Current Status and Financial Strategy of Water Utilities in the World

- 世界の水道事業の現状と経営戦略 -

IWA Workshop

Specialist Group on Statistics and Economics

19th March 2015, 9:30–17:00
Meeting Room 1 on 7th floor,
Japan Water Works Association

IWA International Water Association
Specialist Group
Statistics and Economics

Organized by; IWA Specialist Group on Statistics and Economics,
Japan Water Works Association and IWA Japan National Committee

IWA Workshop / Specialist Group on Statistics and Economics

- Current Status and Financial Strategy of Water Utilities in the World -

[Time table]

Time	Lecture	講演
9:30-9:40	Opening Address from Dr. Masaru Ozaki, Executive Director, Japan Water Works Association	開会挨拶 日本水道協会理事長　尾﨑　勝
9:40-9:50	Address from Workshop Chair Prof. Satoshi Takizawa	ワークショップ座長挨拶 滝沢　智
9:50-10:10	Address from Chairman of IWA Specialist group on Statistics and Economics Dr. Ed Smeets	IWA 統計・経済 SG 議長挨拶 エド・スミーツ
10:10-10:40	(1)　Water Utility Management in Japan Prof. Satoshi Takizawa	(1)　日本の水道事業経営 滝沢　智
10:40-11:20	(2)　Water Utility Management in the World Current Status & Financial Strategies of Water Utilities in the World / THE NETHERLANDS Dr. Ed Smeets	(2)　世界の水道事業経営 世界／オランダの水道の現状及び財政戦略 エド・スミーツ
11:20-12:00	Current status of "The Romanian Water Services" Mr. Teodor Popa	ルーマニアの水道の現状 テオドール・ポパ
12:00-13:00	**Lunch [60min]**	
13:00-13:40	Current Status of Waterworks in Spain Dr. Francesc Hernández-Sancho	スペインの水道の現状 フランチェスク・エルナンデス・サンチョ
13:40-14:30	Part I: Water price around the globe Part II: Uncovering the Belgian Water sector Mr. Jan Hammenecker	[1 部]世界の水道料金 [2 部]ベルギー水道の現状 ヤン・ハメネッカー
14:30-15:10	Current Status of Waterworks in United States - Current Status & Strategies to Enhance Financial Sustainability - Dr. Deborah Galardi	アメリカの水道の現状、財政安定性に向けた現状と戦略 デボラ・ギャラーディ
15:10-15:30	**Break [20min]**	
15:30-16:50	(3)　Discussion	(3)　ディスカッション
16:50-17:00	(4)　Round-up	(4)　ワークショップ総括

Prof. Satoshi Takizawa

Professor, Graduate School of Engineering, The University of Tokyo

Profile/

Dr. Satoshi Takizawa is a professor in environmental engineering, the University of Tokyo. The major fields of his research are: advanced water treatment technologies, groundwater management in urban areas, and planning and management of water utilities. As a chair of the working group of the Committee for the Security of Water Supply organized by JWWA between 2008 and 2009, he took a leadership role in writing the future strategies of water utility management in Japan. Recently, he has worked as a chair of the working group of “International Development of the Japanese Water Industry” set up by the Ministry of Economy, Trade and Industry. His research fields extend from Japan to the developing countries in Asia and African regions, and he has many international collaborative research projects. He has published more than 100 peer-reviewed papers and books on technologies and management of urban water systems.

Title of Speech /

Water Utility Management in Japan

IWA Specialist Group Statistics and Economics — JWWA Japan Water Works Association

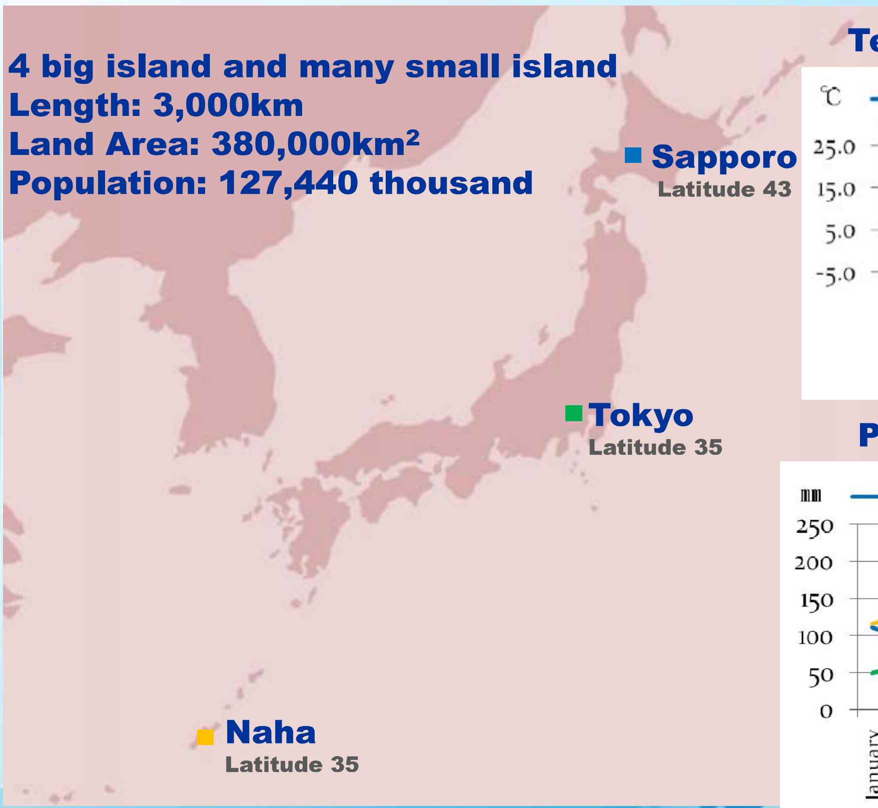
IWA Workshop
Current Status and Financial Strategy of Water Utilities in the World
March 19th , 2015

Water Utility Management in Japan

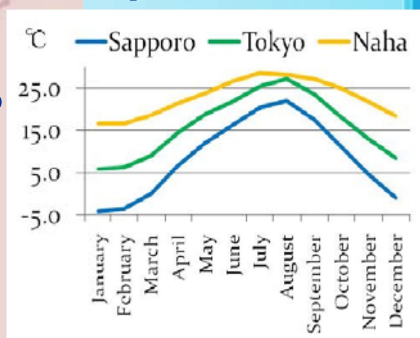
Satoshi Takizawa
Professor, Graduate School of Engineering
The University of Tokyo

Geography of Japan

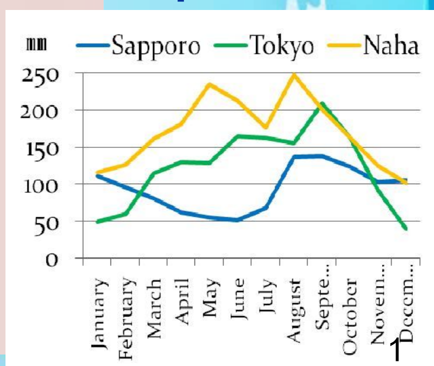
4 big island and many small island
Length: 3,000km
Land Area: 380,000km^2
Population: 127,440 thousand



Temperature



Precipitation



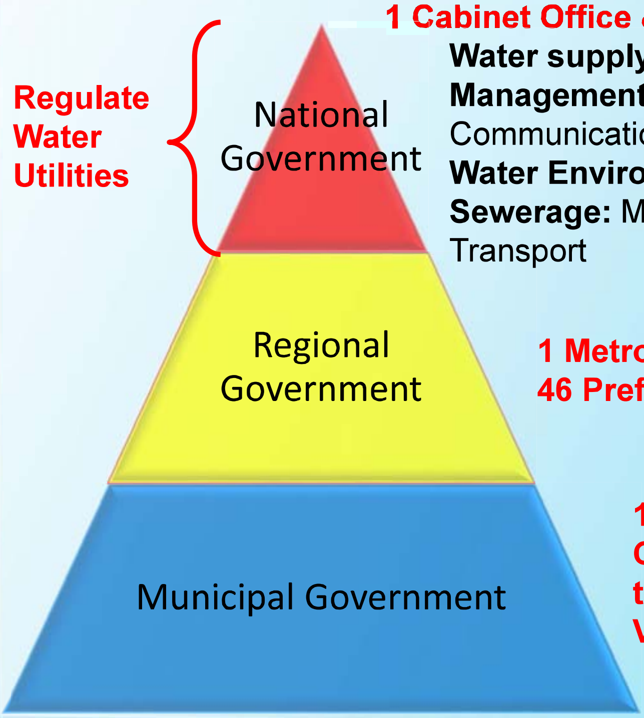
Waterworks in Japan

The First Modern Waterworks: est. in 1887
Water Supply Volume per Capita: 326 L/d

	unit	2010	2011	2012
Total Population	Thousand capita	128,000	127,713	127,440
Water Supply Population	thousand capita	124,817	124,657	124,466
Coverage Ratio		97.5%	97.6%	97.7%
Daily Maximum Water Supply Volume	thousand m^3	48,149	47,240	46,383
Daily Average Water Supply Volume	thousand m^3	41,482	40,838	40,611

Structure of National and Municipal Governments

Regulate Water Utilities



1 Cabinet Office & 12 Ministry

Water supply: Ministry of Health Labor and Welfare
Management: Ministry of Internal Affairs and Communication
Water Environment: Ministry of Environment
Sewerage: Ministry of Land, Infrastructure and Transport

1 Metropolitan, 46 Prefectures

1,718 Cities, towns, Villages

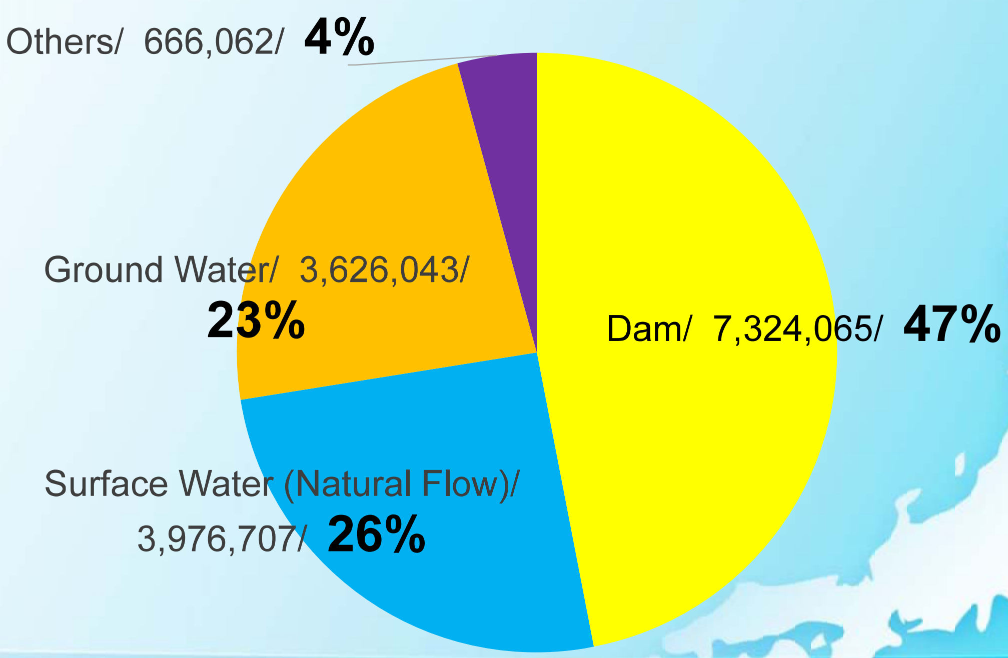
Local Governments Manage Waterworks

Number of Water Utilities

	Year / Organization	2010	2011	2012
Water Supply	Prefecture	5	5	5
	City	843	833	821
	Town	500	497	494
	Village	37	37	37
	Special District Authority	49	48	48
	Private	9	9	9
	Subtotal	1,443	1,429	1,414
Bulk Water Supply	Prefecture	44	42	42
	City, Town, Village	4	4	4
	Special District Authority	50	49	49
	Subtotal	98	95	95
Small Scale Water supply Systems (Supply Population =<5,000)	Public	5,874	5,672	5,494
	Others	813	783	763
	Subtotal	6,687	6,455	6,257
Total		16,178	15,983	15,866

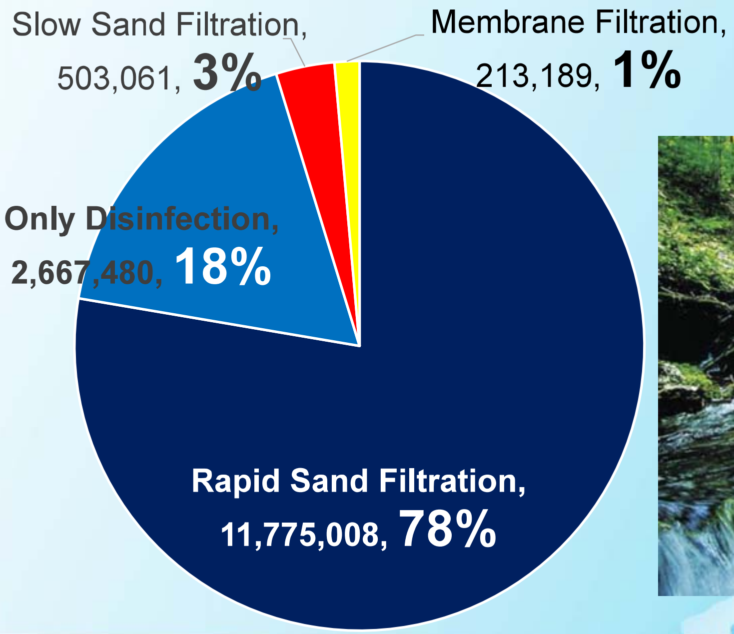
Annual Water Abstraction

(Water supply & Bulk water supply) **(1,000m³)**



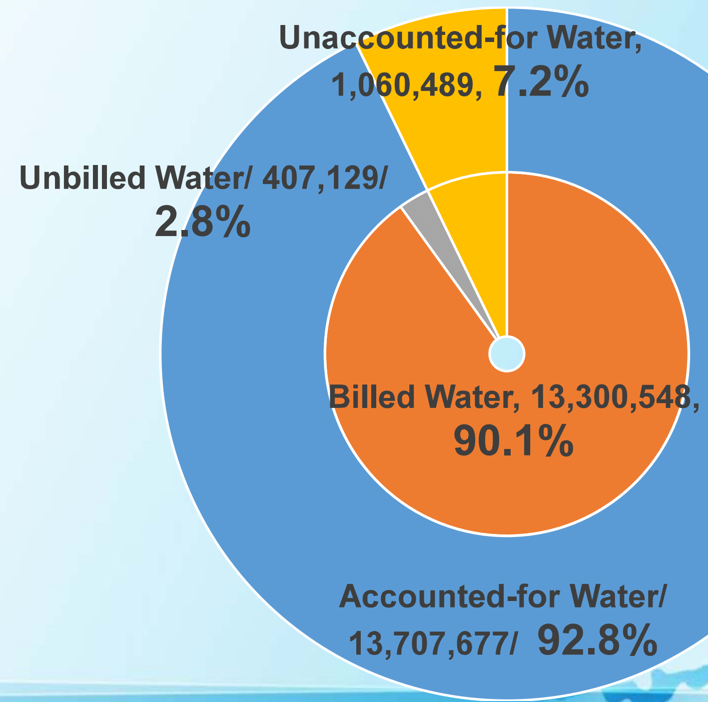
Annual Purification Volume

(Water supply & Bulk water supply in 2012) **(1,000m³)**



Annual Water Supply Volume

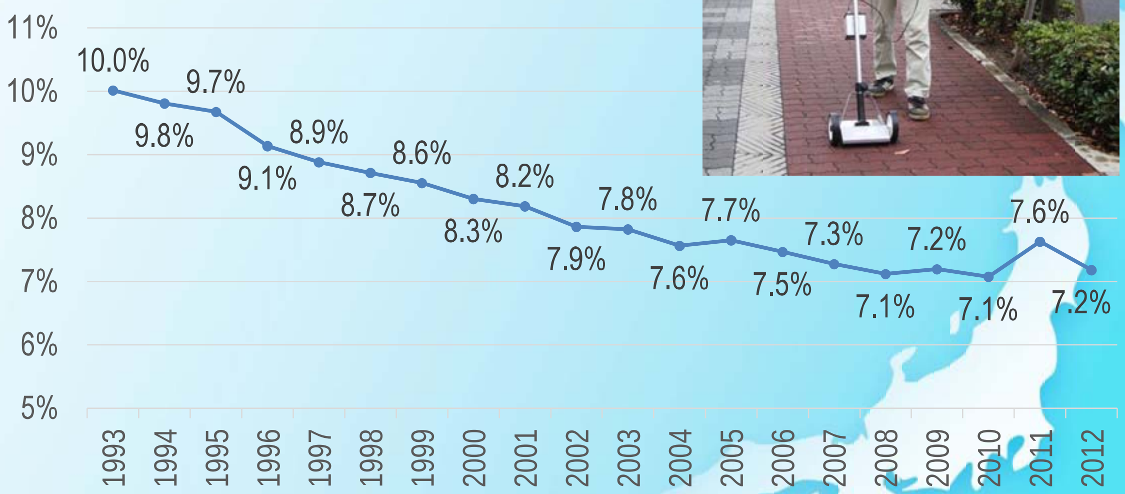
(Water supply & Bulk water supply in 2012) **(1,000m³)**



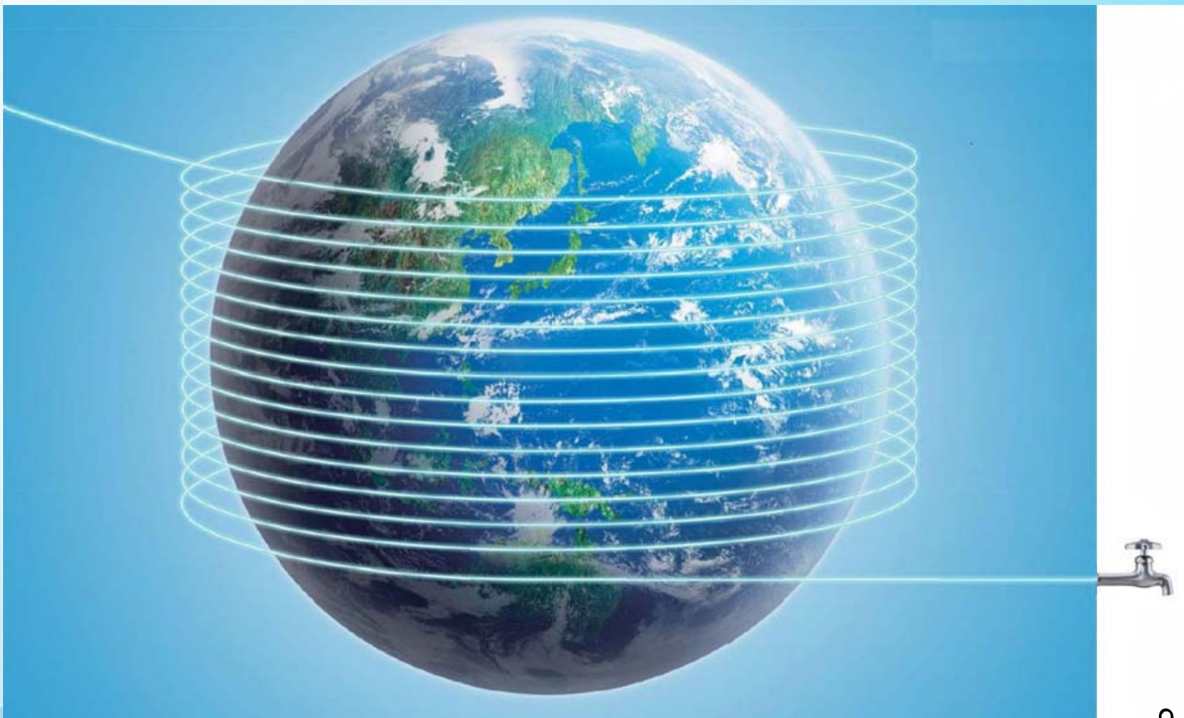
Reduction of Water Leakage

Water Leakage Ratio: 7.2% (JPN Ave.)
Tokyo Metro.: 2.0% (2012)

(Water supply & Bulk water supply)

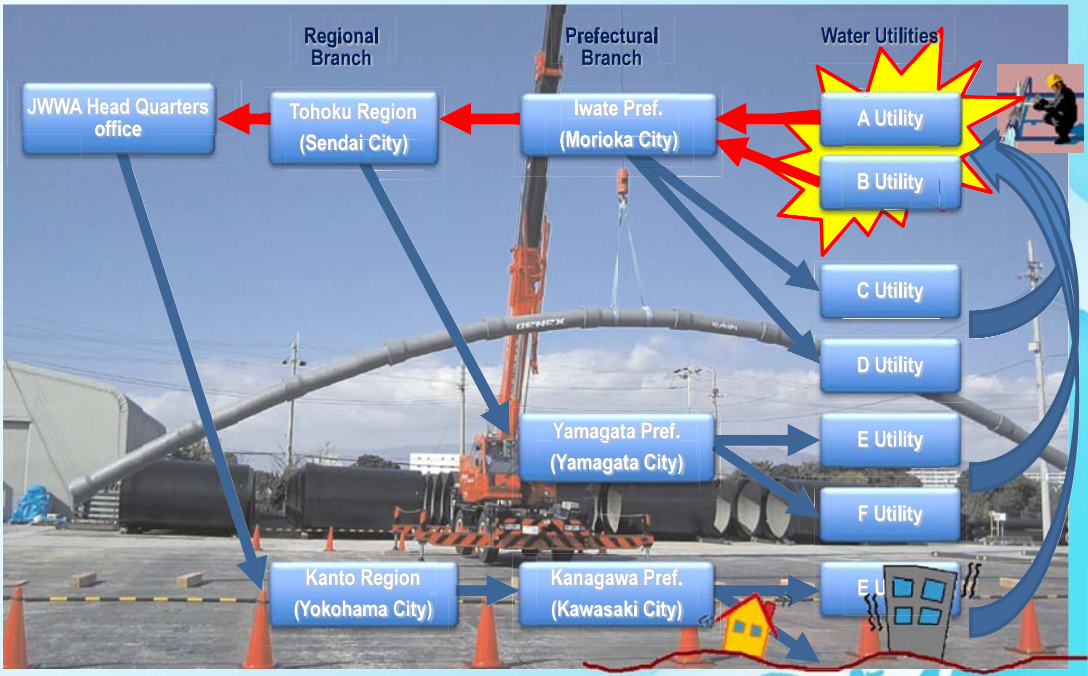


Pipeline length



Earthquake

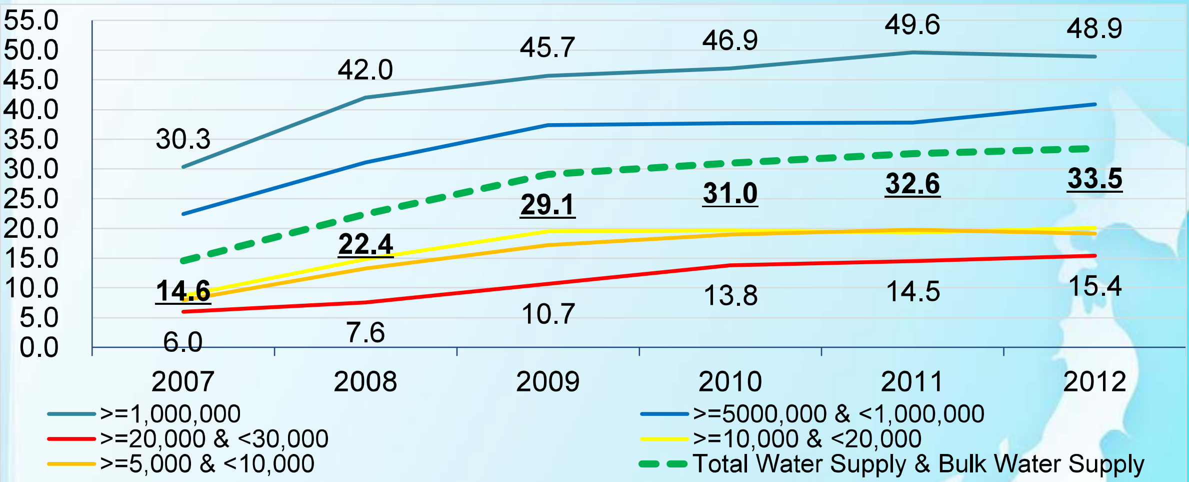
Anti-seismic pipe, and collaboration network



