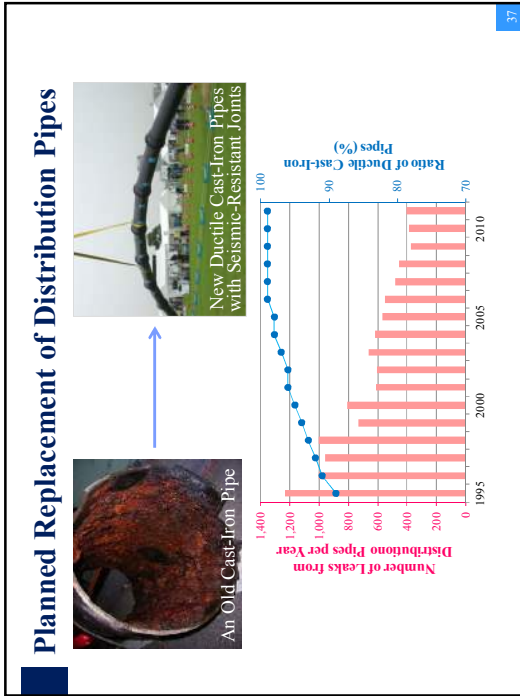


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Leak Detection Work

- **Detect Underground Leaks**
 - By measuring the amount of water entering into an isolated distribution area late at night
 - By listening for sounds of water leaks using acoustic bars or electric leak detectors



Advantages of 24 / 7 Water Supply

- Remove pumps and overhead tanks at households and enable direct and continuous water supply

Advantages of 24 / 7 Water Supply

- Locate water leaks more easily

Advantages of 24 / 7 Water Supply

- Monitor and maintain water supply system effectively

Tokyo Waterworks Asset Management

Inspection Research




Photo-1 In basin




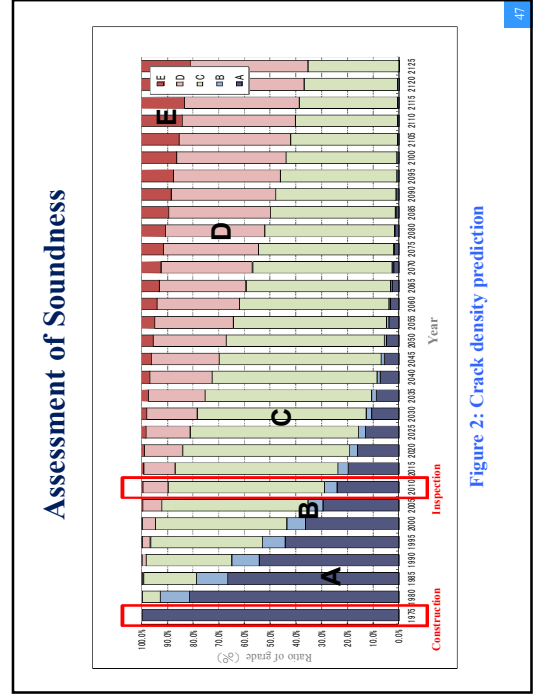
Photo-2 Delamination

With unified criteria
Concrete structures; crack-density / width / length, delamination density (Table 1), etc.

Pipes : number of corrosion / leakage, soil characteristics, etc.

Grade	Cracks		Delamination	
	Crack density (value)	Crack density (value)	Delamination density (value)	Delamination density (value)
A	Not exceeding 0.01 ml/ft ²	Not exceeding 0.00 ml/ft ²	Not exceeding 0.00 ml/ft ²	Not exceeding 0.00 ml/ft ²
B	0.01 ~ Not exceeding 0.03 ml/ft ²	0.01 ~ Not exceeding 0.25 ml/ft ²	0.01 ~ Not exceeding 0.25 ml/ft ²	0.01 ~ Not exceeding 0.25 ml/ft ²
C	0.03 ~ Not exceeding 0.25 ml/ft ²	0.25 ~ Not exceeding 0.50 ml/ft ²	0.25 ~ Not exceeding 0.50 ml/ft ²	0.25 ~ Not exceeding 0.50 ml/ft ²
D	0.25 ~ Not exceeding 0.50 ml/ft ²	0.50 ~ Not exceeding 1.00 ml/ft ²	0.50 ~ Not exceeding 1.00 ml/ft ²	0.50 ~ Not exceeding 1.00 ml/ft ²
E	0.50 ml/ft ² or more	1.00 ml/ft ² or more	1.00 ml/ft ² or more	1.00 ml/ft ² or more

Table 1: Evaluation Criteria of Concrete Structures



Database




Figure 1

Electronic database, possible to access by any staffs.
(inspection research data, repair histories, asset ledger, financial data, operation and management data, etc.)

