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## Aged-Pipeline Renewal Plan with Enhancing Seismic Upgrade

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## Introduction -enhancing seismic upgrade-

#### Great Hanshin-Awaji Earthquake in Jan. 1995

Ibaraki Prefecture Review of the earthquake countermeasures in 1996-1998.

#### The Ordinance No.60 promulgated by MHLW\* in Apr. 2008.

#### Ibaraki Prefecture Earthquake Resistance Ratio: 16.3%(RWSA\*), 16.8%(RIWSA\*)

\*MHLW: Ministry of Health, Labor and Welfare \*RWSA: Regional Water Supplying Authority \*RIWSA: Regional Industrial Water Supplying Authority \*reference: Guideline for Water Supply (JWWA)

Ibaraki Prefecture NEEDs to enhance seismic upgrade for pipelines

## Introduction -renewing aged-pipeline-

#### Expansion of Water Supply in the 1960s and 1970s

#### Ibaraki Prefecture Start Year for Supply: 12/1960~(RWSA), 10/1966~(RIWSA)

\*RWSA: Regional Water Supplying Authority \*RIWSA: Regional Industrial Water Supplying Authority

#### Lifetime of the Pipeline is 40 years as a legal period.

 Ibaraki Prefecture

 Aged-pipeline Ratio:
 0%(RWSA), 6.0%(RIWSA) in 2008

 6.3%(RWSA), 19.2%(RIWSA) in 2018

 46.6%(RWSA), 44.4%(RIWSA) in 2028

\*reference: Guideline for Water Supply (JWWA)

Ibaraki Prefecture NEEDs to renew the aged-pipelines by design





#### NEEDs for enhancing seismic upgrade

NEEDs for renewing aged-pipeline

Developing for agedpipeline renewal plan with enhancing seismic upgrade



## **Outline of IBARAKI Prefecture**



Items	Contents	IBARAKI
Area	6,095km2 (23 <sup>rd</sup> in 47 pref.)	Prefecture
Population	2,964,000ppl (11 <sup>th</sup> in 47)	ΤΟΚΥΟ
Amount of Farming Ou tput	408.2 Bln Yen (3 <sup>rd</sup> in 47)	MITO CITY (CAPITAL)
Amount of Manufactur ed item	12,744.1 Bln Yen (8 <sup>th</sup> in 47)	
iller	Alex Marine	



## Outline of Bureau of the Public Enterprises

#### $\rightarrow$ 1. Regional Water Supplying Authority (RWSA)

#### → 2. Regional Industrial Water Supplying Authority (RIWSA)

Item	Contents	The numer of WTP is the treatment capacity(m3/day).
No. of RWSA	4 RWSAs	
No. of WTP	10 WTPs*	Nihari WTP
Lengths of t he Pipeline	750,585m	Sekijo WTP Hinuma WTP
Targeted Sup	34 MUNIs*	(37,400) (24,000) (24,000)
ply Commue	2 WSUs*	RWSA Kenchuo
Supply	2,387,680ppl	RWSA
Population		Rokko BWSA
Maximum Su	548,075m3/d	Kashima WTP
pply Amount	Minter	Mitukaido WTP (34,600) Wanigawa
*WTP: Water Treatm *MUNI: Municipality WSU: Water Supply	ent Plant	Kennan RWSA Tone WTP (100,000) Ami WTP (50,400) Kasumigaura WTP (155,675)
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## **Outline of Bureau of the Public Enterprises**

#### $\rightarrow$ 1. Regional Water Supplying Authority (RWSA)

→ 2. Regional Industrial Water Supplying Authority (RIWSA)

Item	Contents	The numer of WTP is the treatment capacity(m3/day).
No. of RIWS A	4 RIWSAs	Nihari WTP
No. of WTP	7 WTPs	
Lengths of t	520,027m	Sekijo WTP (122,680)
he Pipeline		(5,350) Nakagawa
Targeted	22 MUNIs*	
Supply Area		Kenou RIWSA
Targeted	275 Compani	Kashima
Supply User	es	IWSA Kashima
Maximum Su	1,127,330m3/	Mitukaido
pply Amount	d	(41,800) Wanigawa (75,000)
	Lever	Kennan RIWSA Ami WTP (40,000)
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## **Methodology for Renewal Planning**