Challenges - Resilience

Ratio of Earthquake-resistant Pipeline

(Water supply & Bulk water supply) **(%)**



Ratio of Earthquake-resistant Facilities	2010	2011	2012
Main Pipeline (Water Conveyance, Transmission, Distribution Main Pipe)	31.0	32.6	33.5
Water Treatment Facilities	18.7	19.7	21.4
Distribution Reservoirs	38.0	41.3	44.5

Waterworks in Japan

Financial Conditions

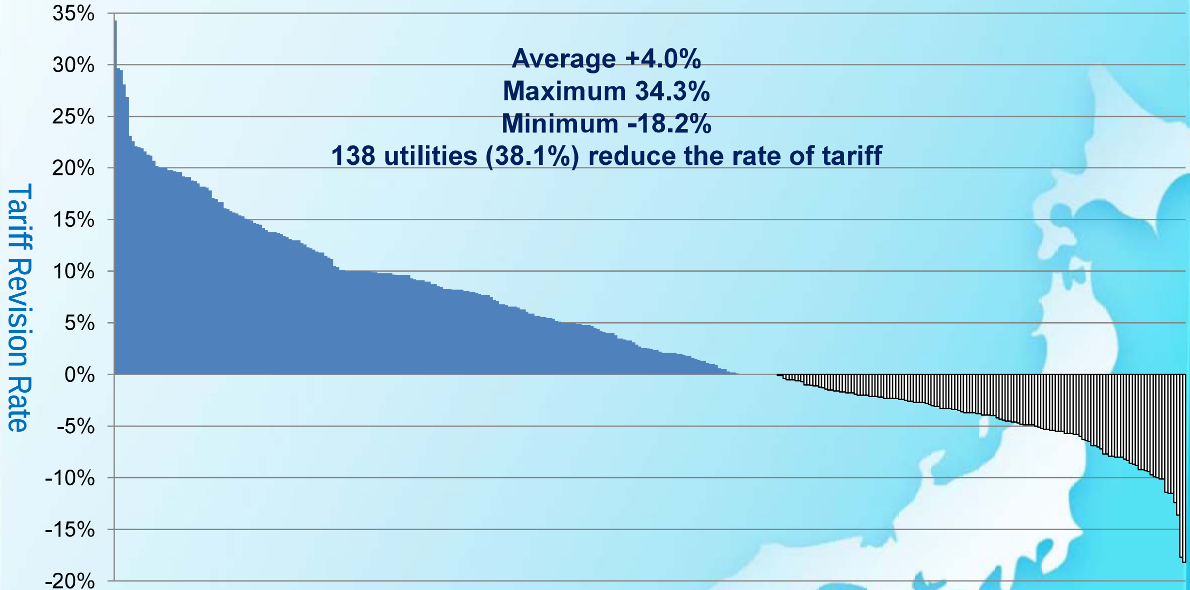
- **Self-accounting System based on Corporate Accounting Principles**
- **The Water Tariff are approved in the assembly of local governments.**
- **No Regulation body for Water Tariff**

Challenges - Sustainability

Securing Appropriate Tariff Level

Current State of Tariff Revision

(Arrange the revision rate of 362 utilities in high order, 2011-2014)



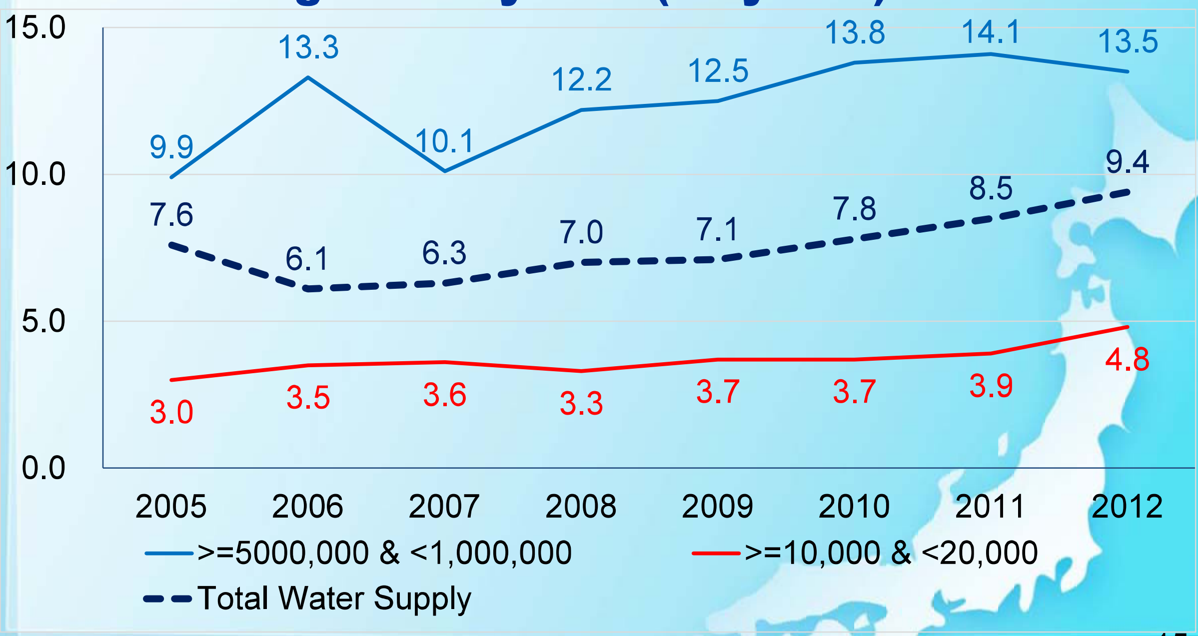
Challenges - Sustainability
Renewal of Aged Facilities


Rust of Aged Pipe


Water Leakage from Aged Pipe

Challenges - Sustainability
Renewal of Aged Facilities

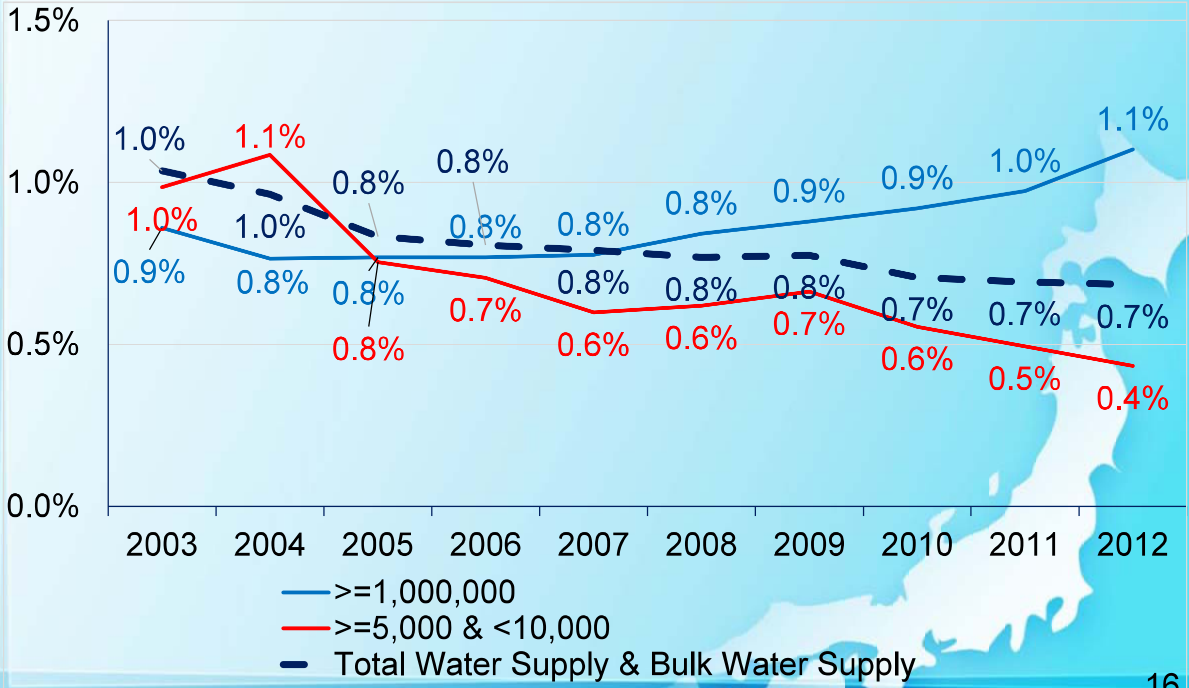
Ratio (%) of Aged Pipes exceed Depreciation Period Designated by Law (40 years)



Challenges - Sustainability

Renewal of Aged Facilities

Ratio (%) of Replaced Pipes



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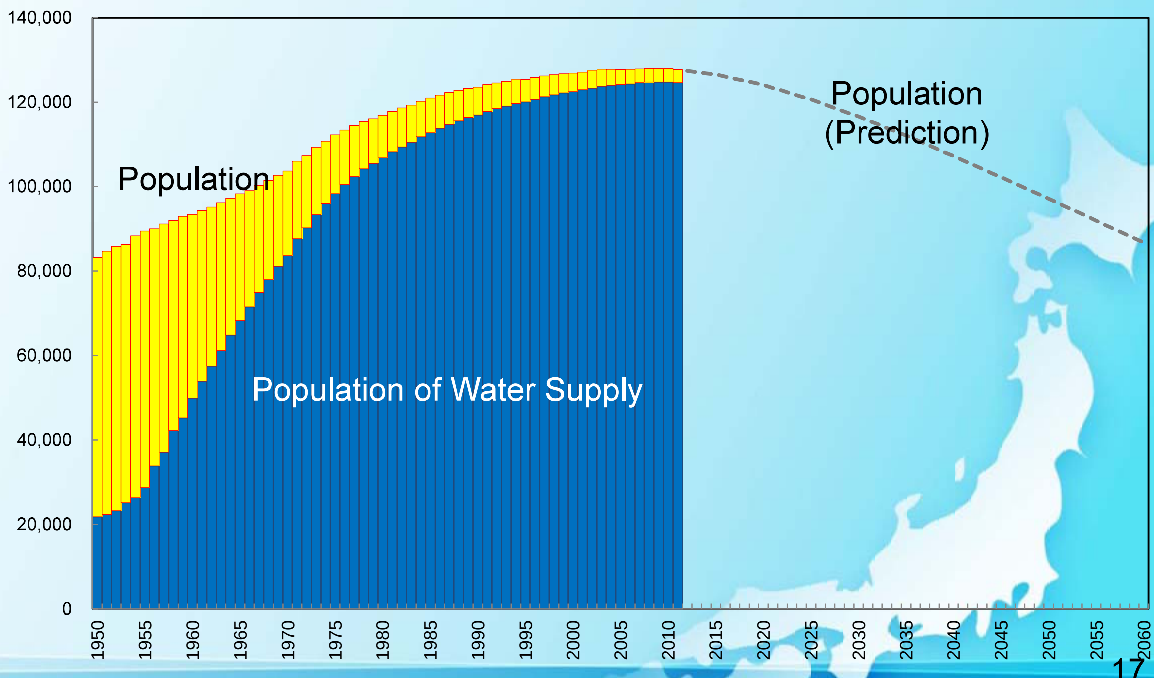
Challenges - Sustainability

Revenue on Water Supply is Decreasing

Future Prediction of Population



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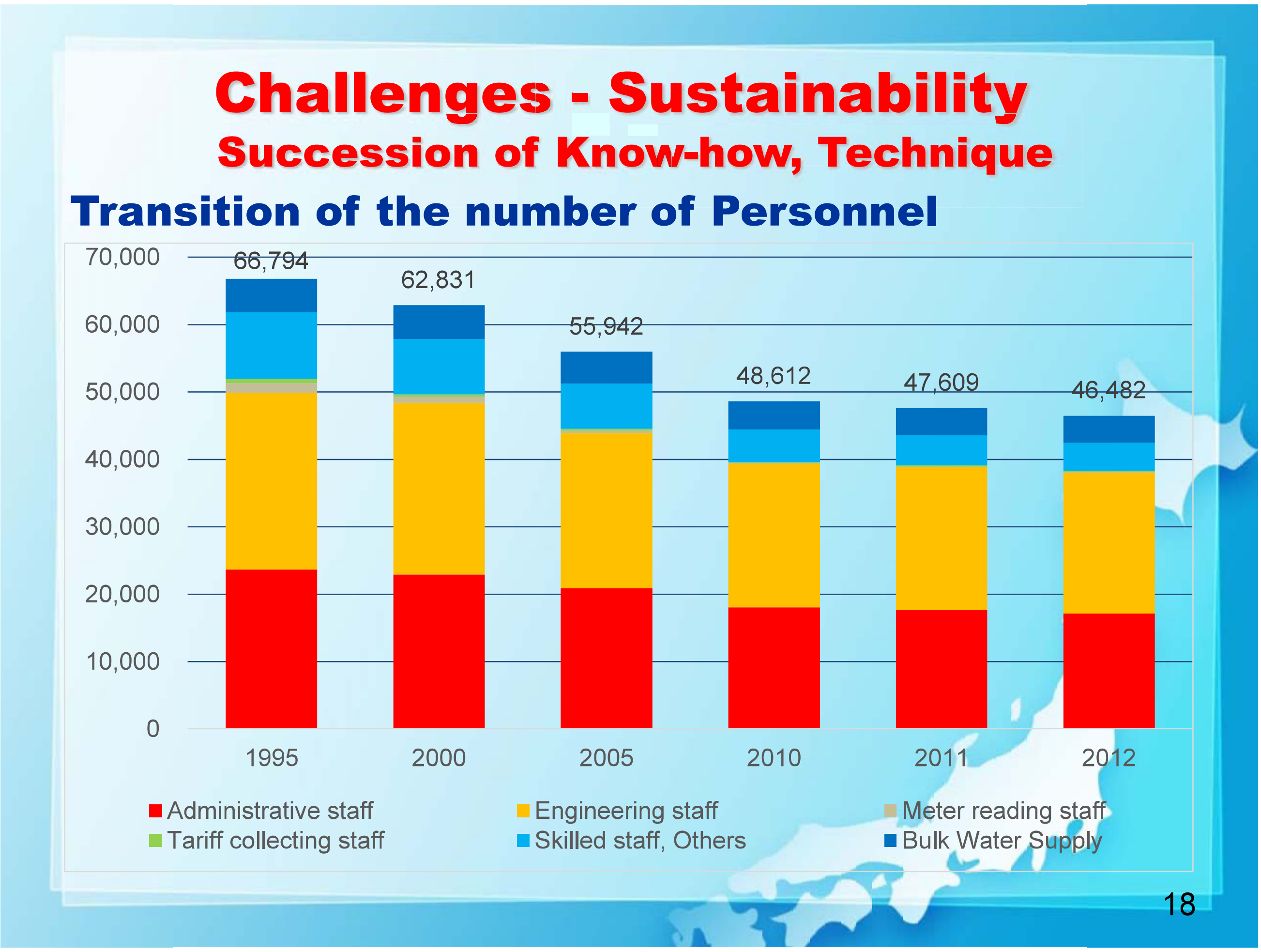
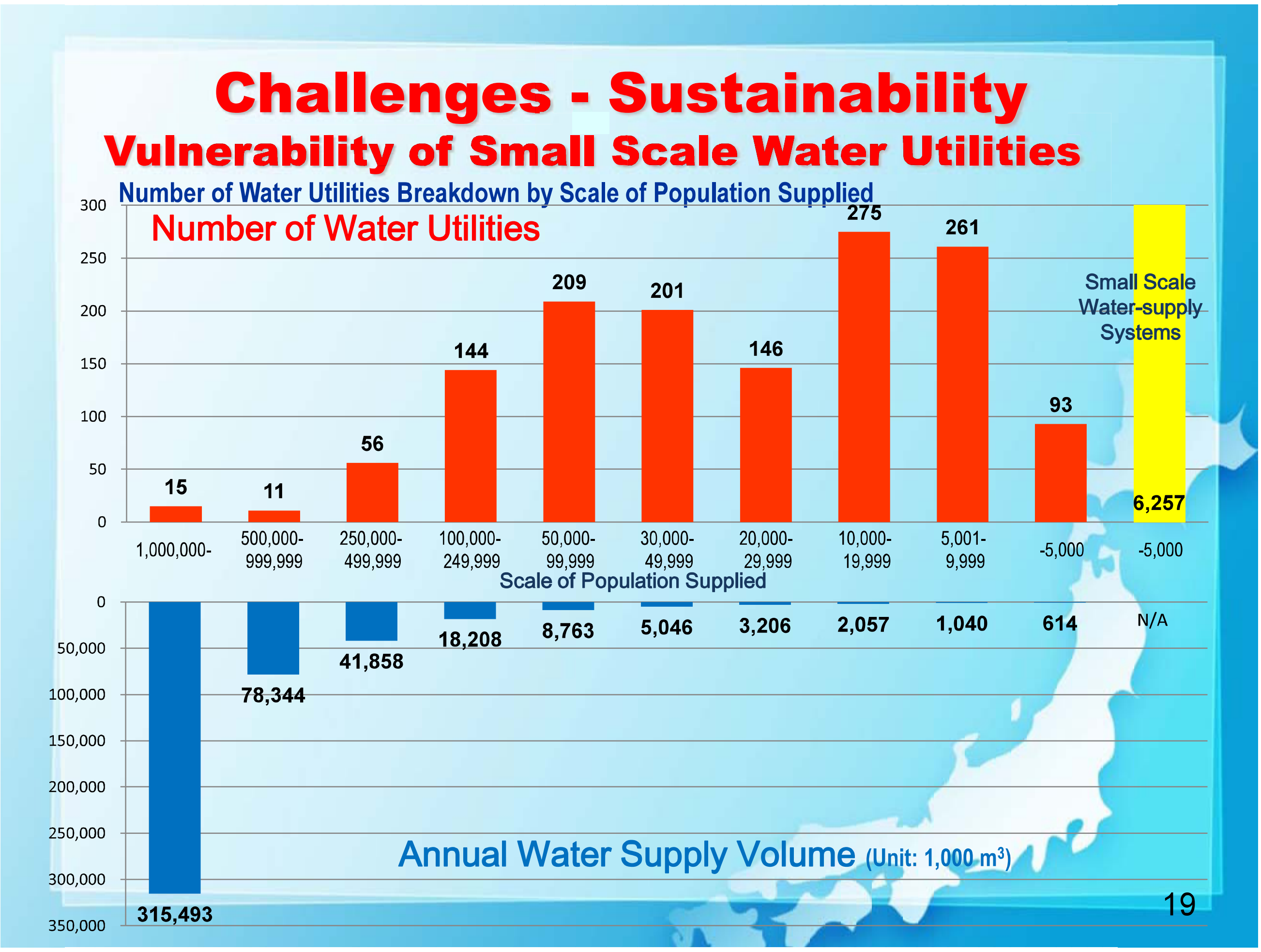

Challenges - Sustainability
Succession of Know-how, Technique
Transition of the number of Personnel
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
66,794
62,831
55,942
48,612
47,609
46,482
1995
2000
2005
2010
2011
2012
Administrative staff
Engineering staff
Meter reading staff
Tariff collecting staff
Skilled staff, Others
Bulk Water Supply
18

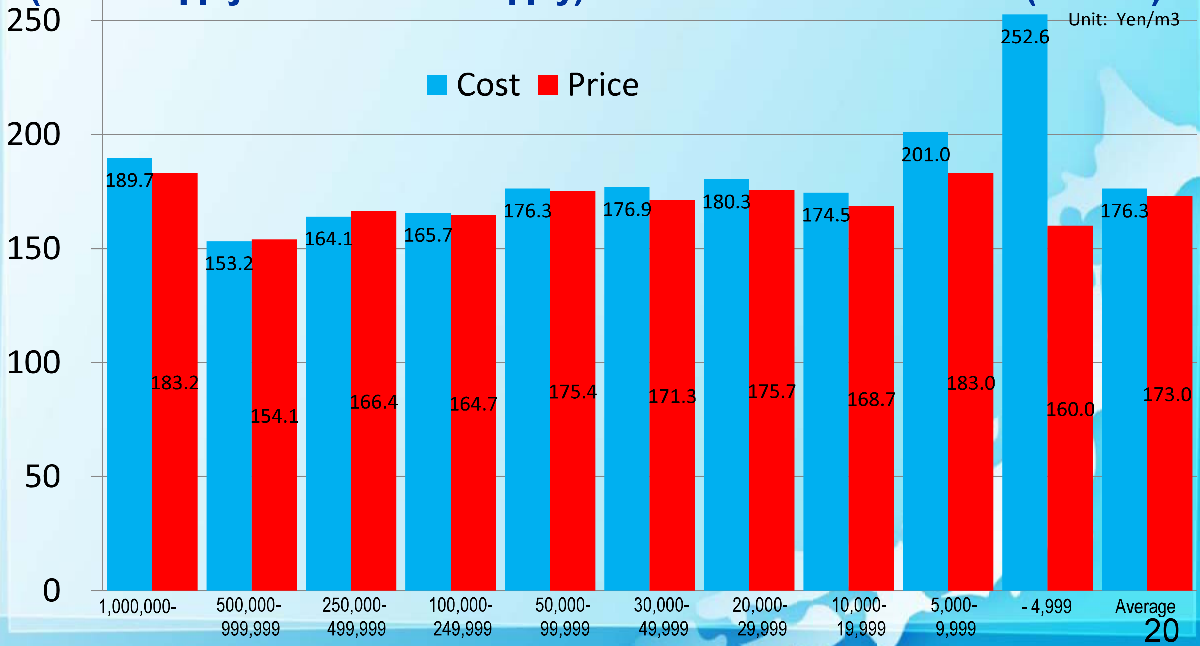

Challenges - Sustainability
Vulnerability of Small Scale Water Utilities
Number of Water Utilities Breakdown by Scale of Population Supplied
Number of Water Utilities
300
250
200
150
100
50
0
15
11
56
144
209
201
146
275
261
93
6,257
Small Scale Water-supply Systems
1,000,000-
500,000-999,999
250,000-499,999
100,000-249,999
50,000-99,999
30,000-49,999
20,000-29,999
10,000-19,999
5,001-9,999
-5,000
-5,000
Scale of Population Supplied
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
315,493
78,344
41,858
18,208
8,763
5,046
3,206
2,057
1,040
614
N/A
Annual Water Supply Volume (Unit: 1,000 m3)
19

Challenges - Sustainability

Vulnerability of Small Scale Water Utilities

Supply cost & Unit price by Population Scale

(Water supply & Bulk water supply) **(Yen/m3)**



Towards the Problem Solution
Self-Analysis

Practical Use of
Statistics on Water Supply in Japan

All 1,509 Utilities cooperate on this statistic
Number of Items

- **Facilities & Management: 3,800 items**
  Water supply, Management, Personnel, Risk management, etc.
- **Water Quality: 3,000 items**

Comparison with same scale utilities
Comparison with Japanese average, etc.