Facilities: concrete structure and equipment
Pipes: distribution pipes. (linked with Mapping System)

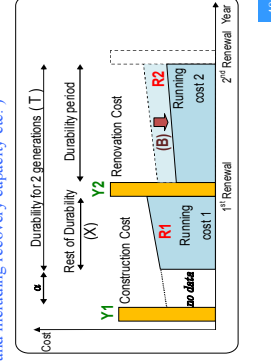
Relations LCC Analysis and Renewal plan

$LCC = (Y1 + Y2) + (R1 + R2) - B$

Y1: Construction Cost, Y2: 1st Renewal Cost (Y2)
R1: Running Cost, R2: Running Cost after 1st Renewal.
B: Benefit by Renewal (saved cost of electric power, chemical consumption, repair frequency, and including recovery capacity etc.)

$$\sum ATC = \sum \min [LCCn] / Tn$$

$\sum ATC$: sum of Annual Total Cost
LCCn : Life Cycle Cost for 2 generations
Tn : Durability for 2 generations



Accounting System in Delhi Jal Board

Presented by
 Sh. K. S. SHARMA
 Joint Director (Finance & Accounts)
 Delhi Jal Board



1

History of Delhi Jal Board

Delhi Jal Board is the only agency responsible for treatment and supply of potable water and treatment of sewerage in Delhi.

Prior to formation of Delhi Jal Board:

- 1926 - Joint Water & Sewerage Board under Joint Water & Sewerage Board Act.
- 1957 - Delhi Water Supply and Sewerage Disposal Undertaking under DMC Act.
- 1998 - Delhi Water Board Act.



2


Accounting Operation

Delhi Jal Board is an organized body to manage the whole operations relating to water and sewerage activities broadly in three sections.

1. Administration
2. Finance
3. Accounts and Revenue wings

3. Engineering

- Water Constructions
- Drainage Constructions
- WTP-Operation
- STP-Operations
- Civil Maintenance
- E&M Maintenance
- Sewage Maintenance
- Leak Detection
- Planning




3

Sources of Funds

Main source of income of Delhi Jal Board

1. Income from sale of water
2. Grant / Loan from Govt. of NCT of Delhi / Govt. of India




4

Accounting system adopted by Delhi Jal Board

Prior to 2003-04 Accounts of Delhi Jal Board were maintained on Cash Basis Single Entry System.

Switched to double entry accrual basis computerized accounting system in 2003-04. Accordingly annual accounts are prepared in the format approved by CAG which consist of Income & Expenditure Account, Balance Sheet , Schedule to Income & Expenditure Account, Schedule to Balance Sheet , Notes to Accounts.




5

Accounting system adopted by Delhi Jal Board

Being part of Govt. of National Capital Territory of Delhi, Delhi Jal Board is also to follow laid down Govt. procedures.

To integrate the General Accounting System and Govt. procedures Delhi Jal Board also prepares Annual Budget under section 65 of Delhi Water Board Act, 1998.



6

Accounting system adopted by Delhi Jal Board

Being a statutory body, Accounts of Delhi Jal Board are audited by Accountant General of Central Revenue (AGCR).

Besides that Delhi Jal Board has also have an integrated Internal Audit wing.



7

Accounting Policies

Delhi Jal Board prepares its financial statements adopting the accounting standards notified by the Institute of Chartered Accountants of India.



8

Accounting Policies

Accounting Standard-01
 Delhi Jal Board discloses the Accounting Policies which contains the following concepts:

- Accounting Conventions
- Historical Cost Basis
- Accrual Basis
- Matching Concept

Accounting Standard-02
 Inventories are valued at cost and charged at the time of actual consumption.



9

Accounting Policies

Accounting Standard-06
 Depreciation Accounting-Delhi Jal Board has adopted Straight Line Method of Depreciation

S. No.	Nature of Asset	Rate of Depreciation
1	Building & Civil Structures	2%
2	Plant & Machinery	3.50%
3	Electrical Installation	10%
4	Furniture & Fixtures	10%
5	IT Infrastructures	10%
6	Office Equipments	7.50%
7	Tools & Equipments	8.50%
8	Vehicles	8.50%



10

Accounting Policies

Accounting Standard-09
 Revenue Recognition - Delhi Jal Board recognizes the revenue on raising of bills (sale of water, sewage charge, interest on late payment, cheque penalty)
 Other fees are recognized on receipt



11

Accounting Policies

Accounting Standard-10
 Accounting for Fixed Assets-Delhi Jal Board maintain the Fixed Assets as per Accounting Standard 10

Accounting Standard-12
 Accounting for Government Grant-Delhi Jal Board is following accounting standard 12

Capital Grant:
 Non-Depreciable Assets-Capital Reserve
 Depreciable Assets-Deferred Income
 Revenue Grant-Income



12

Accounting Policies

Accounting Standard-15
Employee Benefits - Delhi Jal Board has adopted Central Civil Service Rules to give all service as well as retirement benefits like Pension, Gratuity etc. to its employees.