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1	Deterior	ation Indicator*1	
		Item	Criterion
• Risk of • Leakag • Soil cor • Pipeline	Rank A (Score:76-100)	Fine Condition (No Need to Renew for the near term)	
	Rank B (Score:51-75)	Allowable Condition (Need to Refine the weak points)	
2	Indicato	Rank C (Score:26-50)	Non Allowable Condition (N eed to Renew by design)
	•Pipeline •Water v	Rank D (Score:0-25)	Bad Condition (Need to Ren ew immediately)

\*1 JWWA: Waterworks Facility Renovation Guidelines, 2005.05 \*2 JWWA: Forcast of damaged pipeline by earthquake, 1998.11

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## **Setting for Renewal time of Pipe**



Renewal time for "Non Earthquake Resistance Pipe"
 Set before the end of the lifetime by this methodology
 Renewal time for "Earthquake Resistance Pipe"
 Set in the end of the lifetime as 65 years for DIP

as 55 years for SP

In Conoral	Item	Criterion
in General	Rank A	Fine Condition (No Need to
Definition of	(Score:76-100)	Renew for the near term)
Earthquake Resi	Rank B	Allowable Condition (Need
•Steel Pipe	(Score:51-75)	to Refine the weak points)
S S2 NS US	Rank C	Non Allowable Condition (N
UF. KF. P2 type	(Score:26-50)	eed to Renew by design)
*reference: Guideline for	or Rank D	<b>Bad Condition (Need to Ren</b>
	(Score:0-25)	ew immediately)
		: LOW possibility
		of Liquefaction

## **Setting for Renewal time of Pipe**

Renewal time for "Non Earthquake Resistance Pipe"
 Set before the end of the lifetime by this methodology
 Renewal time for "Earthquake Resistance Pipe"
 Set in the end of the lifetime as 65 years for DIP

as 55 years for SP

In this study...

#### In General...

Definition of Earthquake Resistance Pipe
Steel Pipe
Ductile Iron Pipe (S, S2, NS, US, UF, KF, P2 type)
\*reference: Guideline for Water Supply (JWWA)

#### Definition of Earthquake Resistance Pipe • Steel Pipe • Ductile Iron Pipe (S, S2, NS, US, UF, KF, P2 type) (K type in cohesive soil) \* cohesive soil : LOW possibility of Liquefaction



## **Methodology for Renewal Planning**





\*1 JWWA: Waterworks Facility Renovation Guidelines, 2005.05 \*2 JWWA: Forcast of damaged pipeline by earthquake, 1998.11

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Equalization of the renewal time















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## **Determination of Renewal Pipelines' Priority**

• 1. Regional Water Supplying Authority (RWSA)

→ 2. Regional Industrial Water Supplying Authority (RIWSA)



**Renewal Installed Term** 

 Considering the other construction cost about the setting for enhancing seismic upgrade
 2 peak terms: 2015-2029, 2045-2054

## **Determination of Renewal Pipelines' Priority**

 $\rightarrow$  1. Regional Water Supplying Authority (RWSA)

2. Regional Industrial Water Supplying Authority (RIWSA)



**Renewal Installed Term** 



 Considering the other construction cost about the setting for enhancing seismic upgrade
 1 peak term: 2040-2049

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### **Results of the Renewal Plan**



- Figuring out the massive basic data of pipelines by Mapping System (GIS)
- Merits from the viewpoint of grasping Progress of Renewal Plan and ASSET MANAGEMENT



## **Cost-Benefit Analysis**

Item	Regional Water Supplyin g Authorities	Regional Industrial Water Sup plying Authorities
Result of Cost-Ben efit Ratio	5.01	1.00

#### Judgment criterion: the cost-benefit ratio is more than 1.00.

 Main Benefit -Regional Water Supplying Authorities-Benefit for decreasing damage of water outage
 Main Benefit -Regional Industrial Water Supplying Authorities-Benefit for decreasing cost of operation and maintenance















# THANK YOU

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## **Contents of Survey**





•Elapsed years of the Pipeline •Lengths of the Pipeline •Pipeline materials



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