Towards the Problem Solution
Self-Analysis

Practical Use of Japanese Performance Indicator

(JWWA Standards Q100: Guidelines for the management and assessment of a drinking water supply service)

Number of Items: 137
91 items are able to calculate based on Statistics on Water supply in Japan

- **Reliability**
  Ex) Self owned resources ratio: 77.05%
- **Stability**
  Ex) Drinking water storage volume per population supplied: 180.63L
- **Sustainability**
  Ex) Ratio of Current income to Current expense: 108.92%
- **Environment**
  Ex) Electric power consumption per $1m^3$: 373.40 kWh/m^3

Towards the Problem Solution

Asset Management

Current status of Asset Management:

Large-scale Water Supply & Bulk Water Supply 51.6%

Small-scale Water Supply (<50,000 PE) 12.5%

Support Tool to promote introduction of Asset Management, especially, for the Small Scale Water Utilities (Ministry of Health, Labour and Welfare)

Towards the Problem Solution

Consolidation of Water Utilities (Up-scaling)

Reasons Why Consolidation Does Not Progress in Japan

- No Enforcement from National Government
- Absence of Leader Utilities
- Gaps in Water Tariff Levels, Financial Conditions, Facility Levels, and Maintenance Levels
- Personnel Reduction by Consolidation
- The most of Small Utilities are Exhausted to promote consolidation, etc.

Towards the Problem Solution

Various types of Consolidation of Water Utilities

New Water Supply Vision in 2013

Towards the Problem Solution

Public Private Partnerships (PPP)

Reasons Why PPP Does Not Progress in Japan

- Absence of Regulatory Organization
- Water Utilities worried about
  - Losing skilled staff
  - Declining of service quality
  - Emergency response
  - Uncertainty in the cost reduction

Towards the Problem Solution

AIM of the IWA workshop

- **Sharing information and statistical data between water utilities in different countries to offer an opportunity to re-think the current practice of water utility management.**

Thank you for your attention!

List of JWWA Q100 Performance Indicator led by Statistics on Water Supply in Japan

Guidelines for the management and assessment of a drinking water supply service (JWWA Q100)				Statistics on Water Supply	
PI Code	**Name of PI**	**Description**	**Definition**	**Stats Code**	**Name of Stats**
1001	Resources availability ratio	The purpose of drinking water supply services is to deliver the enough volume of water with stability. To do it, water resources should hold the sufficient volume of water. The ratio of water volume held by the water resources to water volume consumed actually represents the allowance and efficiency of the water resources. Accordingly, this indicator value should be high in preparation for droughts.	Resources availability ratio = (Average daily transmission input/ Resource capacity) × 100 (unit: %)	5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
				0412	Designed Maximum Water Abstraction Volume per Day/ Total (m3)
1002	Surplus capacity of resources	The purpose of drinking water supply services is to deliver the enough volume of water with stability. To do it, water resources should hold the sufficient volume of water. The ratio of water volume held by the water resources to water volume consumed actually represents the allowance and efficiency of the water resources. Accordingly, this indicator value should be high in preparation for droughts.	Surplus capacity of resources = ((Resource capacity/ Maximum daily transmission input) × 1) × 100 (Unit: %)	5103	Water Supply Volume per Day/ Daily Maximum Water Supply Volume (m3)
				0412	Designed Maximum Water Abstraction Volume per Day/ Total (m3)
1003	Effective raw water ratio	This indicator is similar to the leakage rate indicator, but represents the ratio of water effectively used to water abstracted. It has wider meaning than the leakage rate indicator, that is, the effectiveness of water used in terms of total system.	Effective raw water ratio = (Annual effective volume/ Annual intake volume) × 100 (Unit: %)	5021	Annual Water Supply Volume/ Accounted Water Consumption (1,000 m3)
				5026	Annual Bulk Water Supply Volume/ Accounted Water Consumption (1,000 m3)
				5031	Annual Water supply volume to another water supplier/ Accounted Water Consumption (1,000 m3)
				5012	Annual Water Abstraction Volume/ Total (1,000 m3)
1004	Self owned resources ratio	This indicator can be applied to self owned dams and wells, and represents flexibility in the management of water resources. In addition, it relates to water flexibility upon drought.	Self owned resources ratio = (Self owned resource capacity/ Total resource capacity) × 100 (Unit: %)	0412	Designed Maximum Water Abstraction Volume per Day/ Total (m3)
				0408	Designed Maximum Water Abstraction Volume per Day/ Raw Water Receiving (m3)
				0411	Designed Maximum Water Abstraction Volume per Day/ Purified Water Receiving (m3)
				0412	Designed Maximum Water Abstraction Volume per Day/ Total (m3)
1115	Direct supply from distribution main	This indicator is a direct water supply ratio, and is one of indices showing the extent to which an approach to keeping the reliability of water quality control is employed and the safety of service quality. Compared with the conventional method of using receiving tanks for buildings having three floors or more, the direct water supply method has advantages, for example, it can address sanitary problems in the tank and trouble with the water quality. Accordingly, it is desired to migrate to the direct water supply method by improving water distribution systems and facilities in the future.	Direct supply from distribution main = (Number of direct connection users/ Total number of users) × 100 (unit: %)	6981	Total/ Number of buildings
				5214	Tariff structure by customer use/ Number of Household/ Total
				5342	Tariff structure by meter size/ Number of Household/ Total
1117	Ratio of lead service lines	As a rule, the use of lead pipes are prohibited f rom a safety point of view, but many old lead pipes still remains. Water utilities may change the type of pipes connected to water meters when making a laying change in distribution lines. However, this indicator value does not reduce because they cannot change indoor lead pipes.	Ratio of lead service lines = (Number of lead service lines in use/ Number of service lines) × 100 (unit: %)	3907	Lead Service pipes/ Site Number of remaining Lead service pipes (Total)
				5214	Tariff structure by customer use/ Number of Household/ Total
				5342	Tariff structure by meter size/ Number of Household/ Total
2001	Drinking water storage volume per population supplied	The service reservoir capacity should be high enough to keep drinking water in preparation for disasters like earthquakes. When a disaster occurs, a single user needs a minimum water volume of three liters in a day. This indicator gives information about how many days the reservoir can supply water, but in real life, three liters become insufficient over the course of time. Accordingly, this indicator employs the volume of reserved drinking water per user, not the number days.	Drinking water storage volume per population supplied = ((Total service reservoir capacity (except emergency reservoirs) × 1/2 + Emergency reservoir capacity)/ Service population) × 1,000 (unit: L/person)	0532	Water Purification Plant/ Treated Water Reservoir/ Effective Capacity (m3)
				0542	Water Purification Plant/ Distribution Reservoir/ Effective Capacity of Distribution Reservoirs (m3)
				0535	Water Distribution Facilities/ Effective Capacity of Distribution Reservoirs (m3)
				0540	Water Distribution Facilities/ Effective Capacity of Elevated Distribution Reservoir (m3)
				6708	Emergency receiving tanks, etc./ Settled by Water utilities/ Potable Water & Domestic water (m3)
				6711	Emergency receiving tanks, etc./ Settled by Local Government/ Managed by Water Utilities/ Potable Water & Domestic water (m3)
				6714	Emergency receiving tanks, etc./ Settled by Local Government/ Managed by Local governments/ Potable Water & Domestic water (m3)
				0206	Population/ Water Supply Population (Capita)

2002	Transmission input per population supplied	This indicator shows the progress of water-saving consumption, which is an approach to the preservation of water environments.	Transmission input per population supplied = (Average daily transmission input/ Service population) × 1,000 (unit: L/person/day)	5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
				5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
				0206	Population/ Water Supply Population (Capita)
2004	Service reservoir capacity	This indicator tells how many hours the reservoirs can supply water at an average daily flow rate, that is, the stability of water supply and the capability of responding to critical events, such as disasters and accidents. The larger the indicator value, the higher the capabilities of water regulation and ad hoc water supply when an emergency event has occurred. According to Design Criteria for Waterworks Facilities, the service reservoir should have effective capacity which makes it possible to deliver water for 12 hours at a maximum daily flow rate.	Service reservoir capacity = Total service reservoir capacity/ Average daily transmission input (unit: days)	0532	Water Purification Plant/ Treated Water Reservoir/ Effective Capacity (m3)
				0542	Water Purification Plant/ Distribution Reservoir/ Effective Capacity of Distribution Reservoirs (m3)
				0535	Water Distribution Facilities/ Effective Capacity of Distribution Reservoirs (m3)
				0540	Water Distribution Facilities/ Effective Capacity of Elevated Distribution Reservoir (m3)
				6708	Emergency receiving tanks, etc./ Settled by Water utilities/ Potable Water & Domestic water (m3)
				6711	Emergency receiving tanks, etc./ Settled by Local Government/ Managed by Water Utilities/ Potable Water & Domestic water (m3)
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				5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
2005	Restricted water supply	This indicator represents days when water supply is restricted in a year, that is, coMF ort and convenience given to users as well as the stability of water supply services.	Restricted water supply = Number of restricted service days per year (unit: days)	6943	Drought/ Pressure reducing water supply/ Number of days
				6945	Drought/ Temporal water supply/ Number of days
				6948	Water quality accident/ Pressure reducing water supply/ Number of days
				6950	Water quality accident/ Temporal water supply/ Number of days
2006	Population served by water supply	This indicator represents the ratio of the number of users to the population of a service area, and is one of indices showing the general conditions and local characteristics of water supply services.	Population served by water supply = (Service population/ Service area population) × 100 (unit: %)	0206	Population/ Water Supply Population (Capita)
				0202	Population/ Population in Water Supply District (Capita)
2007	Distribution mains density	This indicator represents the length of distribution pipes per service area of 1 km2, which means the extent of physical convenience when consumers apply for water supply.	Distribution mains density = Distribution pipe length/ Service area (unit: km/km2)	0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)
				0218	Area/ Current Water Supply District Area (km2)
2008	Customer meter density	This indicator represents the number of water meters per pipeline of 1 km, that is, the number of water supply points per unit length of distribution pipes.	Customer meter density = Number of water meters/ Distribution pipe length (unit: No./km)	5215	Number of installed meter
				5343	Number of installed meter
				0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)
2101	Aging of water treatment facilities	The useful life has a deep relationship with years for which facilities have been used. However, it is difficult to constantly review the useful life in order to maintain and control waterworks facilities. Accordingly, this indicator employs the statutory useful life defined in Municipal Enterprise Law.	Aging of water treatment facilities = (Capacity of purification facilities exceeding statutory useful life/ Capacity of all purification facilities) × 100 (unit: %)	3601	Capacity of Facilities/ Exceed Depreciation Period Designated by Law (m3/ day)
				5118	Capacity of Facilities (m3/ day)
2102	Aging of electric and mechanical equipment	The life cycle has a deep relationship with years for which electrical or mechanical equipment has been used. However, it is difficult to constantly review the life cycle in order to	Aging of electric and mechanical equipment = (Number of electric and mechanical equipment exceeding life cycle/ Total number of electric and	3603	Number of Instrumentation equipment exceed legal durable years (number of equipment)

		maintain and control waterworks facilities. Accordingly, this indicator employs the life cycle.	mechanical equipment) × 100 (unit: %)	3602	Total number of Instrumentation equipment (number of equipment)
2103	Aging of mains	The useful life has a deep relationship with years for which facilities have been used. However, it is difficult to constantly review the useful life in order to maintain and control waterworks facilities. Accordingly, this indicator employs the statutory useful life of pipelines.	Aging of mains = (Length of pipelines exceeding statutory useful life/ Total pipeline length) × 100 (unit: %)	3604	Length of Pipeline/ Raw Water Conveyance pipes/ pipes exceed Depreciation Period Designated by Law (40 years) (m)
				3605	Length of Pipeline/ Water Transmission pipes/ pipes exceed Depreciation Period Designated by Law (40 years) (m)
				3606	Length of Pipeline/ Distributing Main pipes/ pipes exceed Depreciation Period Designated by Law (40 years) (m)
				3607	Length of Pipeline/ Distributing Branch pipes/ pipes exceed Depreciation Period Designated by Law (40 years) (m)
				0701	Length of Raw Water Conveyance pipes/ Classified by Diameter/ Length of Raw Water Conveyance pipes/ Total (m)
				0706	Length of Water Transmission pipes Classified by Diameter/ Length of Water Transmission pipes/ Total (m)
				0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)
2104	Mains rehabilitation	This indicator represents the percentage of conveyance, transmission, and distribution pipes replaced in a year, that is, the extent to which the replacement is made in order to ensure the reliability.	Mains rehabilitation = (Length of replaced pipelines/ Total pipeline length) × 100 (unit: %)	7016	Raw Water and Purified Water Transmission pipes/ Length of Replaced pipes/ Total (m)
				7040	Water Distribution pipes/ Length of Replaced pipes/ Total (m)
				0701	Length of Raw Water Conveyance pipes/ Classified by Diameter/ Length of Raw Water Conveyance pipes/ Total (m)
				0706	Length of Water Transmission pipes Classified by Diameter/ Length of Water Transmission pipes/ Total (m)

				0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)
2106	Valves replacement	This indicator represents the percentage of valves replaced in a year, that is, the extent to which the replacement is made in order to ensure the reliability of water distribution control for pipelines.	Valves replacement = (Number of replaced valves/ Total number of existing valves) × 100 (unit: %)	0746	Number of Replaced Valve
				0747	Number of Installed Valve
2107	Newly installed mains	This indicator shows the extent to which pipelines increase. Water distribution networks should cover all service areas to achieve the 100 -percent water supply coverage.	Newly installed mains = (Length of newly installed pipelines/ Total pipeline length) × 100 (unit: %)	7008	Raw Water and Purified Water Transmission pipes/ Length of Newly Installed pipes/ Total (m)
				7032	Water Distribution pipes/ Length of Newly Installed pipes/ Total (m)
				0701	Length of Raw Water Conveyance pipes/ Classified by Diameter/ Length of Raw Water Conveyance pipes/ Total (m)
				0706	Length of Water Transmission pipes Classified by Diameter/ Length of Water Transmission pipes/ Total (m)
				0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)
2201	Accidental water resource pollution	This indicator does not relate directly to services offered by water utilities or authorities, but they should take flexible measures against any accidents to supply an enough volume of water. Most water pollution accidents have a serious impact on water supply. Accordingly, it is important to take a variety of preventive measures to reduce the accidents. Using this indicator with water cut rates allows water utilities to check the stability of drinking water supply services.	Accidental water resource pollution = Number of water pollution accidents per year (unit: No.)	3809	Annual Water quality accident/ Number of incidents (times/ year)
2202	Trunk mains failures	This indicator represents the number of accidents occurring in main pipelines in a year, that is, the soundness of the pipeline facilities. The mains refer to pipelines important to water operation. When this indicator value becomes large, water utilities should take quick measures, for example, replacement pipelines in which accidents often occur or which have aged pipes.	Trunk mains failures = (Number of mains failures/ Total mains length) × 100 (unit: No./100 km)	3810	Number of Water main pipe accidents (times/ year)
				6812	Length of Raw Water Conveyance pipes/ Total (m)
				6824	Length of Water Transmission pipes/ Total (m)

				6836	Length of Water Distribution pipes/ Distributing Main pipes/ Total (m)
2203	Available water volume in an accident	For the risk management of drinking water supply systems, it is simply assumed that the largest purification plant or pump station stops completely. This indicator represents the flexibility and margin of the system, that is, the sustainability of services.	Available water volume in an accident = (Reduced transmission input/ Average daily transmission input) × 100 (unit:%)	3811	Distribution water volume at the time of accidents (m3/ day)
				5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
2204	Population supplied water in an accident	For the risk management of drinking water supply systems, it is simply assumed that the largest purification plant or pump station stops completely. This indicator represents the flexibility and margin of the system, that is, the sustainability of services.	Population supplied water in an accident = (Accident -affected population/ Service population) × 100 (unit:%)	3812	Water Supply Population at the time of accidents (Capita)
				0206	Population/ Water Supply Population (Capita)
2205	Water supply points density in emergency	This indicator represents the number of service locations per service area of 100 km2, that is, the ease of use when an emergency event has occurred. It is also one of indices showing response to an emergency event.	Water supply points density in emergency = (Number of distribution and emergency reservoirs/ Service area) × 100 (unit: No./100 km2)	6701	Distribution Reservoir, etc./ Disaster correspondence/ Number of Water Supply (Number of Authorization)
				6704	Wells/ Number of Water Supply
				6707	Emergency receiving tanks, etc./ Settled by Water utilities/ Number of Water Supply
				6710	Emergency receiving tanks, etc./ Settled by Local Government/ Managed by Water Utilities/ Number of Water Supply
				6713	Emergency receiving tanks, etc./ Settled by Local Government/ Managed by Local governments/ Number of Water Supply
				0218	Area/ Current Water Supply District Area (km2)
2207	Ratio of earthquake-resistant treatment facility	Drinking water structures should conform to earthquake resistance for safety (Rank A of Level 2). New facilities are designed to meet Level 2, while it is difficult to improve aged facilities to meet Level 2. Therefore, repairs for improving the earthquake resistance should be evaluated carefully.	Ratio of earthquake-resistant treatment facility = (Capacity of earthquake-resistant purification facilities/ Capacity of all purification facilities) × 100 (unit:%)	4101	Capacity of Purification plants with Earthquake-resistance/ Ｌ２対応 (m3/ day)
				5118	Capacity of Facilities (m3/ day)

2208	Ratio of earthquake-resistant pumping station	Drinking water structures should conform to earthquake resistance for safety (Rank A of Level 2). New facilities are designed to meet Level 2, while it is difficult to improve aged facilities to meet Level 2. Therefore, repairs for improving the earthquake resistance should be evaluated carefully. This indicator makes a judgment regarding the earthquake resistance of pump stations rather than pumps.	Ratio of earthquake-resistant pumping station = (Capacity of earthquake-resistant pump stations/ Capacity of all pump stations) × 100 (unit:%)	4105	Capacity of pumping stations with Earthquake-resistance ランクＡでＬ２対応 (m3/ day)
				6514	Pumping Stations classified by Facilities/ Total/ Pumping Volume (m3/ min.)
2209	Ratio of earthquake-resistant service reservoir	Drinking water structures should conform to earthquake resistance for safety (Rank A of Level 2). New facilities are designed to meet Level 2, while it is difficult to improve aged facilities to meet Level 2. Therefore, repairs for improving the earthquake resistance should be evaluated carefully. In addition, the water leakage should be checked with this indicator. If a plant has pump stations and distribution reservoirs, water utilities should select either indicator by comparing the importance of both facilities.	Ratio of earthquake-resistant service reservoir = (Capacity of earthquake-resistant service reservoirs/ Capacity of all service reservoirs) × 100 (unit:%)	4109	Earthquake-resistant countermeasureが施されている Distribution Reservoir/ Capacity/ ランクＡでＬ２対応 (m3)
				0532	Water Purification Plant/ Treated Water Reservoir/ Effective Capacity (m3)
				0542	Water Purification Plant/ Distribution Reservoir/ Effective Capacity of Distribution Reservoirs (m3)
				0535	Water Distribution Facilities/ Effective Capacity of Distribution Reservoirs (m3)
				0540	Water Distribution Facilities/ Effective Capacity of Elevated Distribution Reservoir (m3)
				6708	Emergency receiving tanks, etc./ Settled by Water utilities/ Potable Water & Domestic water (m3)
				6711	Emergency receiving tanks, etc./ Settled by Local Government/ Managed by Water Utilities/ Potable Water & Domestic water (m3)
				6714	Emergency receiving tanks, etc./ Settled by Local Government/ Managed by Local governments/ Potable Water & Domestic water (m3)
2210	Ratio of earthquake-resistant pipeline	This indicator shows the progress of migration to earthquake-resistant conveyance, transmission, and distribution pipes, that is, water supply system's safety and response to seismic disasters. Since not so many	Ratio of earthquake-resistant pipeline = (Length of earthquake-resistant pipelines/ Total pipeline length) × 100 (unit:%)	6802	Length of Raw Water Conveyance pipes/ Ductile Iron pipes (Connected with Earthquake-resistant Joint) (m)
				6814	Length of Water Transmission pipes Ductile Iron pipes (Connected with Earthquake-resistant Joint) (m)

		polyethylene pipes are used, it still takes a time to verify the earthquake resistance. Accordingly, the performance indicator should be marked with an asterisk (*) if the polyethylene pipe is included.		6826	Length of Water Distribution pipes/ Distributing Main pipes/ Ductile Iron pipes (Connected with Earthquake-resistant Joint) (m)
				6838	Length of Water Distribution pipes/ Distributing Branch pipes/ Ductile Iron pipes (Connected with Earthquake-resistant Joint) (m)
				6850	Length of Raw Water Conveyance pipes/ Steel pipes (Connected with Welded Joint) (m)
				6854	Length of Water Transmission pipes Steel pipes (Connected with Welded Joint) (m)
				6858	Length of Water Distribution pipes/ Distributing Main pipes/ Steel pipes (Connected with Welded Joint) (m)
				6862	Length of Water Distribution pipes/ Distributing Branch pipes/ Steel pipes (Connected with Welded Joint) (m)
				6852	Length of Raw Water Conveyance pipes/ Polyethylene pipes (Connected with Reinforced Heat Fusion Attachment pipes Fittings) (m)
				6856	Length of Water Transmission pipes Polyethylene pipes (Connected with Reinforced Heat Fusion Attachment pipes Fittings) (m)
				6860	Length of Water Distribution pipes/ Distributing Main pipes/ Polyethylene pipes (Connected with Reinforced Heat Fusion Attachment pipes Fittings) (m)
				6864	Length of Water Distribution pipes/ Distributing Branch pipes/ Polyethylene pipes (Connected with Reinforced Heat Fusion Attachment pipes Fittings) (m)
				6810	Length of Raw Water Conveyance pipes/ Stainless Steel pipes (m)
				6822	Length of Water Transmission pipes Stainless Steel pipes
				6834	Length of Water Distribution pipes/ Distributing Main pipes/ Stainless Steel pipes (m)
				6846	Length of Water Distribution pipes/ Distributing Branch pipes/ Stainless Steel pipes (m)
				0701	Length of Raw Water Conveyance pipes/ Classified by Diameter/ Length of Raw Water Conveyance pipes/ Total
				0706	Length of Water Transmission pipes Classified by Diameter/ Length of Water Transmission pipes/ Total (m)
				0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)
2211	Chemicals stock	Each purification plant has to keep chemicals for water treatment. An earthquake may make it impossible to deliver chemicals. Accordingly, it is desired to have appropriate amounts of chemical stocks.	Chemicals stock = Average chemical stock/ Daily consumption (unit: days)	4205	Chemical Storage/ Average Coagulant Storage (t)
				4242	Chemical Storage/ Average Chlorine Agent Storage (t)

				4206	Chemical Storage/ Daily Average Coagulant Usage Volume (t/ day)
				4243	Chemical Storage/ Daily Average Chlorine Agent Usage Volume (t/ day)
2212	Fuel stock	Each purification plant has to keep fuels. An earthquake may make it impossible to deliver fuels. Accordingly, it is desired to have appropriate amounts of fuel stocks able to supply power for a period of time assumed in the event of a disaster.	Fuel stock = Average fuel stock/ Daily consumption (unit: days)	4207	Fuel storage/ Average Fuel storage volume (t)
				4208	Fuel storage/ Daily Water Consumption (t/ day)
2213	Water truck	The more the supplies, the more helpful in an emergency event, but cost and control problems persist. The necessary supplies include engine pumps, lamps, water balloons, water bags, and simple purifiers, but this indicator selects only emergency water trucks as their representative.	Water truck = (Number of water trucks/ Service population) × 1,000 (unit: No./1,000 persons)	4211	Number of Water trucks (台)
				0206	Population/ Water Supply Population (Capita)
2215	Water service tank carried by vehicles	This indicator represents how much water can be supplied to 1,000 users via on-vehicle service tanks in the event of a disaster, that is, response to critical events such as earthquakes.	Water service tank carried by vehicles = (Total capacity of on - vehicle service tanks/ Service Population) × 1,000 (unit: m3/1,000 persons)	4212	Total Capacity of Water service tanks for car (m3)
				0206	Population/ Water Supply Population (Capita)
2216	Ratio of non-utility generation facility	The indicator is the ratio of on-site generation power to total generation power in waterworks facilities, and shows the percentage of electric facilities able to run in an emergency event, that is, one of indices representing response to critical events.	Ratio of non-utility generation facility = (On-site generation power/ Total generation power) × 100 (unit:%)	4209	Capacity of Non-utility generation facilities (kW)
				4210	Total Electric Power Capacity of Non-utility generation facilities (kW)
3001	Operating ratio	This indicator is one of indices showing the profitability. It indicates the extent to which the income covers the expense. The higher the operating ratio, the higher the prof it, and less than 100 percent means a loss	Operating ratio = (Operating income/ Operating expenses) × 100 (unit:%)	5402	(1) Operating Income [(a)〜 (c)] (1,000 yen)
				5413	(1) Operating Expenses [(a)〜 (j)] (1,000 yen)
3002	Ratio of current expense to current income	This indicator is the most typical index showing the profitability. It indicates the extent to which the income covers the expense. The higher the ratio, the higher the current profit, and less than 100 percent means a loss. The operation is good if this indicator exceeds 100 percent within a charge calculating period (financial planning period) rather than in one fiscal year.	Ratio of current expense to current income = ((Operating income + Non-operating income)/ (Operating expenses + Non-operating expenses)) × 100 (unit: %)	5402	(1) Operating Income [(a)〜 (c)] (1,000 yen)
				5406	(2) Non-operating Income [(a)〜 (d)] (1,000 yen)
				5413	(1) Operating Expenses [(a)〜 (j)] (1,000 yen)