Accounting Standard-16
Borrowing Cost- As per accounting standard 16 Delhi Jal Board loading construction period interest expenses as Finance Cost



13


Accounting Policies

Financing Pattern for Project:
Delhi Jal Board do not borrow directly from public.
Delhi Jal Board receives funds in the shape of loan and grant from Govt. of NCT of Delhi or Govt. of India.
For externally aided project funds are received through Govt. of India / GNCT of Delhi as per term of agreement from International agencies like ADB, JICA etc.



14

THANK YOU



15

第3回セミナー

2014年8月27日に、Indian Habitat Centerにて開催された。出席者数は総勢約90名人であった。「NRWの削減」をメインテーマに据え、以下の発表があった。

- 1) 持続可能な水道事業経営～東京都の経験から：東京水道サービス(株)増子社長
- 2) 東京都水道局の漏水防止対策：東京都水道局、谷本東部第一支所給水課長
- 3) NRW率低減に向けた東京都水道局の取組み：東京都水道局、小澤新宿営業所長
- 4) 漏水探知デモンストレーションの実施報告：堀江専門家
- 5) DJBにおける現状の漏水発見及び漏水修理のプロセス：DJBの発表

セミナーの後半は、DJBが今後どのようにNRWを削減していくかについて、JETの百瀬統括をコーディネータとして、パネルディスカッションを行った。内容は以下の通りであった。

- a) 検針方法
- b) 料金未払い者への対応
- c) 配水管などの水道施設建設のためのコストは顧客に請求するか否か
- d) 水道料金の見直し頻度
- e) 料金請求の期間
- f) メータの設置状況、また、メータのないものへの料金の請求方法
- g) 水道事業への政府からの補助金投入状況
- h) 未納料金の回収にかけた費用と回収できた料金の比率
- i) (TSSから) LDIの作業効率を改善するために、職員増加を提案
- j) (谷本課長から) 古い管や痛んだ管の交換と、マッピングなどのデータベース更新を継続的に実施することの重要性を提案
- k) (増子社長から) TSSがタイ国のパイロットプロジェクトでNRWが26%から3%にまで減ったケースを紹介



第3回セミナー1



第3回セミナー2



第3回セミナー・ディスカッション1



第3回セミナー・ディスカッション2



Japan International Cooperation Agency

THIRD SEMINAR UNDER “THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT” (Scheduled)

Organized By

Delhi Jal Board AND Japan International Cooperation Agency

Date: 27th of August 2014

Venue: Magnolia, Indian Habitat Center

Location: Delhi, India

09:30 ~ 10:00	Registration
Opening Speech	
10:00 ~ 10:10 AM	- Delhi Jal Board (DJB) <i>Mr. Vijay Kumar, Chief Executive Officer, Delhi Jal Board</i>
10:10 ~ 10:20 AM	- JICA <i>Mr. Shinya Ejima, Chief Representative of India Office, Japan International Cooperation Agency</i>
Special Lecture	
10:20 ~ 10:50 AM	“Sustainable Water Supply Management ~Experience in Tokyo~” <i>Dr. Atsushi Masuko, President, TSS TOKYO WATER Co., Ltd (Former director general of Waterworks Bureau of Tokyo Metropolitan Government)</i>
DJB’s session	
10:50 ~ 11:20 AM	“Prevention of water leakage in Delhi” <i>DJB LD&I or The relevant persons of leakage prevention unit</i>
Waterworks Bureau Tokyo Metropolitan Government’s session	
11:20 AM ~ 12:20 PM	“Prevention of water leakage in Tokyo” <i>Mr. Tomoyuki Tanimoto, Director, Water Supply Section, East Area First Branch Office, Bureau of Waterworks, Tokyo Metropolitan Government</i>
	“NRW reduction practice in TMWB” <i>Mr. Kenji Ozawa, Manager of Shinjuku Service Station, West Branch Office, Bureau of Waterworks, Tokyo Metropolitan Government</i>
12:20 ~ 12:35 PM	Tea Break
JICA Expert session	
12:35 ~ 13:05 PM	“Leak detection demonstration performance report and suggestion about leakage reduction” <i>Mr. Hiroki Horie, JICA Leak Detection Expert</i>
Panel Discussion	
13:05 ~ 14:05 PM	“Conversion to stable water supply management by reduction of Non-Revenue Water” <i>Coordinator: Mr. Kazufumi Momose, Chief Advisor Panelist: DJB, TMWB, JICA Expert</i>
Closing Speech	
14:05 ~ 14:15 PM	- Delhi Jal Board (DJB) <i>Mr. Amit Satija, Addl. C.E.O Director (Finance &Accounts), Delhi Jal Board</i>
14:15 ~	Lunch