				5424	(2) Non-operating Expenses [(a)～ (e)] (1,000 yen)
3003	Rate of total returns	This indicator shows the extent to which the gross income covers the gross expense. The operation is not good if the indicator value does not exceed 100 percent, which means that the income is less than the expense.	Rate of total returns = (Gross income/ Gross expenses) × 100 (unit:%)	5401	1 / Gross Income (1)＋ (2)＋ (3) (1,000 yen)
				5412	2 / Gross Expenses (1)＋ (2)＋ (3) (1,000 yen)
3004	Ratio of cumulative deficit	This indicator is the ratio of the cumulative deficit to the operating income (except the commissioned work revenue), and shows whether the operation of a water utility is good or not by grasping the amount of the cumulative deficits. It is one of indices showing the soundness of operation. If the indicator is not zero, it says that the operation is not good. The higher the value, the worse the operation.	Ratio of cumulative deficit = (Cumulative deficit/ (Operating income × Commissioned work income)) × 100 (unit:%)	5535	(c) Unappropriated Profit, Unappropriated Deficit (△) (1,000 yen)
				5402	(1) Operating Income [(a)～ (c)] (1,000 yen)
				5404	(b) Revenue on Trusted Construction (1,000 yen)
3005	Percentage of money transferred (revenue receipts)	This indicator represents the dependence of the revenue receipts on the transferred money, that is, the soundness and efficiency of operation. Drinking water supply services are based on a self -supporting system in which the source of revenue is a water rate. It is desirable to make the indicator value lower.	Percentage of money transferred (revenue receipts) = (Transferred money/ Revenue receipts) × 100 (unit:%)	5409	(c) Subsidy from General Account (1,000 yen)
				5401	1 / Gross Income (1)＋ (2)＋ (3) (1,000 yen)
3006	Percentage of money transferred (capital income)	This indicator represents the dependence of the capital income on the transferred money, and is one of indices showing the soundness and efficiency of operation. Drinking water supply services are based on a self-supporting system in which the source of revenue is a water rate. It is desirable to make the indicator value lower.	Percentage of money transferred (capital income) = (Transferred money on capital accounts/ Capital income) × 100 (unit:%)	5606	1/ Capital Receipt (2) Subsidies from General Account (1,000 yen)
				5608	1 / Capital Receipt (4) Government Subsidy (1,000 yen)
				5611	1 / Capital Receipt (7)/ Total [(1)～ (6)] (A) (1,000 yen)
3007	Revenue on water sales per personnel	This indicator employs the water supply revenue to represent productivity per staff member belonging to the profit and loss account.	Revenue on water sales per personnel = (Water supply revenue/ Number of staff members on profit and loss account)/ 1,000 (unit: thousand yen/person)	5403	(a) Revenue on Water Supply (1,000 yen)
				0330	Number of Personnel which accounted to profit & loss account (Capita)

3008	Ratio of personnel salary costs for revenue on water sales	This indicator represents the ratio of the salaries paid to the personnel to the water supply revenue, and is one of indices used to analyze the profitability of operation. Basically, the water supply revenue should go to drinking water supply services, so it is not desirable to increase the indicator value by allotting the revenue to the personnel.	Ratio of personnel salary costs for revenue on water sales = (Labor cost/ Water supply revenue) × 100 (unit:%)	5732	1/ Personnel Expenses〔 (1)＋ (2)〕(1,000 yen)
				5403	(a) Revenue on Water Supply (1,000 yen)
3009	Ratio of income bond interest for revenue on water sales	This indicator represents the ratio of the interest on corporate bonds to the water supply revenue, and is one of indices used to analyze the profitability of operation.	Ratio of income bond interest for revenue on water sales = (Interest on corporate bonds/ Water supply revenue) × 100 (unit :%)	5425	(a) Interest Cost of Public Corporation Bonds (1,000 yen)
				5403	(a) Revenue on Water Supply (1,000 yen)
3010	Ratio of depreciation cost for revenue on water sales	This indicator represents the ratio of the depreciation costs to the water supply revenue, and is one of indices used to analyze the profitability of operation.	Ratio of depreciation cost for revenue on water sales = (Depreciation cost/Water supply revenue) × 100 (unit:%)	5421	(h) Depreciation Expense (1,000 yen)
				5403	(a) Revenue on Water Supply (1,000 yen)
3011	Ratio of principal redemption on revenue bond for revenue on water sales	This indicator represents the ratio of the money redeemed from corporate bonds to the water supply revenue, and is used to analyze the impact of the redemption money on operation.	Ratio of principal redemption on revenue bond for revenue on water sales = (Redemption money/ Water supply revenue) × 100 (unit:%)	5617	2 / Capital Expenditure (3) Redemption of Public Corporation Bonds (1,000 yen)
				5403	(a) Revenue on Water Supply (1,000 yen)
3012	Ratio of unamortized balance on revenue bond for revenue on water sales	This indicator represents the ratio of the balance of corporate bonds to the water supply revenue, and is used to analyze the corporate bond balance and its impact on operation.	Ratio of unamortized balance on revenue bond for revenue on water sales = (Corporate bond balance/ Water supply revenue) × 100 (unit:%)	5523	(2) Borrowed Capital [(a)～ (b)] (1,000 yen)
				5403	(a) Revenue on Water Supply (1,000 yen)
3013	Ratio of tariff to production (ratio of water supply charges to water supply expenses)	This indicator represents the balance of water supply, and is one of indices showing the soundness of operation. If the indicator value is below 100 percent, income other than charges compensates water supply expenses.	Ratio of tariff to production = (Water supply rate/ Water supply cost) × 100 (unit:%)		
3014	Unit tariff of water supply	This indicator shows how much money water utilities earn by supplying a cubic meter of drinking water.	Unit tariff of water supply = (Water supply revenue/ Revenue water volume) × 100 (unit: yen/m3)	5403	(a) Revenue on Water Supply (1,000 yen)

			volume) × 100 (unit: yen/m3)	5022	Annual Water Supply Volume/ Breakdown/ Billed Water Consumption (1,000 m3)
				5027	Annual Bulk Water Supply Volume/ Breakdown/ Billed Water Consumption (1,000 m3)
				5032	Annual Water supply volume to another water supplier/ Breakdown/ Billed Water Consumption (1,000 m3)
3015	Cost to water supply	This indicator shows how much money water utilities pay for supplying a cubic meter of revenue water.	Cost to water supply = (Ordinary expenses - (Commissioned work cost + Unused material and article costs + Auxiliary service cost))/ Revenue water volume (unit: yen/m3)	5413	(1) Operating Expenses [(a)～ (j)] (1,000 yen)
				5424	(2) Non-operating Expenses [(a)～ (e)] (1,000 yen)
				5418	(e) Expense on Trusted Construction (1,000 yen)
				3703	Cost of Materials, etc. sold among Previous "Others" (1,000 yen)
				3704	Incidental Expenses (1,000 yen)
				5022	Annual Water Supply Volume/ Breakdown/ Billed Water Consumption (1,000 m3)
				5027	Annual Bulk Water Supply Volume/ Breakdown/ Billed Water Consumption (1,000 m3)
				5032	Annual Water supply volume to another water supplier/ Breakdown/ Billed Water Consumption (1,000 m3)
3016	Charge for one month per 10 m3 for domestic	This indicator represents charges that the standard household pays for using water, and is one of indices showing the economical convenience of consumers. It is inevitable that different water utilities offer different water rates because they have different water resources, locations, waterworks facilities construction timing, operating scales, and labor and facilities maintenance costs. However, a large disparity in regions should be avoidable because water is indispensable to daily life. Water utilities should compare their water rates with the average to take measures for eliminating the disparity.	Charge for one month per 10 m3 for domestic = Monthly minimum charge (13-mm diameter) + Meter rate per 10 cubic meters (unit: yen)	0117	Tariff for Households/ monthly/ Basic Charge (Yen)
				0134	Tariff for Households/ monthly/ Bill for Consumption of 10 m3

3017	Charge for one month per 20 m3 for domestic	This indicator represents charges that the standard household pays for using water, and is one of indices showing the economical convenience of consumers. It is inevitable that different water utilities offer different water rates because they have different water resources, locations, waterworks facilities construction timing, operating scales, and labor and facilities maintenance costs. However, a large disparity in regions should be avoidable because water is indispensable to daily life. Water utilities should compare their water rates with the average to take measures for eliminating the disparity.	Charge for one month per 20 m3 for domestic = Monthly minimum charge (13-mm diameter) + Meter rate per 20 cubic meters (unit: yen)	0117	Tariff for Households/ monthly/ Basic Charge (Yen)
				0133	Tariff for Households/ monthly/ Bill for Consumption of 20 m3
3018	Revenue water ratio	This indicator represents the ratio of revenue water to distribution input (supply volume) in a year, and allows water utilities to check whether the operation of facilities yields revenue.	Revenue water ratio = (Revenue water volume/ Supply volume) × 100 (unit: %)	5022	Annual Water Supply Volume/ Breakdown/ Billed Water Consumption (1,000 m3)
				5027	Annual Bulk Water Supply Volume/ Breakdown/ Billed Water Consumption (1,000 m3)
				5032	Annual Water supply volume to another water supplier/ Breakdown/ Billed Water Consumption (1,000 m3)
				5020	Annual Water Supply Volume/ Annual Water Supply Volume (1,000 m3)
3019	Rate of facility utilization	This indicator shows the ratio of the average daily supply to the daily capacity, and allows water utilities to make a comprehensive judgment regarding the cost effectiveness of waterworks facilities. The larger the value, the higher the efficiency. The indicator is also given by multiplying the maximum operation rate and the load factor. If the indicator value is small because the maximum operation rate is low, not the load factor, it tells that investments are too much and that part of facilities is idle.	Rate of facility utilization = (Average daily supply/ Daily capacity) × 100 (unit: %)	5106	Water Supply Volume per Day/ Daily Average Water Supply Volume (m3)
				5118	Capacity of Facilities (m3/ day)
3020	Maximum rate of operation	This indicator should define the ratio of the longest to the planned in the daily operating time of facilities, but it is difficult to find them. As a result, it represents the ratio of the maximum daily supply to the daily capacity, and is one of indices showing the efficiency of waterworks facilities.	Maximum rate of operation = (Maximum daily supply/ Daily capacity) × 100 (unit: %)	5103	Water Supply Volume per Day/ Daily Maximum Water Supply Volume (m3)
				5118	Capacity of Facilities (m3/ day)
3021	Average rate of loading	This indicator is one of indices showing the efficiency of waterworks facilities. The larger the value, the higher the efficiency. In the water industry, the demand varies season by season and the facilities are designed to meet	Average rate of loading = (Average daily supply/ Maximum daily supply) × 100 (unit: %)	5106	Water Supply Volume per Day/ Daily Average Water Supply Volume (m3)

		a demand peak. As a result, the larger the demand variation, the lower the efficiency and load factor.		5103	Water Supply Volume per Day/ Daily Maximum Water Supply Volume (m3)
3022	Current ratio	This indicator represents the ratio of the current assets to the current liabilities, that is, the capability of paying short -term obligations. The indicator value should be over 100 percent, otherwise a bad debt occurs.	Current ratio = (Current assets/ Current liabilities) × 100 (unit: %)	5510	２/ Current Assets [(１)～ (３)] (1,000 yen)
				5517	６/ Current Liabilities [(１)～ (２)] (1,000 yen)
3023	Ratio of net worth to total capital	This indicator represents the ratio of the owned capital to the total capital (liabilities plus capital), and is one of indices showing the soundness of finance. Water utilities should increase the indicator value to make their operation stable.	Ratio of net worth to total capital = ((Owned capital + Surplus)/ Total of liabilities and capital) × 100 (unit: %)	5522	(１) Equity Capital (1,000 yen)
				5526	９/ Accumulated Profit [(１)～ (２)] (1,000 yen)
				5538	１１/ Liabilities/ Total Capital [７＋１０] (1,000 yen)
3024	Ratio of fixed assets to equity capital	This indicator shows how much owned capital is invested in the fixed assets. If the value is within 100 percent, it means that investments in the fixed assets are within the owned capital. If the value exceeds 100 percent, it means that loans are given to capital investment, which causes problems, such as the payment of the loans and interests.	Ratio of fixed assets to equity capital = (Fixed assets/ (Owned capital + Surplus)) × 100 (unit: %)	5501	１/ Fixed Assets [(１)～ (３)] (1,000 yen)
				5522	(１) Equity Capital (1,000 yen)
				5526	９/ Accumulated Profit [(１)～ (２)] (1,000 yen)
3025	Ratio of principal redemption cost on revenue bond to depreciation cost	This indicator shows the balance between invested capital recovery and reinvestment. If the indicator value exceed 100 percent, the soundness of investment deteriorates because the reinvestment relies on external funds like corporate bonds.	Ratio of principal redemption cost on revenue bond to depreciation cost = (Redemption principal/ Depreciation cost) × 100 (unit: %)	5617	２/ Capital Expenditure (３) Redemption of Public Corporation Bonds (1,000 yen)
				5421	(h) Depreciation Expense (1,000 yen)
3026	Turnover of fixed assets	This indicator represents the ratio of the operating income to the fixed assets, that is, how many times larger than the fixed assets the operating income is in a given period of time. The fixed assets turnover is very important because drinking water supply services relate closely to facilities. If the indicator value is large, the facilities run effectively, but if small, excess investments may occur.	Turnover of fixed assets = (Operating income - Commissioned work income)/ ((Initial fixed assets + Final fixed assets)/2) (unit: rotations)	5402	(１) Operating Income [(a)～ (c)] (1,000 yen)
				5418	(e) Expense on Trusted Construction (1,000 yen)
				5501	１/ Fixed Assets [(１)～ (３)] (1,000 yen)
				5501	１/ Fixed Assets [(１)～ (３)] (1,000 yen)
3027	Efficiency of fixed assets utilization	This indicator represents the ratio of the annual water supply volume to the tangible fixed assets. The larger the value, the more efficient the facilities. If the indicator value is low, water utilities should examine idle and unproductive assets.	Efficiency of fixed assets utilization = (Supply volume/ Tangible fixed assets) × 10,000 (unit: m3/10,000 yen)	5020	Annual Water Supply Volume/ Annual Water Supply Volume (1,000 m3)
				5502	(１) Tangible Fixed Assets [(a)～ (e)] (1,000 yen)
3101	Number of employees' qualifications	Offering drinking water supply services need statutory licenses. Water utilities can commission third parties to conduct any work, but should have qualified staff members. The qualification is classified into statutory and private licenses, but this indicator employs only the statutory. It does not include qualifications obtained as a personal interest.	Number of employees' qualifications = Number of statutory qualifications/ Total number of staff members (unit: No./person)	3505	Number of Qualified person of Technical administrator of waterworks/ Employee (Capita)
				3509	Number of Qualified person of Inspector for water facilities construction/ Employee (Capita)
				0326	Number of Personnel/ Sub/ Total (Capita)
3105	Technical employee's ratio	The inheritance of technology is necessary and important, but in current times, the number of engineers decreases. As the indicator value is reducing, it is more difficult for water utilities to maintain the facilities by themselves.	Technical employee's ratio = (Number of engineers/ Total number of staff members) × 100 (unit: %)	0321	Number of Personnel/ Engineering Staff/ Total (Capita)
				0326	Number of Personnel/ Sub/ Total (Capita)
3109	Transmission input per employee	This indicator is one of indices showing the efficiency of whole drinking water supply services.	Transmission input per employee = Annual distribution input/ Total number of staff members (unit: m3/person)	5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
				0326	Number of Personnel/ Sub/ Total (Capita)
3110	Number of meters per employee	This indicator is one of indices showing the efficiency of whole drinking water supply services.	Number of meters per employee = Number of water meters/ Total number of staff members (unit: No./person)	5215	Number of installed meter
				0326	Number of Personnel/ Sub/ Total (Capita)
4001	Electric power consumption per 1 m3 transmission input	Since it is important to keep power even in the event of an accident, duplex power lines may be necessary with compromising the efficiency in view of environmental protection and risk dispersion. The power consumption varies particularly depending on the geographical features of distribution systems.	Electric power consumption per 1 m3 transmission input = Total power consumption/ Annual transmission input (unit: kWh/m3)	6119	Electric Power Consumption計 (kWh)
				5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
4002	Energy consumption per 1	Energy saving is encouraged to preserve the global environment. This indicator (MJ/m3) can be used to	Energy consumption per 1 m3 transmission input = Total energy		

	m3 transmission input	select measures effective in reducing environmental loads, for example, when water utilities find a target value for energy reduction.	consumption/ Annual transmission input (unit: MJ/m3)	6119	Electric Power Consumption計 (kWh)
				4401～4423	
				5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
4003	Renewable energy use ratio	This indicator represents the percentage of recyclable energy used by a water utility, and is one of indices showing the reduction of environmental loads and environmental preservation. It is desired to improve the efficiency of energy utilization and to decrease environmental loads by using unused and recyclable energy.	Renewable energy use ratio = (Recyclable power consumption/ Total power consumption) × 100 (unit: %)	4501	Renewable Energy Facilities/ Electric Power Consumption/ Hydroelectric Power Generation (kWh)
				4502	Renewable Energy Facilities/ Electric Power Consumption/ Solar Power Generation (kWh)
				4503	Renewable Energy Facilities/ Electric Power Consumption/ Wind Power Generation (kWh)
				4504	Renewable Energy Facilities/ Electric Power Consumption/ Other Power Generation (kWh)
				6119	Electric Power Consumption計 (kWh)
4004	Recycling ratio of generated sludge from purification plants	This indicator represents the effective use of sludge deposited during purification, and is one of indices showing the extent to which water utilities conserve the environment. Setting up a target value for this indicator can embody environmental activities (including environmental management systems).	Recycling ratio of generated sludge from purification plants = (Amount of used sludge/ Amount of deposited sludge) × 100 (unit: %)	0833	Operation Condition/ Disposition Method of Soil Produced in Water Purification/ Effective Utilization (%)
4005	Recycling ratio of construction by-product	This indicator represents the effective use of by-products generated during construction, and is one of indices showing the extent to which water utilities conserve the environment. Setting up a target value for this indicator can embody environmental activities (including environmental management systems).	Recycling ratio of construction by-product = (Amount of recycled by-products/ Amount of generated by-products) × 100 (unit: %)	4301～4307	
				4315～4321	
4006	Emission of CO2 per 1 m3 transmission input	This indicator is one element of environmental measures, which water utilities take to reduce the amount of greenhouse gases.	Emission of CO2 per 1 m3 transmission input = (Carbon dioxide emission/ Annual transmission input) × 106 (unit: g CO2/m3)		
				6120	Contracted Electric Power Company (1)
				6119	Electric Power Consumption計 (kWh)

				4401～4423	
				5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
4101	Underground water ratio	Water resources have surface and underground water, and the smaller the scale of water utilities, the larger the ratio of underground water. This is because the underground water is low in cost and stable, that is, the utilization value is high. However, water utilities should take care of the allowable volume of water because excess pumping may cause a land subsidence.	Underground water ratio = (Pumping discharge/ Water resource volume) × 100 (unit: %)	5006	Annual Water Abstraction Volume/ Ground Water/ Shallow Well Water (1,000 m3)
				5007	Annual Water Abstraction Volume/ Ground Water/ Deep Well Water (1,000 m3)
				5010	Annual Water Abstraction Volume/ Sub/ Total (1,000 m3)
5009	Outsourced purification plant ratio	Conventionally, no engineer was stationed in commissioned purification plants, but this indicator is applied only to third parties based on the law. This is because the conventional commission does not specify the scope strictly. This indicator employs the purification capacity rather than the number of purification plants because the former can clearly show the extent to which the plants are commissioned.	Outsourced purification plant ratio = (Commissioned purification capacity/ Total purification capacity) (unit: %)	3410	Capacity of Water Purification Plants Entrusted to Third Party (m3/ day)
				5118	Capacity of Facilities (m3/ day)
5101	Number of purification plant accident	Many accidents occur in purification plants, but typically, the duplex system and backup function of facilities avoid a water purification or transmission failure because it has a serious impact.	Number of purification plant accident = Number of accidents for ten years/ Number of purification plants (unit: No./plant/ 10 years)	3813	Suspension time of water purification plants (times/ year)
				0545	Water Purification Plant/ Number of Water Purification Plant/ Slow Sand Filtration System
				0546	Water Purification Plant/ Number of Water Purification Plant/ Rapid Sand Filtration System
				0553	Water Purification Plant/ Number of Water Purification Plant/ Membrane Filtration System
5102	Ratio of ductile iron and steel mains	This indicator focuses on the material strength of conveyance, transmission, and distribution pipes, that is, the maintainability.	Ratio of ductile iron and steel mains = ((Length of ductile cast iron pipes + Length of steel pipes)/ Total pipeline length) × 100 (unit: %)	6802	Length of Raw Water Conveyance pipes/ Ductile Iron pipes (Connected with Earthquake-resistant Joint) (m)
				6803	Length of Raw Water Conveyance pipes/ Ductile Iron pipes/ Except Previous item (m)

				6814	Length of Water Transmission pipes Ductile Iron pipes (Connected with Earthquake-resistant Joint) (m)
				6815	Length of Water Transmission pipes Ductile Iron pipes/ Except Previous item (m)
				6826	Length of Water Distribution pipes/ Distributing Main pipes/ Ductile Iron pipes (Connected with Earthquake-resistant Joint) (m)
				6827	Length of Water Distribution pipes/ Distributing Main pipes/ Ductile Iron pipes/ Except Previous item (m)
				6838	Length of Water Distribution pipes/ Distributing Branch pipes/ Ductile Iron pipes (Connected with Earthquake-resistant Joint) (m)
				6839	Length of Water Distribution pipes/ Distributing Branch pipes/ Ductile Iron pipes/ Except Previous item (m)
				6866	Length of Raw Water Conveyance pipes/ Ductile Iron pipes (Connected with K-type Mechanical Joint and Installed on the Stable Ground) (m)
				6867	Length of Water Transmission pipes Ductile Iron pipes (Connected with K-type Mechanical Joint and Installed on the Stable Ground) (m)
				6868	Length of Water Distribution pipes/ Distributing Main pipes/ Ductile Iron pipes (Connected with K-type Mechanical Joint and Installed on the Stable Ground) (m)
				6869	Length of Water Distribution pipes/ Distributing Branch pipes/ Ductile Iron pipes (Connected with K-type Mechanical Joint and Installed on the Stable Ground) (m)
				6804	Length of Raw Water Conveyance pipes/ Steel pipes (m)
				6816	Length of Water Transmission pipes Steel pipes (m)
				6828	Length of Water Distribution pipes/ Distributing Main pipes/ Steel pipes (m)

				6840	Length of Water Distribution pipes/ Distributing Branch pipes/ Steel pipes (m)
				0701	Length of Raw Water Conveyance pipes/ Classified by Diameter/ Length of Raw Water Conveyance pipes/ Total (m)
				0706	Length of Water Transmission pipes Classified by Diameter/ Length of Water Transmission pipes/ Total (m)
				0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)
5103	Number of pipeline failures	This indicator represents the annual sum of accidents in conveyance, transmission, and distribution pipes per pipeline length of 100 km, that is, the soundness of the pipelines There are various accidents; their scale and impact are different. Since this indicator evaluates failed pipelines from a facility control point of view, it ignores the scale of accidents. The influence of accidents varies depending on environmental conditions and measures, and any accident has a possibility of causing serious damage.	Number of pipeline failures = (Number of pipeline failures/ Total pipeline length) × 100 (unit: No./100 km)	3814	Number of pipeline accidents (times/ year)
				0701	Length of Raw Water Conveyance pipes/ Classified by Diameter/ Length of Raw Water Conveyance pipes/ Total
				0706	Length of Water Transmission pipes Classified by Diameter/ Length of Water Transmission pipes/ Total (m)
				0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)
5106	Number of service pipe failures	This indicator shows the soundness of service pipes from branch points to water meters. As a rule, consumers are responsible for maintaining service equipment, but water utilities should support it actively to improve drinking water supply services.	Number of service pipe failures = (Number of service pipe failures/ Total number of users) × 1,000 (unit: No./1,000 No.)	3910	Number of water supply pipe accidents (times)
				5214	Tariff structure by customer use/ Number of Household/ Total
				5342	Tariff structure by meter size/ Number of Household/ Total
5107	Leakage rate	Knowing the volume of water is basic to maintenance, so water utilities should make correct measurements. Since it is impossible to measure the volume of leaked water directly, water utilities are obliged to do estimations. It is recommended that water utilities use a logical analysis as shown in the section "4.3 Structure of classified water quantity."	Leakage rate = (Annual leakage/ Annual transmission input) × 100 (unit: %)	3911	Annual Water leakage volume (m3/ year)
				5018	Annual Water Purified Volume/ Annual Water Purified Volume/ Total (1,000 m3)
				5011	Annual Water Abstraction Volume/ Purified Water Receiving (1,000 m3)
5108	Leakage volume per contracted service connection	Knowing the volume of water is basic to maintenance, so water utilities should make correct measurements. Since it is impossible to measure the volume of leaked water directly, water utilities are obliged to do estimations. It is recommended that water utilities use a logical analysis as shown in the section "4.3 Structure of classified water	Leakage volume per contracted service connection = Annual leakage/ Total number of users (unit: m3/connection)	3911	Annual Water leakage volume (m3/ year)
				5214	Tariff structure by customer use/ Number of Household/ Total

		quantity.”		5342	Tariff structure by meter size/ Number of Household/ Total
5109	Hour of water interruption or water turbidity	A drought causes a water cut, but it is not sudden. This indicator includes only accidental water cuts. If private plumbing work interrupts water supply, it is excluded because of private responsibilities.	Hour of water interruption or water turbidity = (Water cut and turbidity time × Suffered service population)/ Service population (unit: hour)	9201	
				9202	
				0206	Population/ Water Supply Population (Capita)
5112	Valve density	This indicator shows the flexibility of water distribution and the maintainability of pipelines. Water utilities should deploy the valves in appropriate places while considering the configuration and geographical features of pipeline facilities in order to average the dynamic water pressure, to use water rationally, and to maintain the pipelines properly. Moreover, water utilities should install the valves to minimize the area where an emergency water cut occurs.	Valve density = Number of valves/ Total pipeline length (unit: No./km)	0747	Number of Installed Valve
				0701	Length of Raw Water Conveyance pipes/ Classified by Diameter/ Length of Raw Water Conveyance pipes/ Total (m)
				0706	Length of Water Transmission pipes Classified by Diameter/ Length of Water Transmission pipes/ Total (m)
				0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)
5114	Hydrant density	This indicator shows the pipeline facility's capabilities of firefighting and risk management as a lifesaving line. The waterworks play the role of supplying water for firefighting, so the hydrant supplies water when a fire occurs.	Hydrant density = Total number of hydrants/ Distribution pipe length (Unit: No./km)	0743	Number of Fire Hydrant 地 上 (基)
				0744	Number of Fire Hydrant 地 下 (基)
				0745	Number of Fire Hydrant/ Others (基)
				0711	Length of Water Distribution pipes Classified by Diameter/ Length of Water Distribution pipes/ Total (m)

Index of Statistics on Water Supply in Japan

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Form 1			
1-1	Summery of Water Supply	Number of Water Supply Classified by Type	1-1 Summery of Water Supply/ Number of Water Supply Classified by Type
1-2		Present Water Supply Population and Water Coverage Ratio	1-2 Summery of Water Supply/ Present Water Supply Population and Water Coverage Ratio
1-3		Designed Water Supply Population	1-3 Summery of Water Supply/ Designed Water Supply Population
1-4		Water Supply Utilities (5,000<Supply Population)	1-4 Summery of Water Supply/ Water Supply Utilities
1-5		Small Scale Water-supply Systems (Supply Population =<5,000)	1-5 Summery of Water Supply/ Small Scale Water-supply Systems
1-6		Private Water Supply (100<Supply Population)	1-6 Summery of Water Supply/ Private Water Supply (100<Supply Population)
1-7		Private Water Supply Facilities (50=<Supply Population =<100)	1-7 Summery of Water Supply/ Private Water Supply facilities (50=<Supply Population =<100)
2-1	Water Coverage	Water Coverage Divided by Municipalities	2-1 Water Coverage/ Water Coverage Divided by
Form 2－1			
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1-2		Tariff of Water Supply	01-02 Business Plans & Water Coverage/ Tariff of Water
1-3		Target of Water Supply	01-03 Business Plans & Water Coverage/ Target of Water Supply
1-4		Water Coverage	01-04 Business Plans & Water Coverage/ Water Coverage
1-5		Number of Personnel	01-05 Business Plans & Water Coverage/ Number of
1-6		Entrustment to Third Parties	01-06 Business Plans & Water Coverage/ Entrustment to Third Parties
1-7		Diffusiveness of New Technology	01-07 Business Plans & Water Coverage/ New
2-1	Outline of Facilities	Water Abstraction Facilities	02-01 Outline of Facilities/ Water Abstraction Facilities
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2-5		Effluent Treatment Facilities (Part 1)	02-05 Outline of Facilities/ Effluent Treatment Facilities
2-6		Effluent Treatment Facilities (Part 2)	02-06 Outline of Facilities/ Effluent Treatment Facilities
2-7		Length of Pipeline & Fire Hydrant	02-07 Outline of Facilities/ Length of Pipeline & Fire Hydrant
2-8		Length of pipes Networks & Length of Aged pipes (Over 40 Years) Classified by pipes Material	02-08 Outline of Facilities/ Length of pipes Networks & Length of Aged pipes (Over 40 Years) Classified by pipes
2-9		Length of Aged pipes (Over 20 Years)	02-09 Outline of Facilities/ Length of Aged pipes (Over 20 Years)
2-10		Length of pipes Expansion & pipes Renewal Classified by pipes Materials	02-10 Outline of Facilities/ Length of pipes Expansion & pipes Renewal Classified by pipes Materials
3-1	State of Water Supply	Water Abstraction Volume/ Water Purified Volume/ Water Supply Volume	03-01 State of Water Supply-Water Abstraction Volume/ Water Purified Volume/ Water Supply Volume
3-2		Analysis of Water Supply Volume	03-02 State of Water Supply-Analysis of Water Supply
3-3		Number of Service Connections (Tariff structure by customer use) & Annual Billed Water Consumption	03-03 State of Water Supply-Number of Service Connections (Tariff structure by customer use) & Annual Billed Water Consumption
3-4		Number of Service Connections (Tariff structure by meter size) & Annual Billed Water Consumption	03-04 State of Water Supply-Number of Service Connections (Tariff structure by meter size) & Annual Billed Water Consumption
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5-1	Environment & Energy	Environmental Consideration	05-01 Environment & Energy/ Environmental Consideration
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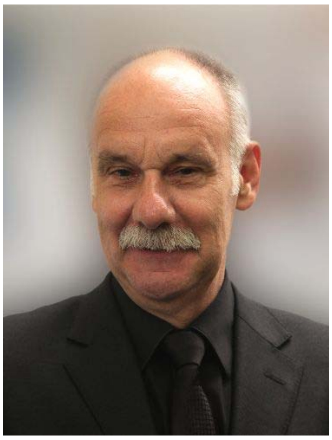
7-2		Expense Classified in Each Facility	07-02 Construction Improvement/ Expense Classified in Each Facility
	Reference		List of JWWA Q100 Performance Indicator led by Statistics on Water Supply in Japan



Profile

1. Name

   Dr. Ed Smeets MSc.

2. Organization

   Edmadi BV

3. Job Title

   Interim Manager and Consultant

4. Profile

   Ed has a Masters degree in Business Economics. He has worked in the Water sector for almost 20 years mainly as Chief Financial Officer (CFO) and Chief Executive Officer (CEO) of Water Supply Companies. Since 2003 he runs his own Interim Management and Consultancy company, mainly doing jobs as CFO or CEO for companies in the water sector but also in other sectors. Furthermore he acts as member of several Supervisory Boards. He is also the chairman of the Specialist Group on Statistics and Economics of the International Water Association.

5. Title of Speech

   1. Current Status & Financial Strategies of Water Utilities in the World - Introduction

   2. Current Status & Financial Strategies of Water Utilities in the World - THE NETHERLANDS

IWA International Water Association | Specialist Group Statistics and Economics

WORKSHOP

Current Status & Financial Strategies of Water Utilities in the World

THE NETHERLANDS

JWWA JAPAN WATER WORKS ASSOCIATION

IWA International Water Association

Tokyo, 19th of March 2015

Ed Smeets

EDMADI BV

INTERIM-MANAGEMENT & CONSULTANCY

Content

- Institutional structure water sector
- Key statistics water supply
- Governance & regulation water supply
- Status water supply today
- Annex: Benchmarking / results

Institutional structure water sector

- 41.000 km^2, 16.8 million inhabitants
- bordering to the North Sea
- half of the country below sea level
- delta of international rivers Rhine, Meuse, Scheldt, Eems
- managing water in Dutch genes for centuries

Institutional structure water sector

Many actors because of history:

- National level
  - government – national water policy
  - Rijkswaterstaat – national water agency responsible for national water infrastructure (coastal defence)

Institutional structure water sector

- Regional level
  - 12 provinces – ground water policy
  - 26 water boards – regional flood protection, surface water quality, wastewater treatment
  - 10 water companies – water supply
- Local level
  - 421 municipalities – sewer system, municipal water systems

Key statistics water supply

10 water supply
companies
operating
at regional scale

Key statistics water supply

Number of employees: 5000

Annual water production: 1126 million m3

Sources: 60% groundwater

40% surface water

Number of connections: 8.0 million

Distribution system: 119.000 km

Average household consumption: 119 litres/person/day

% of total household expenditure: 0.6 %

Turnover: 1351 million €

Investments: ca 430 million €/year

Key statistics water supply

<u>Average drinking water rate households (2014, €)</u>

Standing charge per year	: 57,77	(40,- / 87,-)
Rate per m3	: 0,81	(0,46 / 1,24)
Taxes per m3	: 0,24	
Average rate per m3 all in	: 1,65	(1,35 / 2,06)

(€1,65 = 212 Japanese yen)

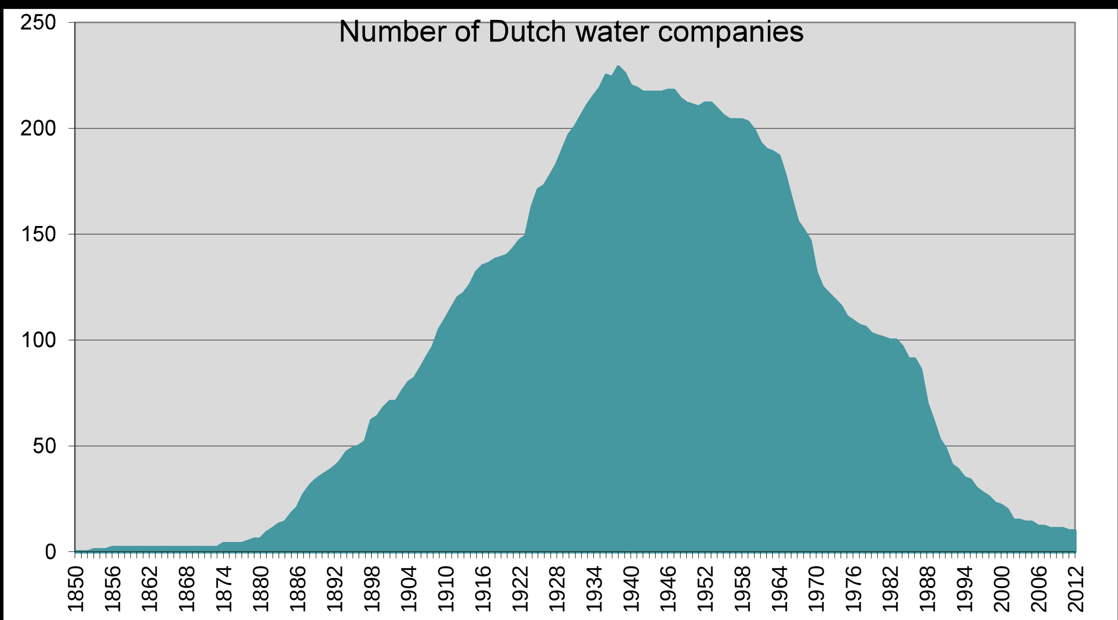
Governance & regulation water supply

- 1850's – 1940's: establishing water companies, increasing coverage
- after WO II: new challenges

  (increase of population, industrialisation, river water pollution)
- need for stronger utilities → voluntary up scaling & forced restructuring via provinces:

  Water Supply Act 1975

Governance & regulation water supply



Governance & regulation water supply

Drinking Water Act (2011)

- legal mandate to 10 regional, public water utilities
- ‘private business, public owners’
  - limited liability companies under private law (except for Amsterdam water cycle utility “Waternet”)
  - decentralised, public ownership (municipalities, provinces)
- regulation at arm’s length
  - integrated focus on public health, continuity, efficiency

Governance & regulation water supply

- mixed supervision
  - national (focus on water quality, continuity, finance & efficiency)
  - decentralised utility governance by public owners (focus on management, performance, investment policy, tariff setting)
- vital infrastructure → risk-based supply plans to secure supply today ánd tomorrow
- reasonable, affordable tariffs
- full cost recovery
- limitation to equity and dividend payments
- mandatory benchmarking

Status water supply today

- Water quality
  - tap water perfectly safe to drink
  - no chlorine, to eliminate disinfection by-products and improve taste
  - conditioning and hardness control for improved network lifetime, reduction of scaling and detergent consumption
- Reliability
  - few interruptions (6,6 mains failures/100 km/year or 6 minutes/connection/year)
  - low distribution losses (1,6 m3/km/day); leakage rate (<5%)
  - infrastructure in good condition – prerequisite for improved water quality

Status water supply today

- Sustainability
  - 100% green energy
  - 98% recycling of treatment residues
- Costs & efficiency
  - full cost coverage (index 1,1)
  - affordable (water bill 0,6 % of disposable household income)
  - low personnel intensity (0,7 fte / 1000 properties)

→ Challenge: to keep it this way – despite low consumer interest

Annex: Benchmarking / results

Benchmarking

- late 1980's: first benchmarking efforts (regional)
- as of 1997: voluntary, national benchmarking programme by Vewin
- initiated by national discussions on privatisation/ liberalisation of public services
- as of 2011: mandatory

Annex: Benchmarking / results

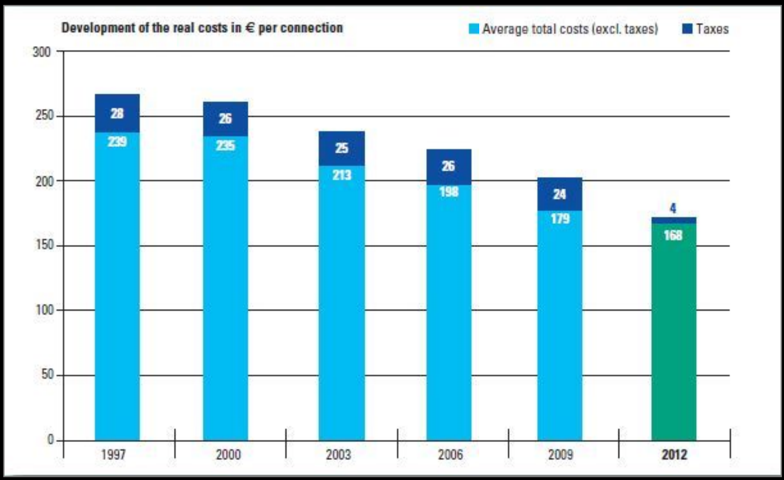
Benchmarking

- objectives
  - raising transparency
  - improving performance
- wide view on performance
- key areas:
  - water quality
  - service quality
  - environment
  - finance & efficiency

Annex: Benchmarking / results

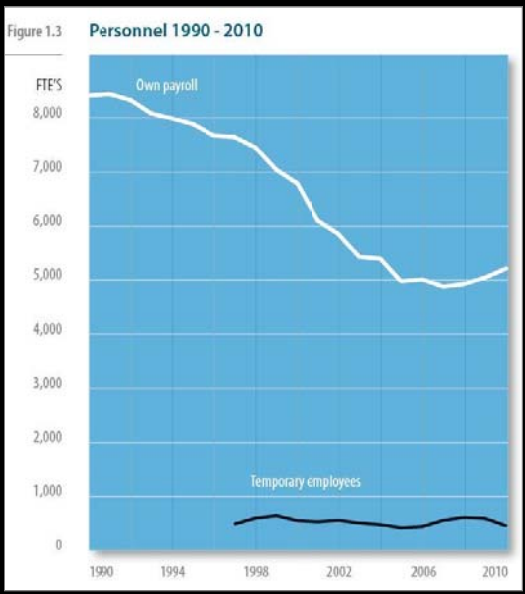
15 years of national benchmarking

- 35% cost reduction (adjusted for inflation)



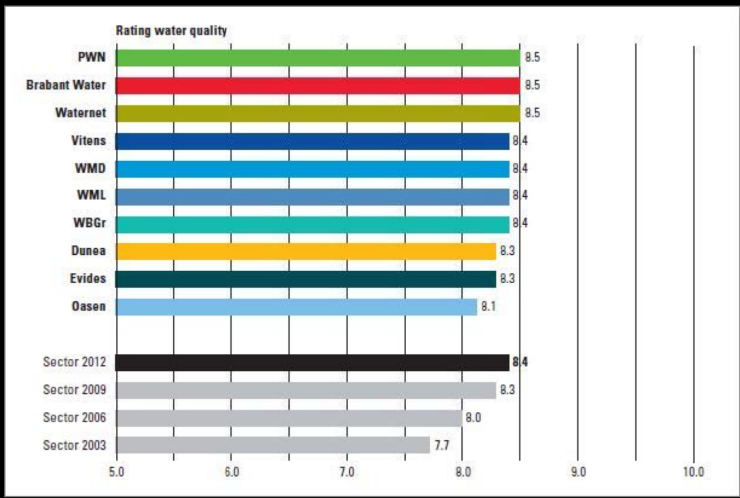
Annex: Benchmarking / results

- staff reduction because of mergers and efficiency improvements



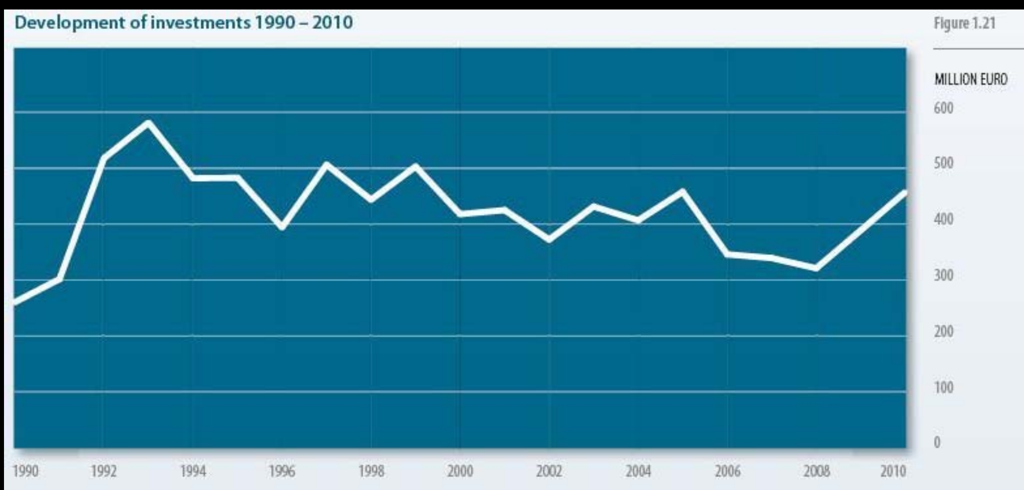
Annex: Benchmarking / results

- … while maintaining/improving water quality (customer surveys)



Annex: Benchmarking / results

- … and maintaining investment levels



Specialist Group
Statistics and
Economics

WORKSHOP

Current Status & Financial Strategies of Water Utilities in the World

INTRODUCTION

JWWA
JAPAN WATER WORKS ASSOCIATION

International Water Association

Tokyo, 19th of March 2015
Ed Smeets

EDMADI BV
INTERIM-MANAGEMENT & CONSULTANCY

CONTENT OF PRESENTATION

- IWA
- Specialist Group Statistics and Economics

IWA: CHARACTERISTICS

- Association of companies and individuals; network of water professionals (>10,000) in 130 countries
- Covering entire water cycle
- +/- 50 Specialist Groups
- High quality series of conferences
- Renowned International journals, publications, website

IWA: THE NETWORK

Biennial Conferences

Specialist Conferences

Leading Edge Conferences

Specialist Groups

Interest Groups

Leading Edge Workshops

Water 21 Magazine

Task Forces

Researchers

Utilities

IWA Books

Forums

Consultants

8 Leading International Journals on Water Sciences

Regulators

Web-Based Collaboration

Equip Manu

Strategic Programs

Industry

International Water Association

IWA SOLUTIONS THROUGH INNOVATIONS

IWA runs programmes on issues considered critical:

- Cities of the future
- Basins of the future
- Urban sanitation
- Water, climate and energy
- Water supply services

SPECIALIST GROUPS IN GENERAL: CHARACTERISTICS

- Specialist Groups lie at the heart of IWA
- Membership is open to all IWA members
- Develop international specialist networks and contacts
- Contribute to research and practice in scientific, technical or management areas
- Disseminate knowledge and information
  - by organising/contributing to conferences/workshops
  - by report/disseminate conclusions in IWA publications

SPECIALIST GROUP STATISTICS AND ECONOMICS

Topics

- All economical and financial issues of water industry (tariffs, efficiency, micro economics, finance of utilities, cost coverage, etc.)
- Periodical world wide surveys and providing analysis/statistics on all kind of economical and financial issues

SPECIALIST GROUP STATISTICS AND ECONOMICS

- 700 members
- +/- 20 active members (from universities, regulators, utilities, consultants, associations, etc.)
- Self-managed by chair, vice-chair, secretary and Management Committee (= active members)
- 2 times per year meetings to discuss program/activities, to do work and to have some fun; in between meetings all activities per mail/phone
- all work is free-time and self-financed