Japan International Cooperation Agency

THIRD SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
L.R. Sharma	AE (C)			
N.K. Verma	EE (D&S)			
V.K. SINGH	EE (M&S) II			
TAKAHITO SUZUKI	Project Formulation Advisor			
EPI FUJITA	Staff, JICA			
V.S. THIND	CE (or) P/L II			
Y.K. Sharma	SE (M&S)			
Vikram Singh	SE (Advisor)			
B.M. DHAUL	Mem (WS)			



Japan International Cooperation Agency

THIRD SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
RAJESH MITRA	SE (N)			
Bijender Kumar	EB (M&S)			
Rajeev K. Gupta	EE (ET)			
V.P. Sharma	SE (SW)			
Narash Kapur	AE (C)			
V.K. BANSAL	Ground Advisor			
R.S. Mehta	CE (M&S) W			
DK JAIN	EE (WE) II			
M.R. Tomar	SE (M&S)			
Wataru SHIMIZU	JICA			



THIRD SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
Pukhraj Singh	AE(C)			
Nashim Ahmed	JE(C)			
JAZKELMAN	J.R(C)			
Himanshu Agamul	EE(NW)I			
Pooja				
U. B. Tripathi	Secy/DWB			
Bit Singh	SE (C/M) D.S.B			
Narash Kumar	DDR (M.R)			
Gopender Kumar	EE NE IV			
Hazi Mohan	AE(LD&I)			



THIRD SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
A.K. GUPTA	SE (GWC) (D/W) Water			
Ajay Gupta	SE (Central)			
V.P. GUPTA	SE (EDW) S&B			
J.K. ARORA	SE (C/M) WE			
Anil K. Sharma	CE (D/W) I			
S.K. Daniya	EE (S&B) I			
Kensaku Ichikawa	Representative			
Chizaki SATO	Intern			
R.K. Bhatta	SE (NW) I			

JICA
JICA



THIRD SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
D.R. PAURBEY	Reporter SAJHA MANSAD			
LALIT SINGHA	AE - DJTB			
ASHOK KUMAR CHAUDHARI	SE (C/M) DJTB			
S. L. MEHRA	CE (WEST)			
SODHIR KUMAR	GE (EAST) I			
Radhya Tyagi	EE (Central) II			
B. C. Patel	EE (S) IV			
MINISH KR	EE (SW) III			
Uttam Kumar	CE (S) III			
Minoru IKEI	Dy Chief Advisor			



THIRD SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
B. L. KURU	BE (N) - I			
S. C. NARAYAN	SE (SW) II			
K. S. SHARMA	JE (D) F&M II			
A. K. JAIN	CE (C-M)			
R. S. Tyagi				
N. K. KHARE	BE (S) II			
K. K. HARIT	EE (NW) IV			
Mohinder Singh	EE (D) I			
H. S. BHATI	JE (C) W&E			
H. V. TANDON	DIR (Rev)			



Japan International Cooperation Agency

THIRD SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
Yuhei Ito	Project Coordinator JICA Expert	[REDACTED]	[REDACTED]	
Manabu Fukushima	SCADA JICA Expert			
Sanjay Prasad	GIS Mapping JICA Expert Team			
Kazufumi Momose	Chief Advisor JICA Expert Team			
Pooja Singh	Project Coordinator JICA EXPERT TEAM			
Hirosh Izumoto	JICA EXPERT TEAM			



Japan International Cooperation Agency

THIRD SEMINAR FOR "THE ASSISTANCE RELATED TO DELHI WATER SUPPLY IMPROVEMENT PROJECT"

Venue: India Habitat Center			Location: Delhi, India	
Name	Designation	Mobile number	E-mail address	Signature
S.K. Bhandari	JE South & MS	[REDACTED]	[REDACTED]	
Pawan Sharma	EE (South) IT DSB			
R.K. Singh	EE (N-P)			
ANANDPAL	EE (W) II			
R.S. GOSWAMY	TD (R) HQ			
Arun Gupta	EE (SW) - II			
S.A.A. NAJMI	Member (Finance)			
Koichiro Arai	JICA Expert			
Anya Puri Jaiswal	JICA Expert Team			
Manzi Dhyani	JICA EXPERT TEAM			



Sustainable Water Supply Management

— Experience in Tokyo —

Atsushi Masuko, Dr. Eng.
President
TSS Tokyo Water Co., Ltd.

1

Why Must NRW be Reduced?