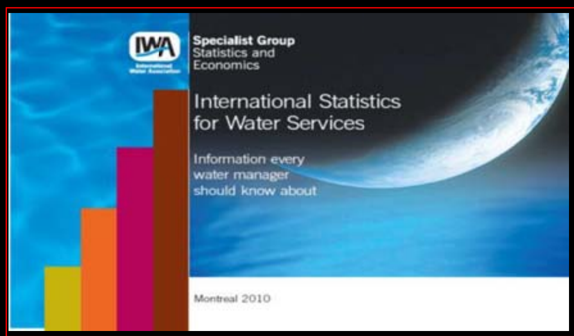
SPECIALIST GROUP STATISTICS AND ECONOMICS

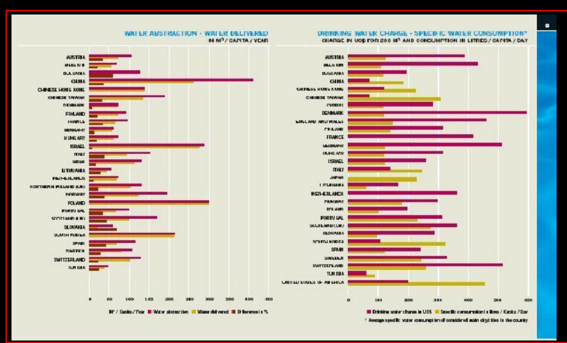
- Chairman:
  - Ed Smeets, (*Netherlands)*
- Vice chair:
  - Doru Popa, (*Rumania)*
- Secretary:
  - Maria Molinos (*Spain*)
- Working Groups
  - Statistics
  - Tariff and Finance
  - Water Economics
  - International Conferences

SPECIALIST GROUP STATISTICS AND ECONOMICS

- Working Group on Statistics
  - Leader:

    Jan Hammenecker, *Belgium*



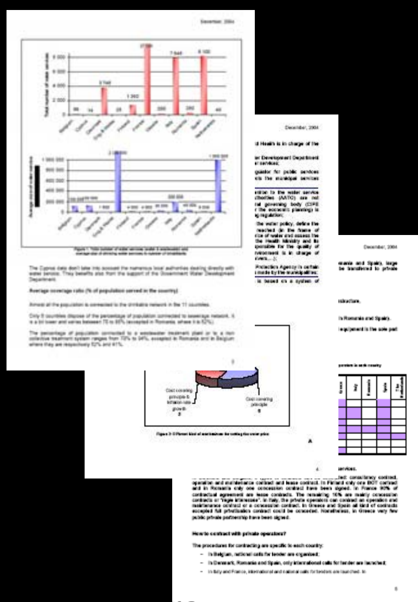


SPECIALIST GROUP STATISTICS AND ECONOMICS

- Working Group on Tariffs and Finance
  - Leader:
    Doru Popa, *Rumania*

SPECIALIST GROUP STATISTICS AND ECONOMICS

- Working Group on Water Economics
  - Leader:
    Francesc Hernandez, *Spain*



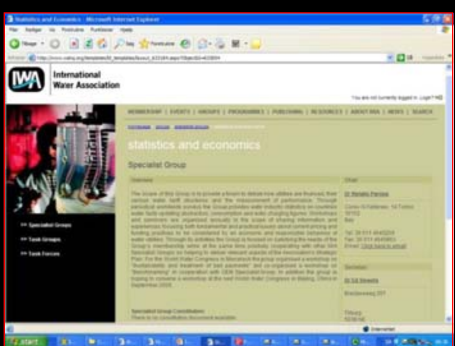
SPECIALIST GROUP STATISTICS AND ECONOMICS

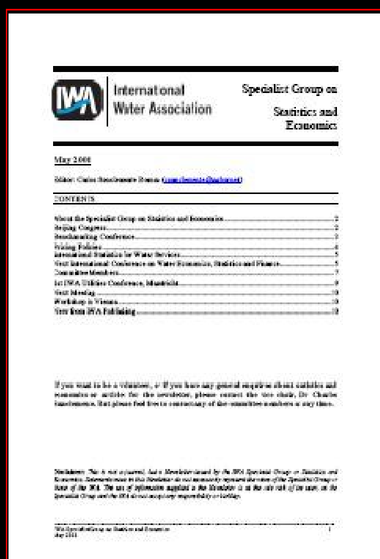
- Working Group on International Conferences
  - Leader:

    Konstantinos P. Tsagarakis, *Greece*

SPECIALIST GROUP S & E: NEWSLETTER

- On the web page to update SG's members and the IWA community with ongoing activities





SPECIALIST GROUP S & E: WORKSHOP

Policy SG

- Two meetings per year hosted by member in home country
- Possibility to organize simple workshop
- Topics to decide by host
- Speakers from SG and home country
- Ultimate goal is to learn from each other

SPECIALIST GROUP S & E: WORKSHOP

Presentations in workshop
- different countries
- different situations
- different solutions

Ultimate goal workshop

TO LEARN FROM EACHOTHER

AND TO CONTRIBUTE

TO GIVE ALL THE PEOPLE ACCESS TO SAFE DRINKING WATER AND RESPONSIBLE TREATMENT OF WASTEWATER

SPECIALIST GROUP STATISTICS AND ECONOMICS

INFORMATION ABOUT SPECIALIST GROUP

Secretary: maria.molinos@uv.es

Chairman: ed.smeets1@planet.nl

Vewin
Association of Dutch water companies

Drinking water fact sheet 2014

Water supply areas

Introduction

This leaflet gives an overview of core data on the drinking water sector and drinking water companies. Additionally, time series give insight into trends in the sector. The data are from the Vewin benchmark database, Vewin's annual 'Overview of water charges' and the study 'Household drinking water consumption' which is conducted every three years for Vewin by TNS NIPO. The maps on hardness of drinking water and WFD areas were compiled by KWR Watercycle Research Institute.

General indicators per supply area [1]

	Inhabitants x 1,000	Surface km²	Employees [2] FTE	Network km
WBG	595	2,403	222	5,053
WMD	434	2,486	155	4,916
Vitens	5,593	18,042	1,238	47,187
PWN	1,684	3,628	536	9,948
Waternet	965	287	433 [3]	3,105
Dunea	1,260	601	519	4,620
Oasen	753	1,115	264	4,089
Evides	2,074	3,226	522	13,118
Brabant Water	2,476	5,026	715	18,158
WML	1,120	2,209	399	8,752
The Netherlands	16,954	39,023	5,002	118,945

[1] By December 31, 2013
[2] Full-time equivalents own pay-roll
[3] FTEs working for water supply only

Sector fundamentals

	2000	2010	2012	2013
Number of companies	24	10	10	10
Employees (fte)	6,803	5,228	5,053	5,002
Investments (million €)	419	458	424	431
Taxes on water (million €)	350	404	251	258
Production (million m³)	1,183	1,136	1,118	1,126
Network length (x 1,000 km)	107	118	119	119
Connections (x 1,000)	7,042	7,701	7,936	7,973
Non-revenue water (million m³)	54	54	57	61

Drinking water per supply area

	Connections [1] x 1,000	Production million m³	Sales [2] million m³	Turnover [2] mln. €
WBG	280	45	42	42
WMD	201	32	28	29
Vitens	2,581	344	330	355
PWN	779	88	100	171
Waternet	494	86	66	97
Dunea	610	77	71	129
Oasen	341	41	46	68
Evides	1,028	165	155	198
Brabant Water	1,119	178	166	161
WML	540	71	71	102
The Netherlands	7,973	1,126	1,076	1,351

[1] Number of connected properties by December 31, 2013
[2] Of drinking water supplied in own supply area

Sector development of water sales and price [1]

	2000	2010	2012	2013
Sales (million m³)	1,127	1,090	1,070	1,076
Turnover (million €)	1,418	1,442	1,329	1,351
Average price (€/m³) [2]	1.43	1.53	1.45	1.47
• Costs water company	1.14	1.16	1.22	1.23
• Groundwater levies and				
distribution reimbursements	0.12	0.16	0.03	0.03
• Tap Water Tax + VAT	0.17	0.21	0.21	0.21
Real price, 2013=100 (€/m³) [2]	1.88	1.65	1.49	1.47

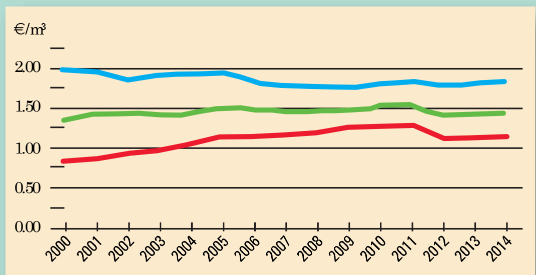
[1] Of drinking water supplied in own supply area
[2] Over all price (households + business users)

Residential drinking water rate per company [1]

	2013	2014			Difference
	Total [2] €/m³	Standing charge €/yr	Volumetric rate €/m³	Total [2] €/m³	Total 2014 vs. 2013
WBG [3]	1.09	45.00	0.64	1.11	1.1 %
WMD	1.15	58.50	0.55	1.16	0.9 %
Vitens [3]	1.14	40.00	0.73	1.15	1.1 %
PWN	1.79	58.80	1.21	1.82	2.0 %
Waternet	1.68	42.15	1.24	1.68	– %
Dunea [3]	1.68	60.28	1.06	1.69	0.6 %
Oasen [3]	1.61	76.25	0.76	1.56	- 3.0 %
Evides [3]	1.54	59.76	0.91	1.54	– %
Brabant Water	1.20	70.44	0.46	1.20	– %
WML	1.64	86.64	0.77	1.67	2.0 %
The Netherlands	1.40 [4]	57.77	0.81	1.41	0.8 %

[1] Rate applicable to metered houses, according to the tariff arrangement of the company. Excluding Tap Water Tax and VAT
[2] For an average family (2.20 persons, 43.4 m³ per person)
[3] Rate in municipalities, not levying distribution reimbursements
[4] Weighted average according to inhabitants per area

Development and spread drinking water rate [1]

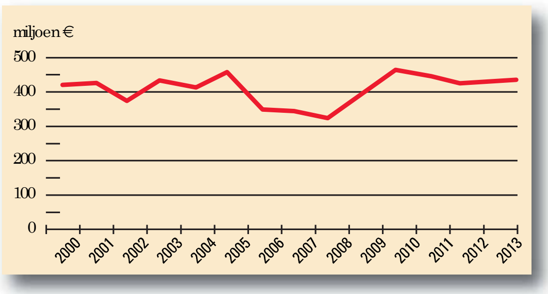


Supply area with highest rate (distribution reimbursements not taken into account)
Supply area with lowest rate
Average rate

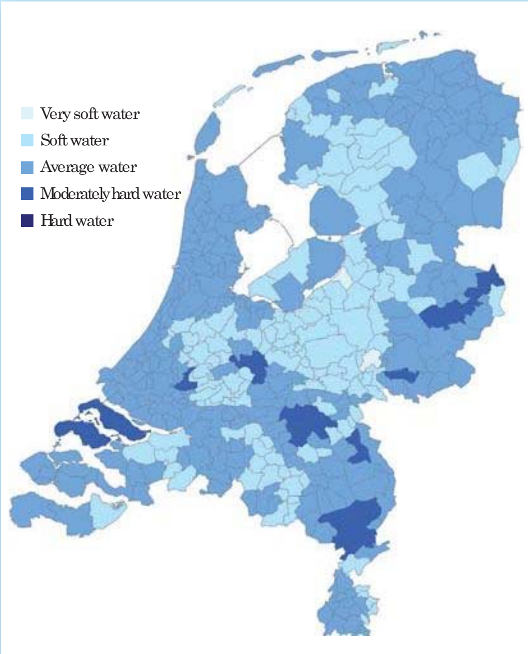
[1] Households

WFD area map

Development of investments



Hardness of drinking water

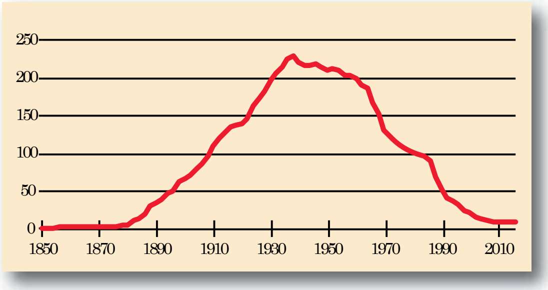


Financial balance by December 31, 2013

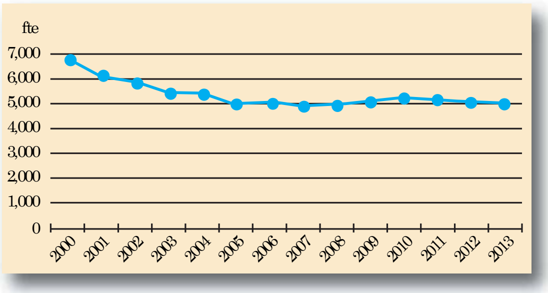
Assets	million €
Tangible fixed assets	5,785
Intangible fixed assets	2
Financial fixed assets	368
Stocks	14
Account receivables / debtors	279
Liquid assets / cash	45
Total	6,494

Liabilities	million €
Share capital	36
Reserves	2,067
Contributions third parties	250
Provisions	190
Long-term loan capital	3,106
Short-term loan capital	843
Total	6,494

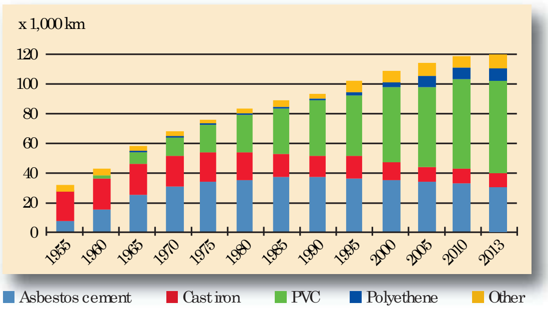
Development of the number of companies



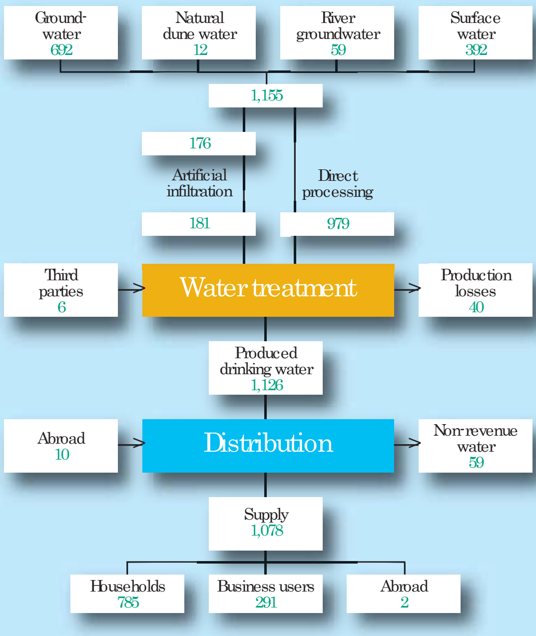
Development of the number of employees



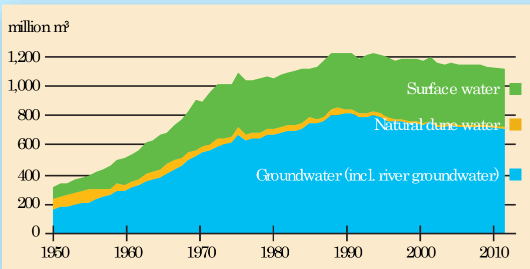
Development of the drinking water network



Drinking water balance 2013, in million m³



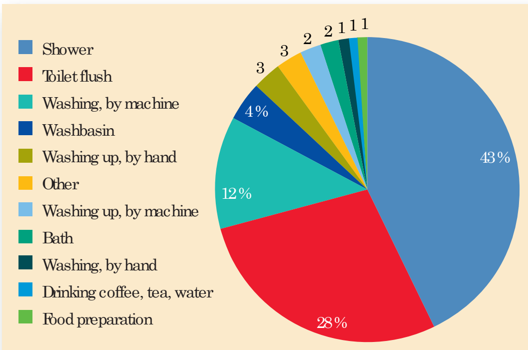
Drinking water production by source



Breakdown of domestic water consumption

Litre / person, per day	1995	2004	2007	2010	2013
Bath	9.0	2.8	2.5	2.8	1.8
Shower	38.3	43.7	49.8	48.6	51.4
Washbasin	4.2	5.1	5.3	5.0	5.2
Toilet flush	42.0	35.8	37.1	33.7	33.8
Washing, by hand	2.1	1.5	1.7	1.1	1.4
Washing, by machine	25.5	18.0	15.5	14.3	14.3
Washing up, by hand	4.9	3.9	3.8	3.1	3.6
Washing up, by machine	0.9	3.0	3.0	3.0	2.0
Food preparation	2.0	1.8	1.7	1.4	1.0
Drinking coffee, tea, water	1.5	1.6	1.8	1.8	1.0
Other	6.7	6.4	5.3	5.3	3.4
Total	137.1	123.8	127.5	120.1	118.9

Breakdown water consumption 2013



Vewin • Association of Dutch water companies
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(Mr.) Teodor Popa

Financial Manager, Brasov Water Company, Romania
President of the Romanian Water Association (RWA) Specialist Group on Economics
Vice-president of the International Water Association (IWA) Specialist Group on Statistics and Economics

Double graduate: MSc. Degrees in engineering and economics.
Internationally trained in the field of management: USA and Europe.

Joined *Brasov Water Company* (one of the finest water utility in Romania) as engineer in 1991. Working since 1994 in fields of water and wastewater infrastructure rehabilitation planning and implementation of international funded projects by European Bank for Reconstruction and Development, European Union and other donors. Involved in elaborating and implementation of Financial Operational Performance Improvement Program, key element for financing of Romanian water infrastructure.
Appointed as Financial Manager in 2001. In addition to the company financial strategy, responsible with company regionalization and restructuring process: institutional transformation, tariff strategy and concession contact implementation.

Member of IWA Strategic Council representing developing countries.
Member of World Water Congress Program Committee and responsible for the Utilities management theme.
Presentations about *Long-term Tariff structuring and future funding of the water sector in Eastern Europe* to various IWA conferences and workshops.
Articles published in *WUMI* (IWA Publishing) and other specialized publications. Organizer for the various workshops on utilities management theme.

Presentation is about the current status of “The Romanian Water Services”

dorupopa@apabrasov.ro

Specialist Group on Economics meeting

The Romanian Water Sector

Teodor Popa
Romanian Water Association

19th March 2015, Tokyo

Teodor Popa

- Experience in the water sector since 1991
- Involved in international financed programs since 1994
- Financial Manager since 2001
- Member of the Strategic Council of IWA

The Romanian Water Sector

Content

- Romanian water sector
  - key figures
  - institutional arrangements
  - the regulator
- Finance
  - tariff policy
  - financial mechanism

Romania water key figures (2013)

- Total population: 21 mil. (3- 4 living abroad)
- Service coverage:
  - 62% water (29% in ’95)
    - 83% in urban area
  - 47 % sewerage
    - 95% treated at least in one stage

Romania water key figures (2013)

- Number of employees: 30,000
- Invoiced water quantity: 550 million m3
- Operating revenues: 700 million Euro
- EBITDA (Profit before taxation and depreciation):

  160 million Euro
- Indebtedness of the sector: 700 million Euro

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Specific consumption (l/cap/day)

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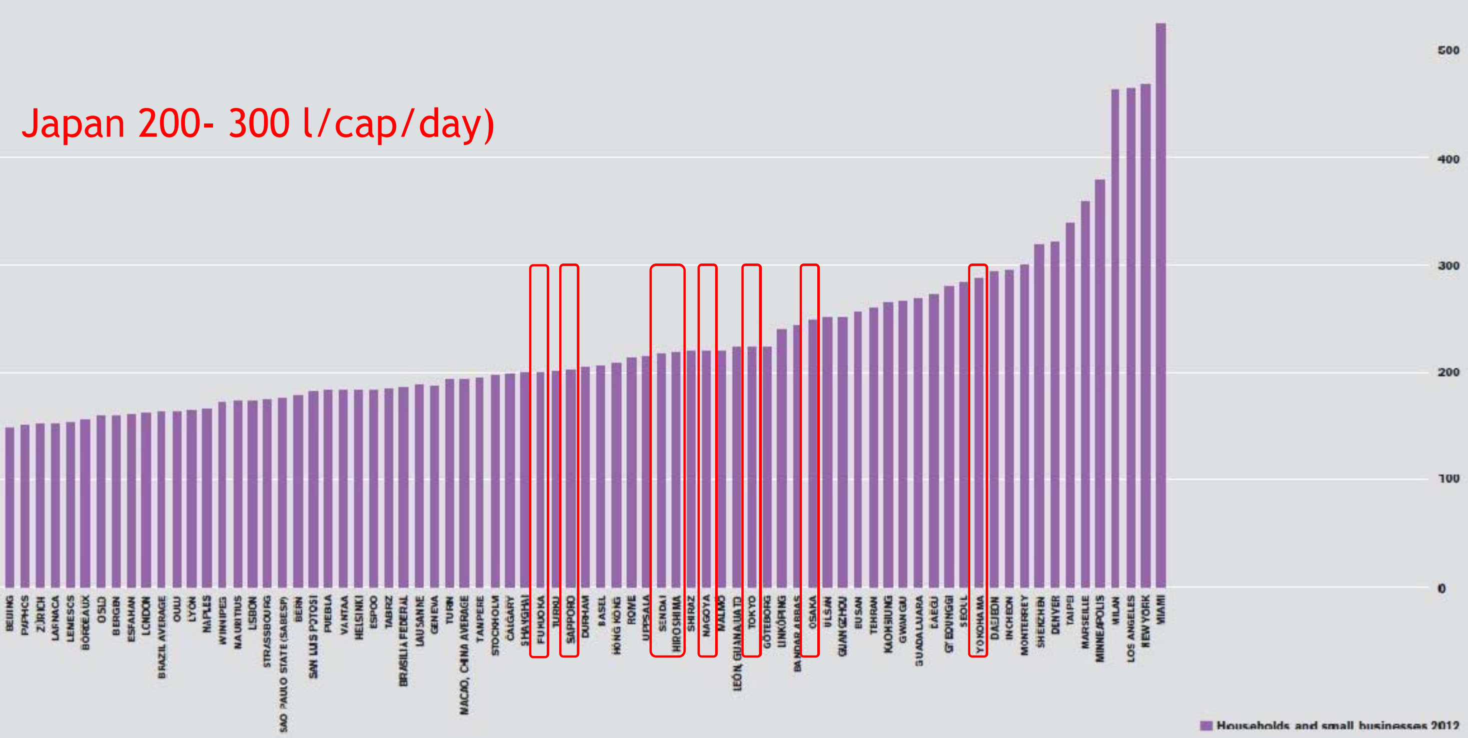
Specific consumption (l/cap/day)



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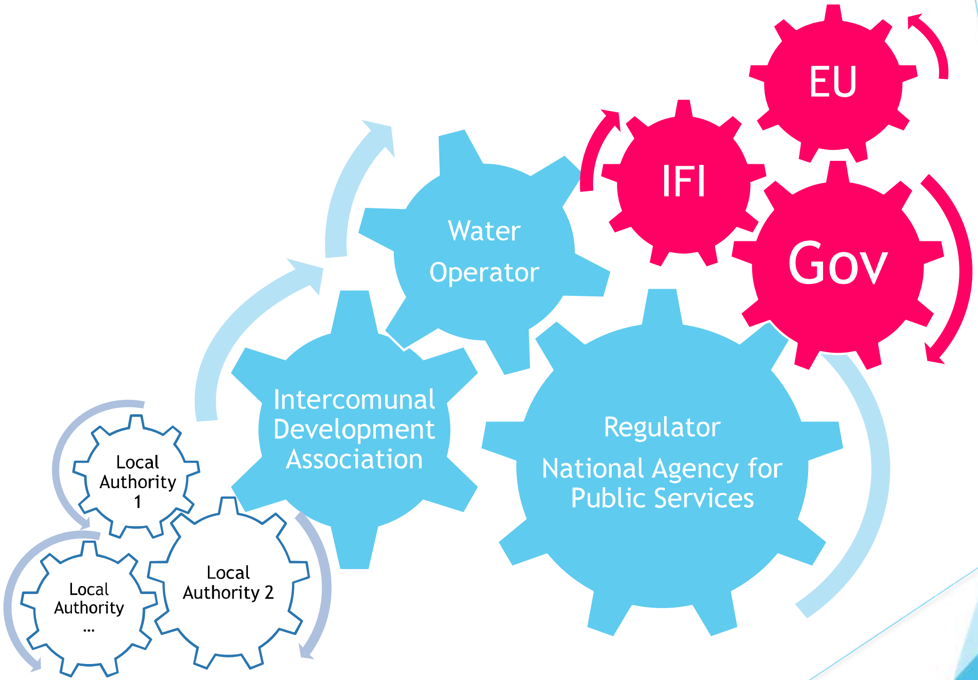
Water sector institutional key players



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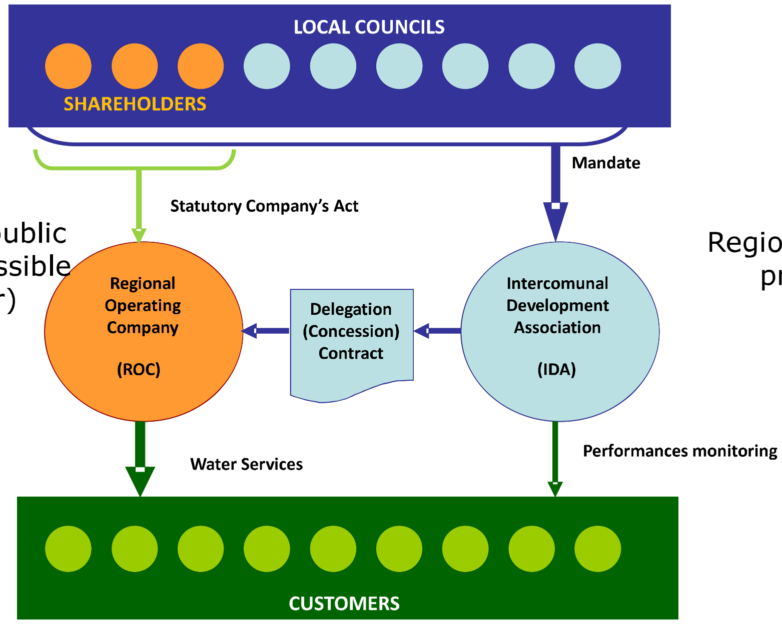
Institutional arrangement in Romania

100% public (PPP possible later)



Regionalization process

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Tariff policy

- Volume based/ Fixed part possible/ Polluters pay principle
- Strategies were related to the investment projects considering the affordability criteria:
  - 2000: 4.0% for the average household income
  - 2003-2004: 3.5%
  - 2007-2011: 2.0-2.5% max. 4% for the lowest decile

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Tariff structure- Romanian Water Act

ASSETS	COST ELEMENTS	ADJUSTMENT
	Operating expenses: Raw water, energy, fuel, staff	INFLATION
	Maintenance & repair expenses. Executed by themselves/ third parties: emergency repairs; routine maintenance; preventive maintenance	REAL TERM
	Environmental expenses:	FORMULA
	Financial expenses: Interest and commission, exchange rate loss	FINANCING/ LOAN AGREEMENT
Water Co. Fixed assets: buildings, equipment etc.	Company' assets depreciation	
City Fixed assets: w& ww. networks etc. (Delegation contract)	Public assets depreciation: zero !	
	Royalty/ Concession fee	
	Development fund	
	Profit	

INVESTMENTS

AFFORDABILITY

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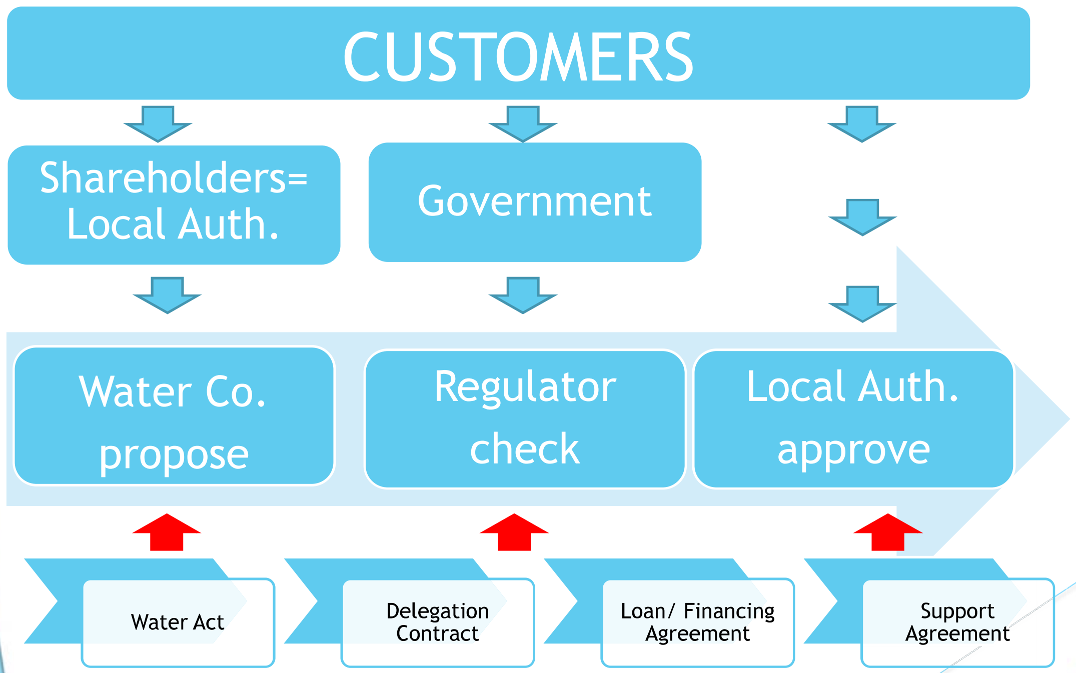
Tariff approval process



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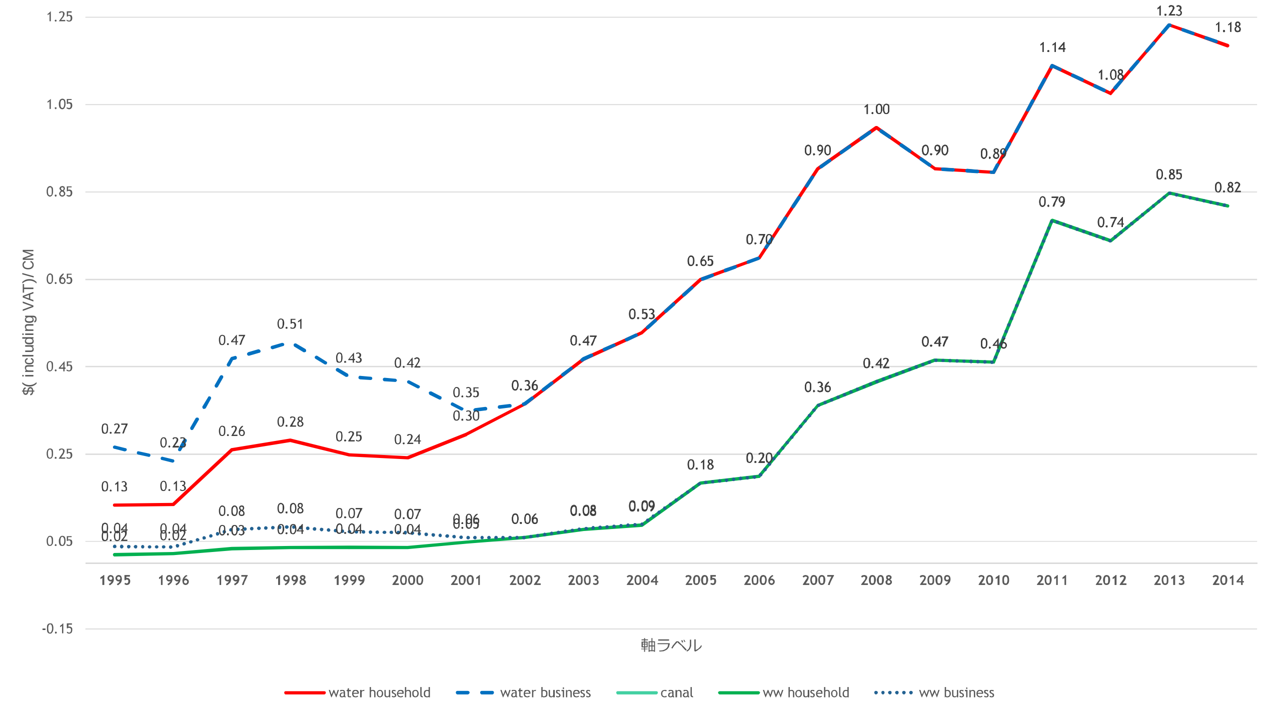
Tariffs evolution ($ including VAT)
Compania Apa Brasov



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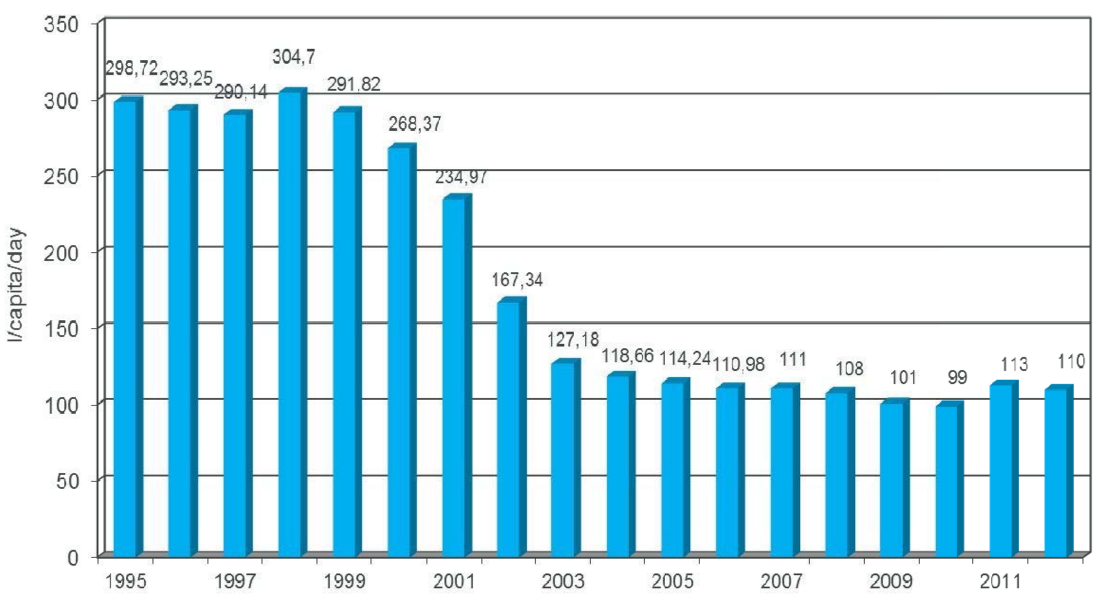
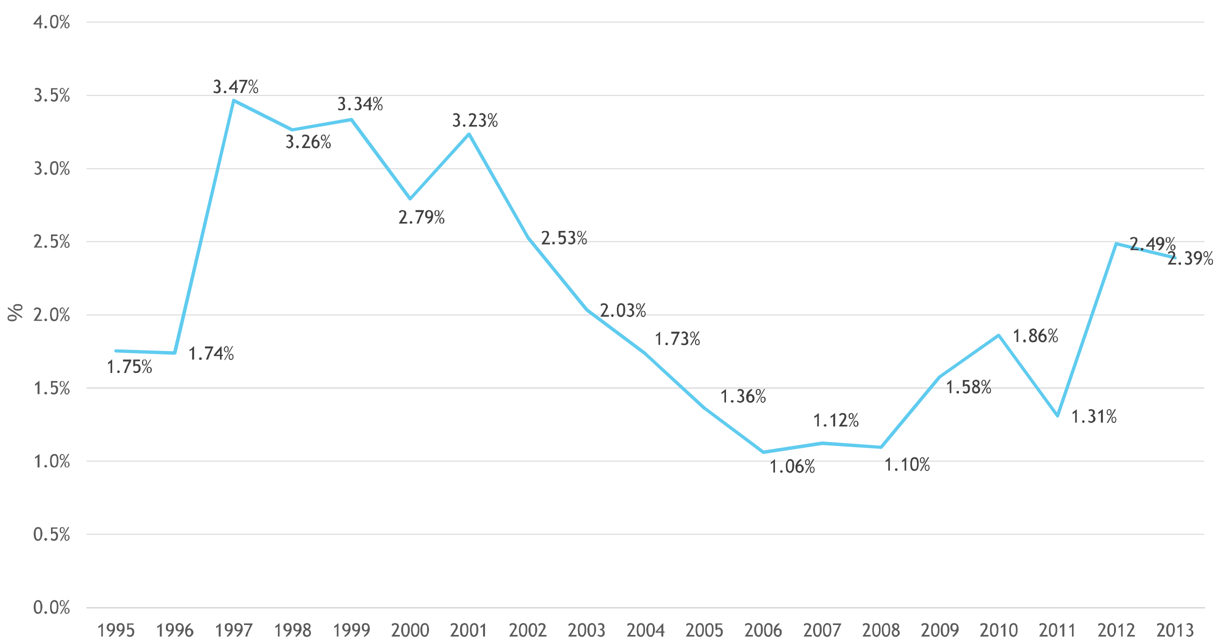
Water consumption per capita
Compania Apa Brasov, Romania

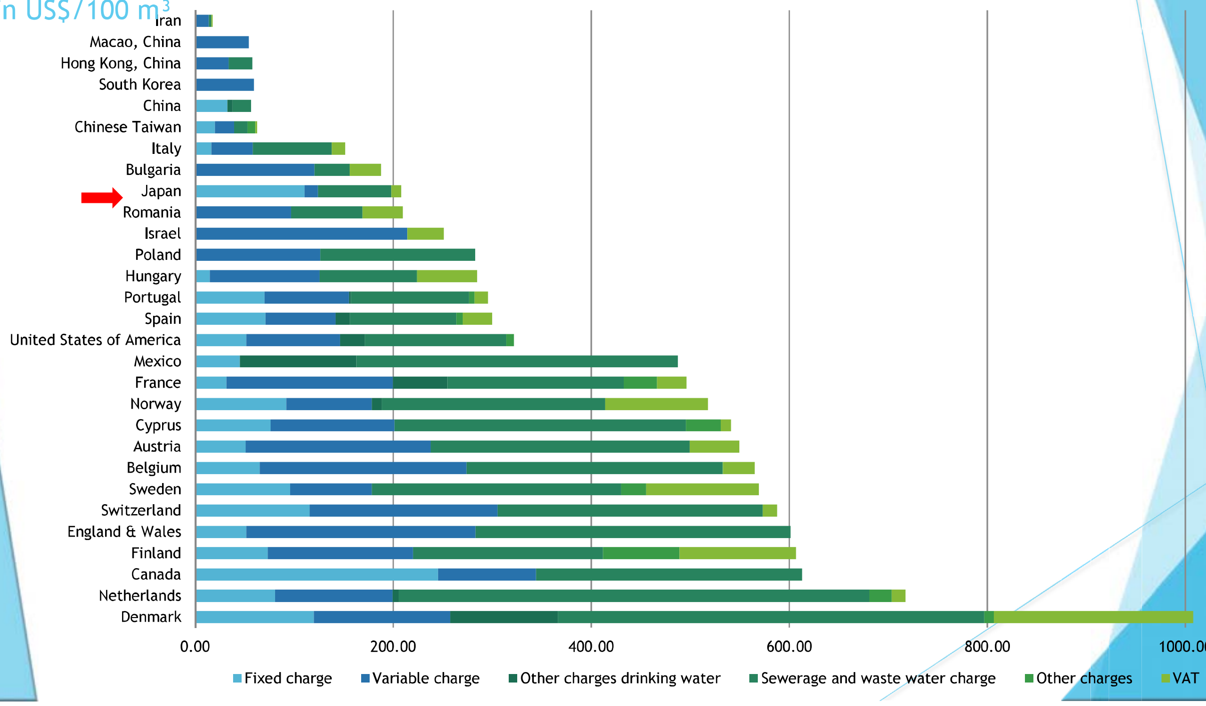


BDO

Affordability
Compania Apa Brasov



Average annual water cycle charges in 2013 for a consumption of 100 m^{3*} in US$/100 m^3



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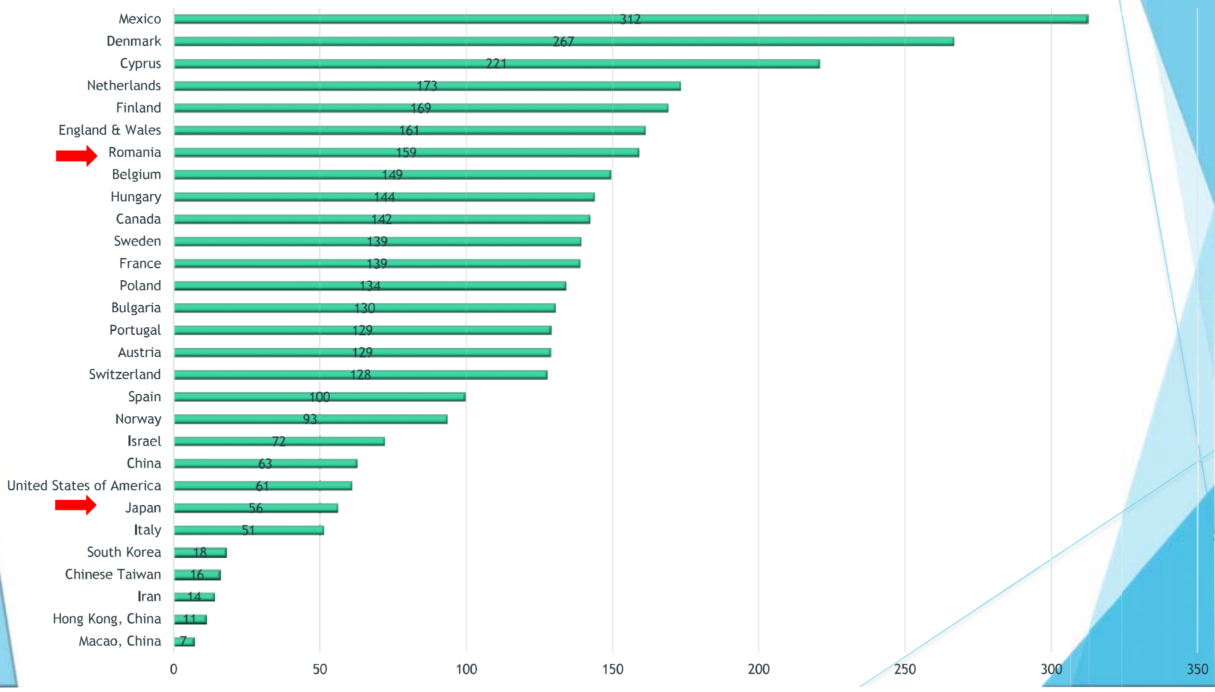
Affordability index

Water cycle charge for 100 m³ x 10 000/GDP



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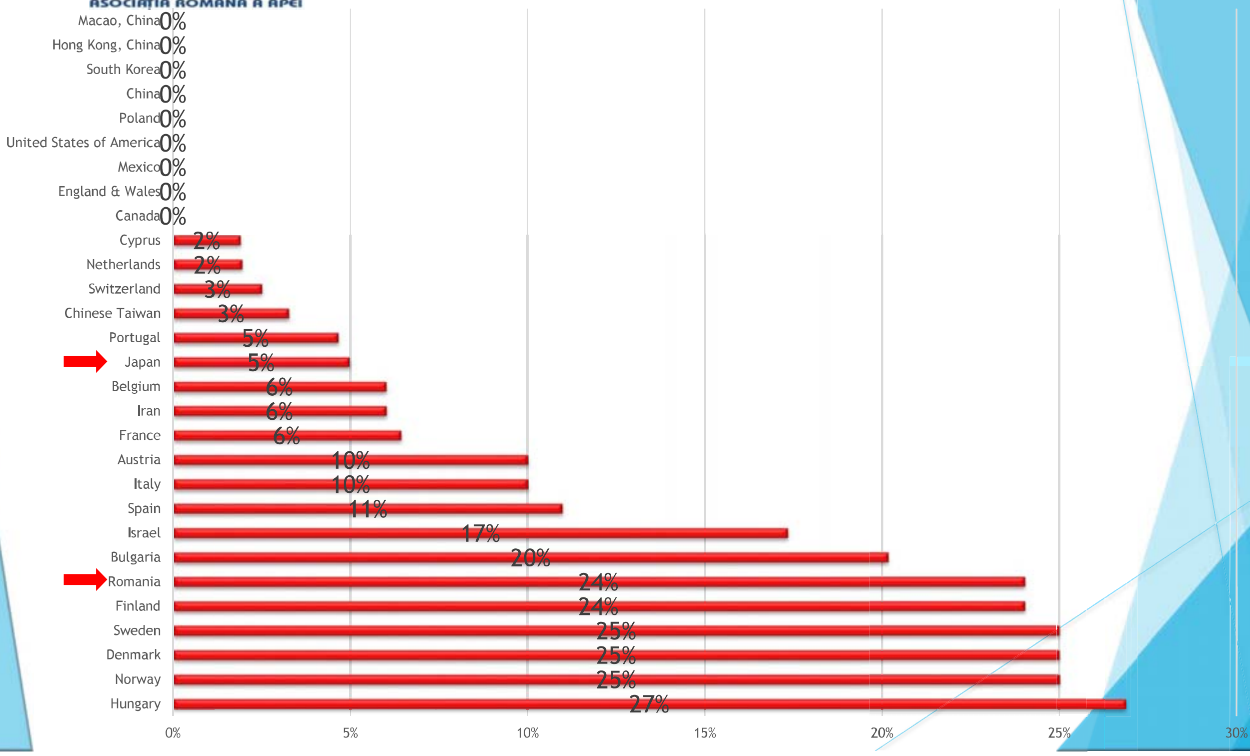
VAT on total charge 100 m³



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City of Detroit water shutoffs

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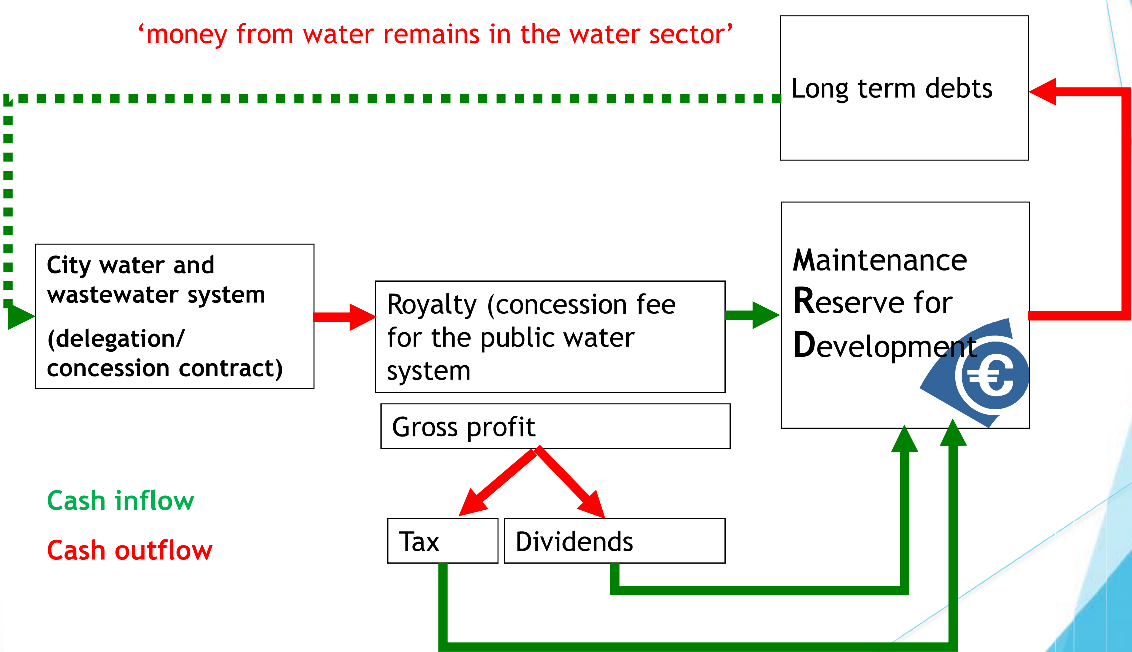
Maintenance Reserve for Development mechanism

‘money from water remains in the water sector’



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Conclusions

- Need to up date financial strategy/ tariff policy
  - Cost recovery principle
  - Polluters pays principle
  - Gradually include depreciation
  - Gradually reduced VAT
  - Applying social measures

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Thank you !