Reducing Water Loss = Developing New Water Sources

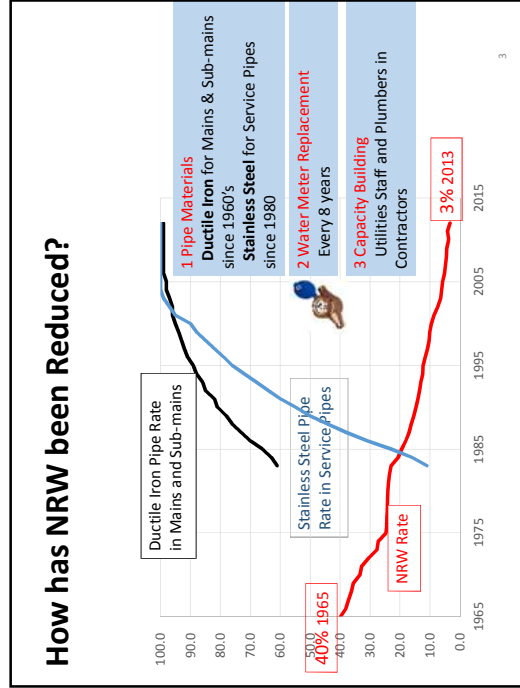



Field Leak Detection Works Ogochi Reservoir

In addition, NRW Reduction leads to

Making Pipe Networks More Robust and Anti-seismic
Reducing Adverse Health Risks and
Customer Service Improvement

2



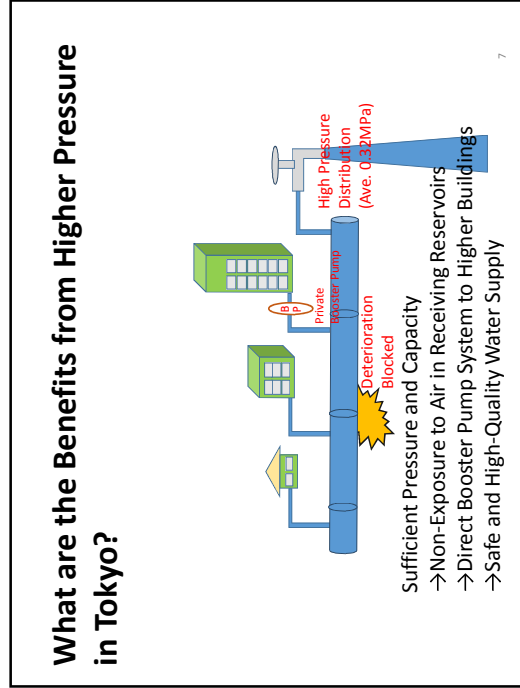
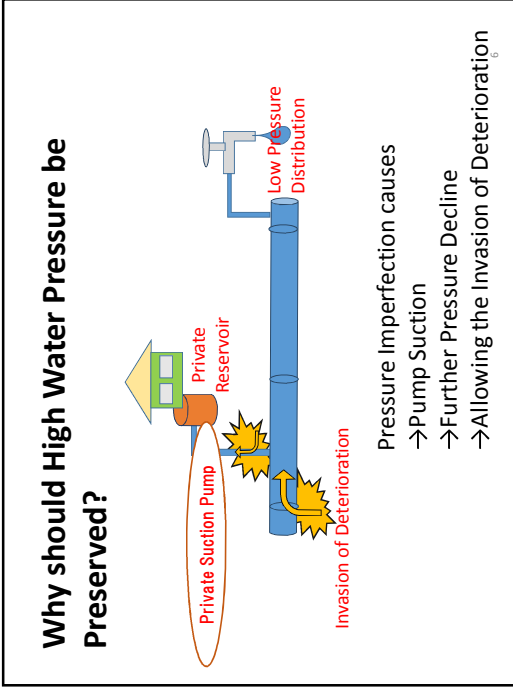
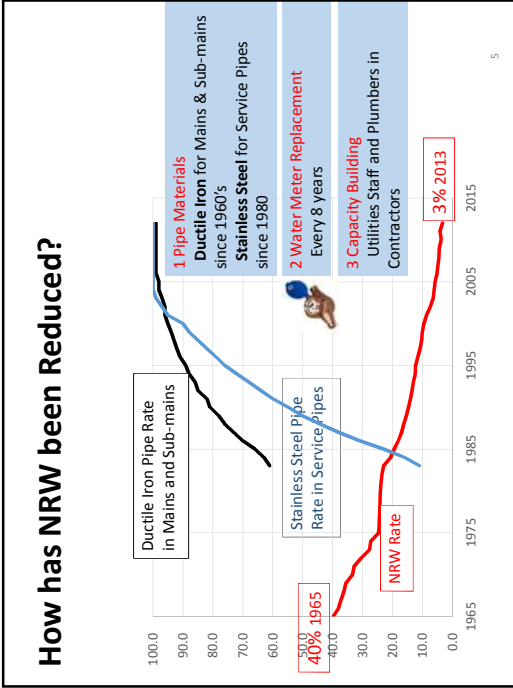
How Has the Distribution Network been Improved?

Pipe Renovations

- Mains and Sub-mains
 - Old Cast Iron, Old Asbestos ⇒ New Ductile Cast Iron
 - ⇒ Fewer Bursts, More Anti-seismic, More Robust And Fewer Leaks
- Service Pipes
 - Old Lead ⇒ New Corrugated Stainless Steel
 - ⇒ No Adverse Health Effects, More Robust And Fewer Leaks




4



History of Pressure Increase

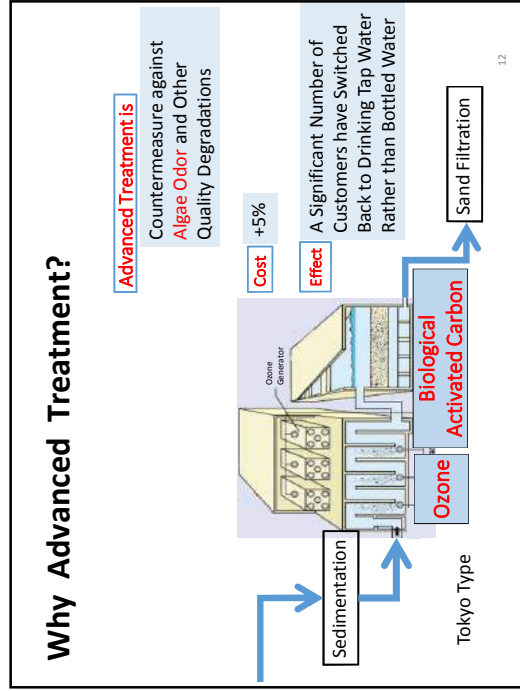
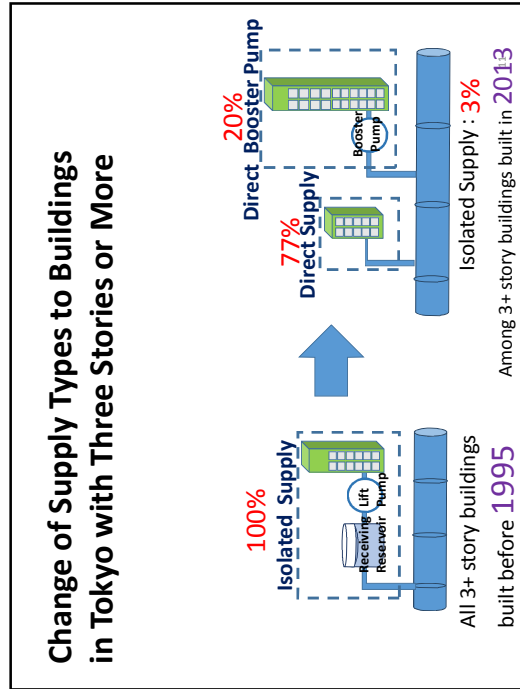
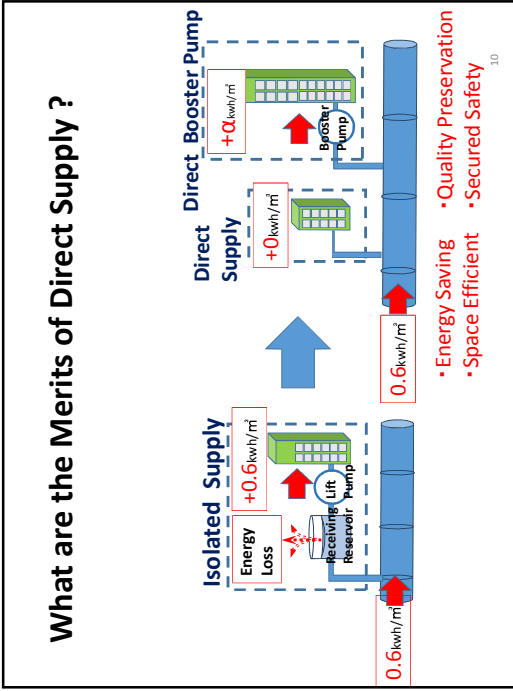
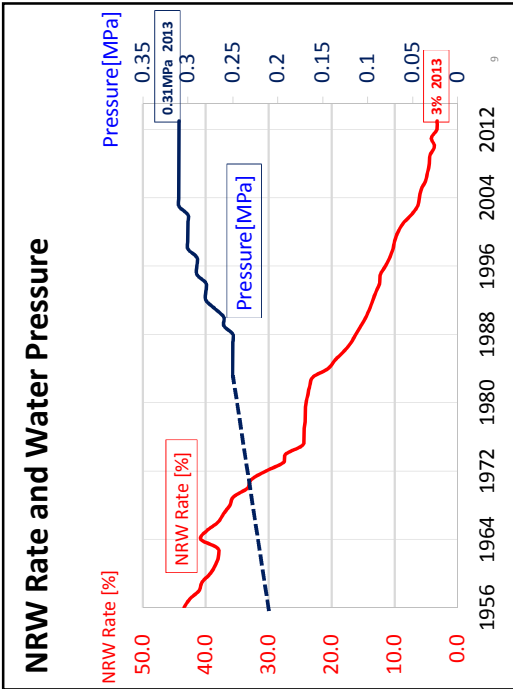
50 years ago

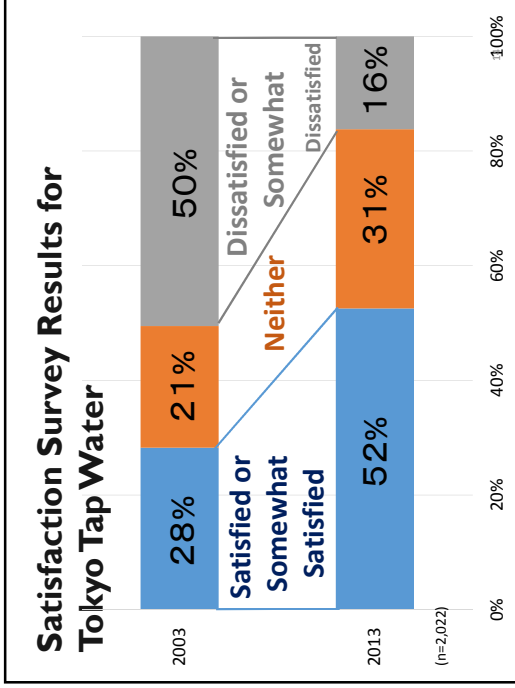
Low Rise Buildings, Lower Requirement for High Pressure Supply
 The Higher the Pressure, the More Leaks Therefore, Supply Pressure was Lower

Now

High Rise Buildings and Less Space
 ⇒ Higher Requirement for Increased Pressure Supply and Direct Supply System

The Benefits of NRW Reduction Work
 ⇒ Fewer Leaks, Energy Saving, Space Saving and High Quality





Tap Water is as Good as Bottled Water

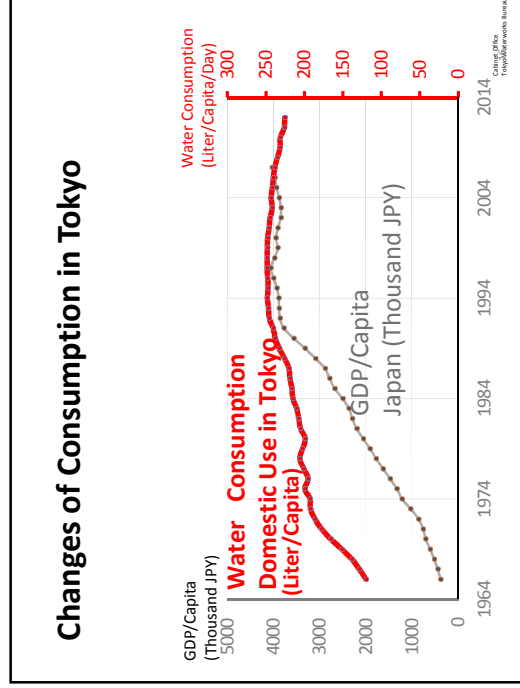
Which is tasty, A or B?

Blind Test

A Tap Water Tokyo 50%

B Bottled Water In Market 50%

among 56,000 people at 134 sites in 2013



Considerations for the Future

- Economic Growth raises Water Consumption as shown.
- Duplication, Networking and Marginal Capacity is required for Reliability of Supply, even in case of Emergencies like Natural Disasters.
- Ceaseless Renovation and maintenance of the Water Supply System is Critical.
- Every Social Activity Depends on the Water Supply. ¹⁷

LEAK DETECTION AND REPAIR PROCESS

S.C. Vashishth
SE(WWW)II

1

OBJECTIVE

The Leak Detection and Investigation Cell was set up in 1979 with an objective of detecting leakage in the water mains, informing the concerned divisions to take remedial action to plug in the leakages and thus reducing wastage of precious water.

2

FUNCTIONS OF THE PATROLLING STAFF

- To detect surface leakages in the water mains.
- To report leakages to the concerned Engineer-in-charge.
- To detect hidden leakages on receiving request from a particular division by using leak detection equipments.

3

PROCEDURE FOR LEAK DETECTION

1. BY VISUAL OBSERVATION DURING FIELD SURVEY
2. BY THE USE OF LEAK DETECTION EQUIPMENT
3. THROUGH COMPLAINT FROM FIELD THRU PUBLIC/STAFF

4

VISUAL OBSERVATION

The most common procedure for detecting leakage is visual observation. The field/patrolling staff working in the divisions are deployed for field survey in their designated areas on daily basis.

Bubbling of water in the street/road, dampness, growth of vegetation (in hot, dry weather) along the line may indicate leakage.

5

USE OF LEAK DETECTION EQUIPMENTS

If the leakage cannot be found by visual inspection, leak detection equipments are used to locate the exact point of leakage. The following equipments are used by LDI staff to detect leakages:-

- *Pipe Route Locator*
- *Sounding Rod*
- *Portable Leak Detector(Ground Microphone)*
- *Measuring Wheel*

6

PIPE ROUTE LOCATOR

The Pipe route locator works on the principle of placing a radio signal on the pipeline. The pipe will then act as an aerial and carry the signal on the pipe. With a specialized radio receiver, the path of this radio signal can be traced. Thus the location of the pipe can be found.



7

SOUNDING ROD

- Sounding Rod is a long non corrosive rod with an arrangement to hear the leakage sound at one end.
- The sound caused by the leak depends on the velocity of flow and the size of the opening.
- A high velocity through a small aperture will make more noise than a large discharge through a large aperture.
- An experienced worker can manage to detect the leak.



8

DIGITAL LEAK DETECTOR WITH GROUND MICROPHONE

- Portable leak detectors are microprocessor based electronic instruments . They sense and amplify the sound of water leaks. The leak position can be verified audibly by surface sounding prior to the any excavation and repair been carried out.
- DLD consists of control unit, ground microphones, sounding rods and necessary interconnecting cables.
- The Ground Microphone combines a new, high sensitivity sensor with proven case of use, enabling leaks to be detected over a greater distance, and background noise to be more easily suppressed, than with conventional sounding equipment.
- This speeds up repair of the leak, reduces repair costs and ensures that disruption to the water supply is minimized.

9

DIGITAL LEAK DETECTOR WITH GROUND MICROPHONE



10

MAJOR CASE STUDIES

- Hidden leakages were find out in areas using metal detector, DLD (Digital leak detector) and other Leak detection equipments.
- Rajender Nagar (July, 2008)
- Hidden leakage at RajGhat near red light .(September,2009)
- The leak detection survey on Patel Nagar road leakage near metro pillar no. 176 running in storm water drains manholes near MCD dispensary. (October ,2011)
- Leakage at Nehru vihar in I R Rising main, opposite bus stand, Timarpur.(July 2014)

11

TYPE OF LEAKAGES

- Leakage from joints
- Leakage from air release valve
- Leakage due to crack in the PSC pipe
- Leakage due to crack in the welding of the MS pipe
- Leakage from the sluice valve

12

Method of plugging leakages for various types of Joints

- PSC Joint – By applying spun yarn , joint filling chemical or gullas with the help of packing tools .
- CI Joint :- By applying wool , lead wool with the help of packing tools etc.
- MS Joint :- By welding the joint with the help of gas cutter and welding machine etc.

13

Method of Plugging the leakages due to crack in PSC pipe

- Shutdown of 12 to 36 hours is required for plugging the leakage.
- Dewatering needs to be carried out with the help of submersible pump sets which may require 6 to 14 hours depending on size of Transmission main
- By replacing the damaged PSC pipe by M.S. gap piece which includes spigot and socket at its two ends

14

Method of Plugging the leakages in the air release valve/ sluice valve.

- The leakage can be plugged by replacing the rubber ball in the air release valve.
- In case of breakage of air release valve , same needs to be replaced .
- By changing the gland packing of the sluice valve .

15

Detail of Rising Mains Plant wise

S. No.	Name of WTP with Capacity	Name & size	Length of Rising Main
1.	120 MGD WTP, Wazirabad,	Klokeri Main 900mm Duplicate Main 900mm TriPLICATE main 900mm West Delhi main 900mm IAR main 1050mm Ponjabi Bagh main 900mm Ramilla main 900mm A-5 Bantay well 600mm	152 kms
2.	OKhla WW 20 MGD	Okhla rising main 900mm Okhla main 900/600mm Feeding main 200/600mm	15 kms
3.	90 MGD Chandrawal WTP PHI	Hindoo Rao main 450mm Pug Staff main 600mm M/M main 600mm Jhandewalan main 750mm Hissan pur main 600mm Shadi Pur main 600mm Palam main 1000/750mm New Rajinder Nagar 750mm Rajinder New main 300mm Biketore main 750mm	71 kms

16