お気遣いありがとうございます。
O ki **zu** ka i A **ri** ga to u go za i **ma** su

Compania apa Brașov

Teodor Popa
Financial Manager
Compania Apa Brasov
DoruPopa@apabrasov.ro

PROFILE

Dr. Francesc Hernandez-Sancho is PhD. in Economics and Associate Professor at the University of Valencia (UV) in Spain. He is Head of the Water Economics Research Group (UV) and Director of the Master on Water Management (UV). He is Leader of the Water Economics Working Group into the IWA SG on Statistics and Economics. His research topics are: Water economics, economic valuation of environmental benefits, water reuse, cost efficiency in wastewater treatment processes, water management, water pricing, feasibility studies for wastewater plants and water reuse projects. He has participated in more than 25 Research Projects related to these topics. He has also published more than 70 articles in scientific journals and more than 25 books. He is Associate Editor of the reviews *Water Science and Technology* and *Water Science and Technology: Water Supply* (IWA Publishing) and *Water Economics and Policy Journal* (World Scientific).

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Water Economics Group
VNIVERSITAT DE VALÈNCIA

Current Status of Waterworks in Spain

Francesc Hernández-Sancho

Águeda Bellver-Domingo

IWA-JWWA Workshop on Statistics and Economics

Current Status & Financial Strategies of Water Utilities in the World

—Ensuring the Sustainability of Water Supply—

Specialist Group Statistics and Economics

Water Economics Group
VNIVERSITAT DE VALÈNCIA

Table of Contents

1. INTRODUCTION

Specialist Group Statistics and Economics

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Human water needs

They must be satisfied. such as address the United Nations in the Resolution "The human right to water and sanitation" (A/RES/64/292):

↓

"Recognizes the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights".

But, there are a few…

Climate change	Investment cost in facilities	Operating and maintenance cost of facilities	Environmental protection

All of them affect to the efficiency of urban water system

What issues affect to the Spanish urban water system?

Climate change	⊕	Environmental protection	⊕	Excessive use of water in agriculture (80% of total use)
A progressive increase of temperatures are since 1973		Water demand and quality standards are increasing		The agriculture sector contributes only 4 % to the Spanish GDP.

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Water Economics Group, Vniversitat de València

2. SPANISH WATER MARKET ORGANIZATION

IWA Specialist Group Statistics and Economics

Water Economics Group, Vniversitat de València

"*Member States shall identify the individual river basins lying within their national territory and, for the purposes of this Directive, shall assign them to individual river basin districts*" (Article 3 WFD).

↓

How does Spain manage the river basin districts?

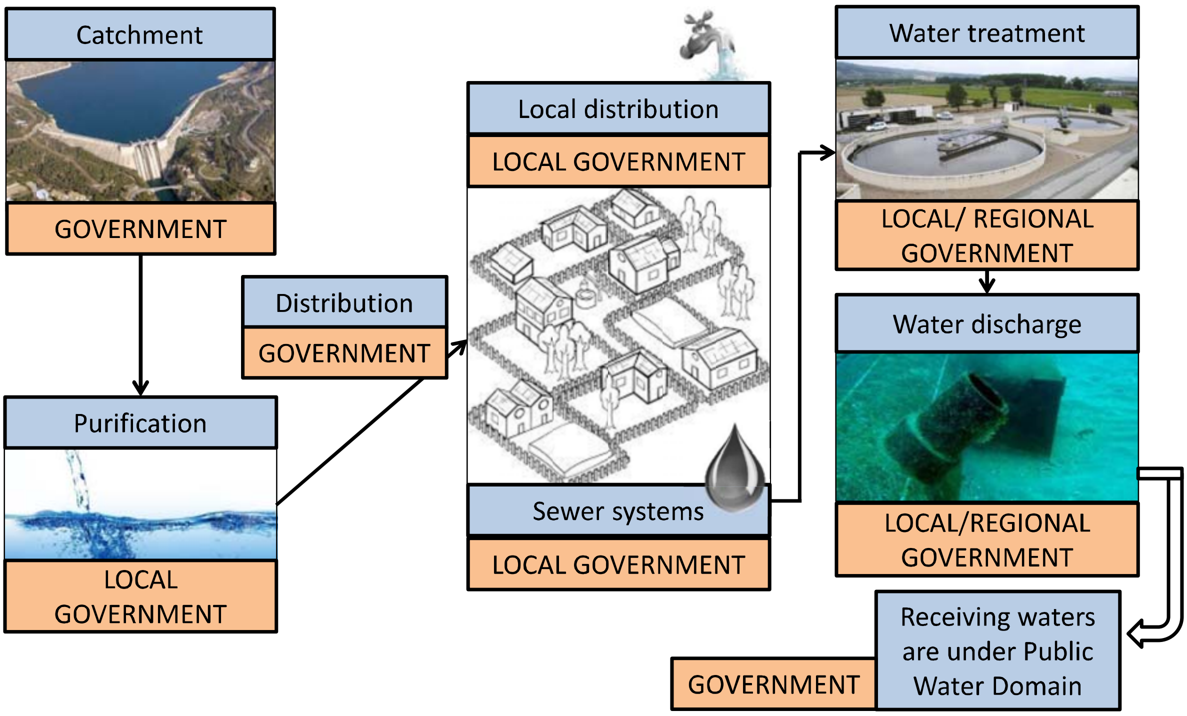
Spain is divided in **17 Regional Governments** which have powers within the limits established in the Spanish Constitution (like environmental management)

→ But, the river basins **are shared** among different Regions

↓

There are **11 River Basin Districts**

Who is the responsible of Spanish integral water cycle? **It is a highly complex issue**



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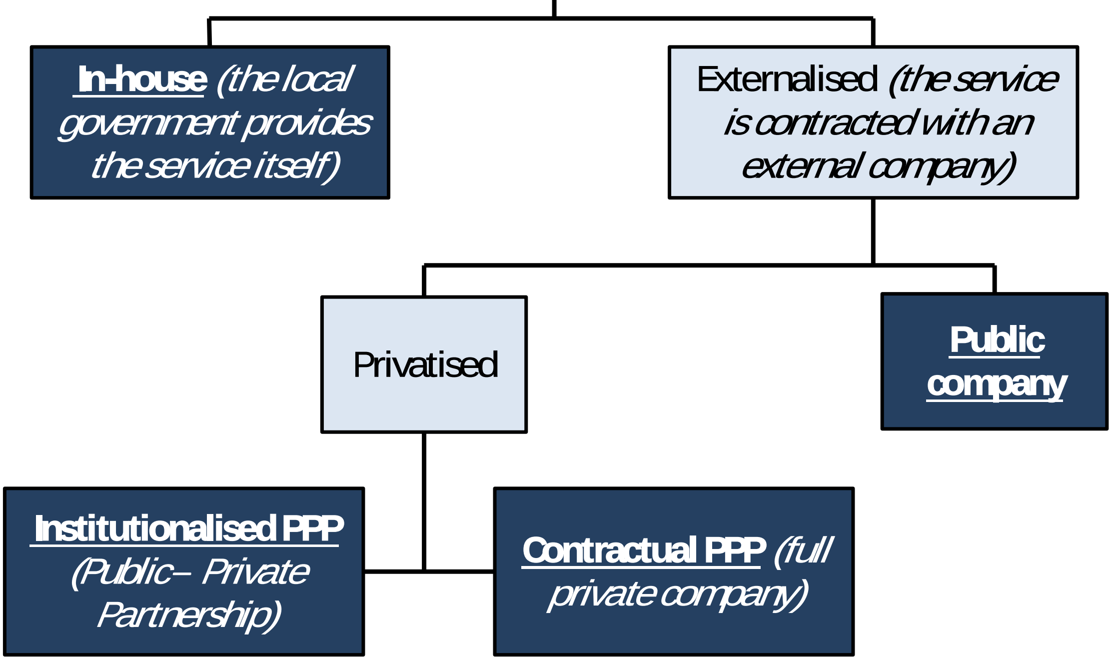
MANAGEMENT FORMS OF THE WATER SERVICE IN SPAIN



MANAGEMENT FORMS OF THE WATER SERVICE IN SPAIN

In-house *(the city council provides the service itself)*

Externalised *(the service is contracted-out an external company)*

Local Government must assume all the responsibility:

- Decision making and management.
- Use its own employees.
- Cover production costs with funds from the municipal budget.

Source: Adapted to García – Valiñas et al.. 2013

MANAGEMENT FORMS OF THE WATER SERVICE IN SPAIN

Decentralising the management of the urban water service while maintaining public ownership:

- It allows still being managed by public workers.
- The outsourcing to a public company permits professionalised management of the urban water service (gains in efficiency are obtained).

Public company

Institutionalised PPP *(Public – Private Partnership)*

Contractual PPP *(full*

- Capital is shared between the private and public sector.
- Local government participation is normally sufficiently significant to guarantee that public objectives will be accomplished.
- Combine public interests (such as universal access and quality standards) with the industry know-how of private management.
- The private partner is mainly responsible for managing these companies, while the political decisions are made by the public partner.

Institutionalised PPP *(Public – Private Partnership)*

MANAGEMENT FORMS OF THE WATER SERVICE IN SPAIN

They are the most widespread form of privatising public services in Spain.

- Concessions are made official by contract (for a limited period), whereby the local government entrusts a corporation (legal entity) the management of the service, but retains ownership.
- At the end of the contract, local governments decide how to be managed for a new period.

Institutionalised PPP *(Public – Private Partnership)*

Contractual PPP *(full private company)*

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It is worth highlighting that in the Spanish legislation:

Only is contemplated privatising the **management of the service**

Facilities remains public property

ATTENTION!

Its is very important to establish clear criteria for maintenance and renovation of facilities

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Main consequence

Atomization of services

Are there a different water utility for each municipality?

There are about 2.000 water operators for 8.119 municipalities

Joint management

325 groupings of municipalities provide wholesale or retail water services

Examples of groupings promoted by the public administration are the Bilbao Water Consortium and the Association of Municipalities in the Pamplona Region

Spanish urban water sector in figures

Contractual and institutional public–private partnerships operate in **medium or large-sized municipalities**

Public sector management operate in **small-sized municipalities**

AGBAR* and **Aqualia*** manage **67%** of water services in the municipalities that have privatized their urban water service

*AGBAR is a subsidiary enterprise of Suez Environment
*Aqualia belongs to Fomento de Construcciones y Contratas (FCC)

3. WATER TARIFF IN SPAIN

How does the Spanish urban system recover costs?

Water tariffs associated with each part of the water cycle guarantee….

- Quality
- Service
- Quantity
- Sustainability

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3. Water tariffs in Spain
Water Economics Group
VNIVERSITAT DE VALÈNCIA

Spanish urban water tariffs aim…

- Cost recovery
- Environmental sustainability
- Responsible consumption

*"The **principle of recovery of the costs** of water services. including environmental and resource costs associated with **damage** or negative impact on the aquatic environment **should be taken into account** in accordance with. in particular. the polluter-pays principle. An **economic analysis of water services** based on long-term forecasts of supply and demand for water in the river basin district will be necessary for this purpose"*
(Principle nº 38. WFD).

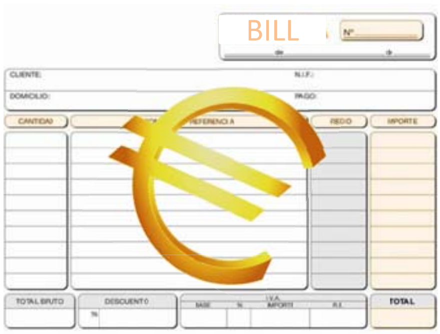
What kind of tariffs exist in Spain?

Regulation tariff	It covers services of surface water catchment and reservoir
Water usage tariff	It covers services of surface water transport
Servicing tariff	This serves to recover the costs of services purification and distribution water through distribution networks
Irrigation community tariff	Covering the costs of distributing water to irrigators
Sewer tariff	For covering the costs of collection services of urban wastewater
Sanitation tariff	For covering the costs of wastewater treatment
Dumping tariff	This serves to cover the costs of discharged control service to Public Water Domain

What kind of tariffs exist in Spain?

Servicing tariff	This serves to recover the costs of services purification and distribution water through distribution networks
Sewer tariff	For covering the costs of collection services of urban wastewater
Sanitation tariff	For covering the costs of wastewater treatment

These are the tariffs that are included in the urban water bill



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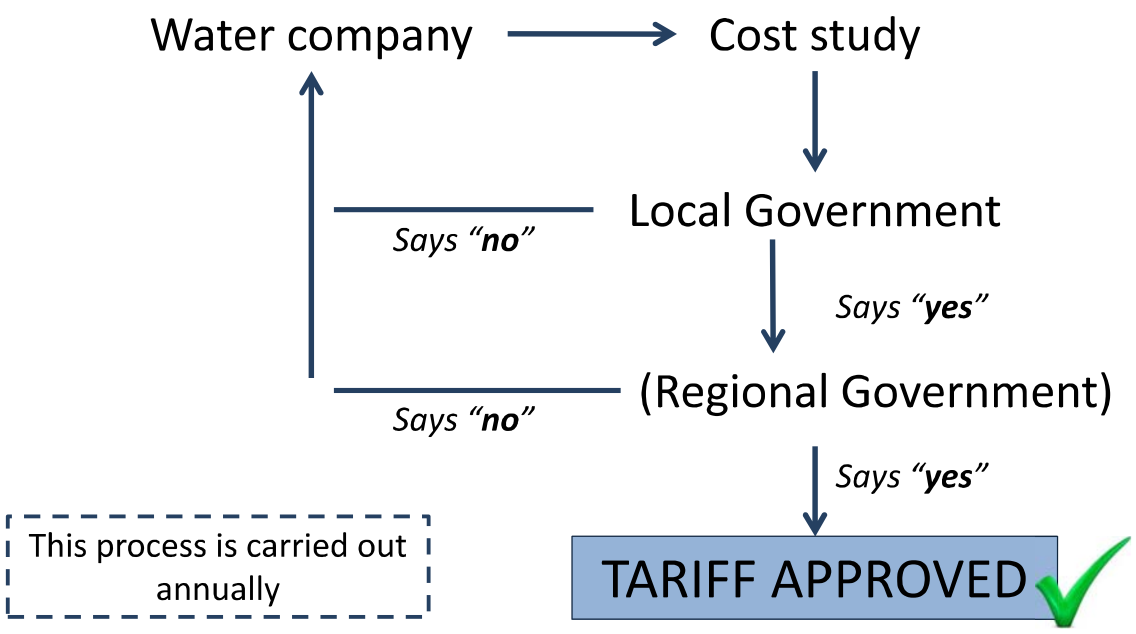
Water Economics Group VNIVERSITAT DE VALÈNCIA

What is the mechanism in Spain for approving water tariffs?



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How is structured the Spanish water tariff?

Binomial formula

$$P = F + a \times Q + b \times Y$$

- F → Fixed component of water services contracted
- a → Price per cubic meter of water consumed (€/m^3)
- Q → Total amount of water consumed (m^3)
- b → Price per cubic meter of wastewater produced (€/m^3)
- Y → Total amount of wastewater (m^3)

Binomial tariff

Fixed component

This part of the tariff guarantees a level of revenue per user to cover the associated fixed costs of supplying the service. **This component is charged regardless of water is used or not**

Variable component

This **part is associated to water amount consumed.** The **increasing block rates** (prices are progressively higher with increasing water consumption), try to promote the efficient use of water

3. Water tariffs in Spain
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Binomial tariff (Increasing block rates)

Service tariff	
Water meter of 13 mm	11.43 €/quarter
Water meter of 15 mm	11.43 €/quarter
Water meter of 20 mm	19.36 €/quarter
Water meter of 25 mm	30.77 €/quarter
Water meter of 30 mm	44.39 €/quarter
Water meter of 40 mm	88.58 €/quarter
Water meter of 50 mm	132.83 €/quarter
Water meter of 65 mm	154.74 €/quarter
Water meter of 80 mm	176.64 €/quarter

Consumption tariff	
Until 15 m^3/quarter	0.1855 €/m^3
Between 16 - 40 m^3/quarter	0.2783 €/m^3
Over 40 m^3/quarter	0.9275 €/m^3

Binomial tariff in figures

95% of the municipalities in Spain use binomial tariffs charged from the first cubic meter of water consumed

5% of the municipalities in Spain use fixed component including a free minimum allowance

Variable component			
58% of the municipalities set three consumption blocks	**29%** of the municipalities apply four consumption blocks	**11%** of the municipalities use two blocks	**2%** of the municipalities apply a flat rate

Average price of water in Spain = **1.59 € /m^3** (207 JPY/m3 aprox.)

- **0.92 € /m^3** refer to water supply (58% of total price)
- **0.67 € /m^3** refer to wastewater treatment (42% of total price)

These prices <u>do not guarantee</u> the cost recovery → The cost recovery percentage is between **65 – 96%**

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Water tariff by Spanish Regions (€/m³)

	Water supply		Wastewater treatment		Integral Water Cycle		
Region	Domestic	Industrial	Domestic	Industrial	Domestic	Industrial	Joint
Andalusia	0.83	1.11	0.58	0.64	1.41	1.75	1.50
Aragon	0.55	1.12	0.46	0.97	1.01	2.09	1.28
Asturias	0.6	0.9	0.62	0.78	1.22	1.57	1.31
Cantabria	0.55	1.38	0.36	0.53	0.9	1.91	1.15
Castilla-La Mancha	0.68	0.83	0.43	0.52	1.12	1.34	1.17
Castilla-León	0.44	0.66	0.42	0.53	0.86	1.18	0.94
Catalonia	1.12	1.62	0.72	0.83	1.84	2.45	1.99
Valencia	0.74	0.87	0.58	0.66	1.33	1.53	1.38
Extremadura	0.83	1.03	0.36	0.47	1.19	1.5	1.27
Galicia	0.61	0.96	0.4	0.68	1.02	1.64	1.17
Balearic Islands	1.38	2.5	0.81	1.49	2.2	3.99	2.65
Canary Islands	1.02	2.23	0.34	0.33	1.61	2.56	1.85
Rioja	0.52	0.57	0.53	0.53	1.05	1.09	1.06
Madrid	0.79	0.86	0.53	0.68	1.32	1.53	1.37
Murcia	1.06	1.57	0.68	0.72	2.35	2.29	2.34
Navarre	0.44	0.57	0.62	0.72	1.06	1.29	1.11
the Basque Country	0.54	0.79	0.5	0.74	1.03	1.53	1.16
Spain	0.85	1.12	0.56	0.69	1.4	1.81	1.59

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3. Water tariff in Spain

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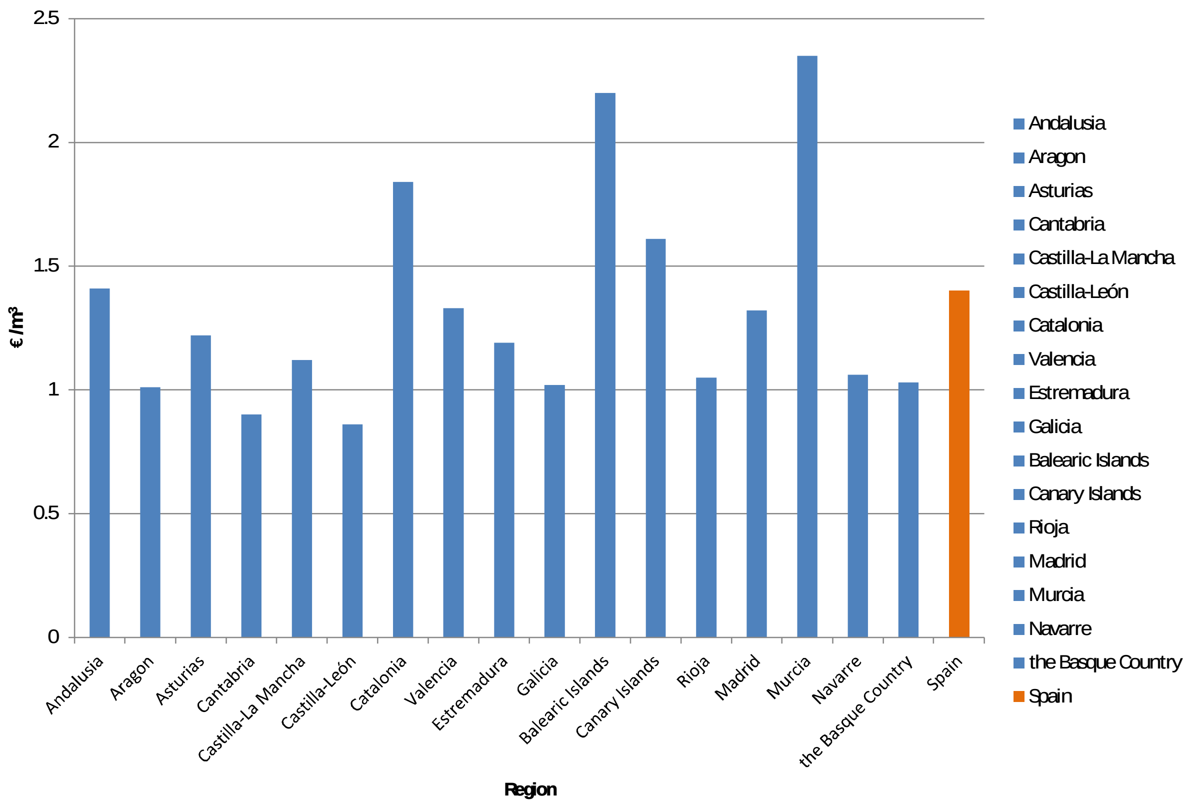
Water tariff for domestic use (Integral Water Cycle)



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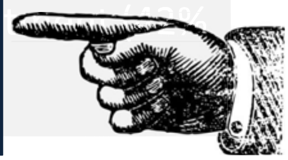
The water bill represents **0.8%** of the household budget and is one of the lowest in Europe

total price)

Tariff should be increased for achieve the cost recovery



These prices do not guarantee the cost recovery

The recovery percentage is between **65 – 96%**

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4. FUTURE SCENARIO: POTENTIAL OF WATER REUSE

47 millions inhabitants

⊕

2,920 WWTPs

=

1,464,261 m³/day of wastewater in Spain

High availability of treated water!

↓

Promoting the **use of reclaimed water** would contribute to mitigate the negative effects of climate change and water scarcity

Current use of reclaimed water in Spain in figures

14% of total Spanish wastewater is reused

71% of current volume of reclaimed water is used for **irrigation**

18% of current volume of reclaimed water is used for **environmental protection**

7% of current volume of reclaimed water is for **recreational uses**

4% of current volume of reclaimed water is for **urban uses**

Not all Regions require the use of reclaimed water.
The Mediterranean regions and those with relevant presence of agriculture are the main users.

Current use of reclaimed water in Spain in figures

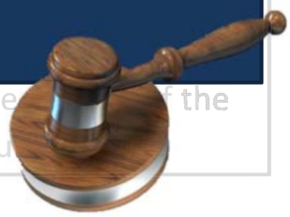
The use of reclaimed water has legal requirements

71% of current volume of reclaimed water is used in

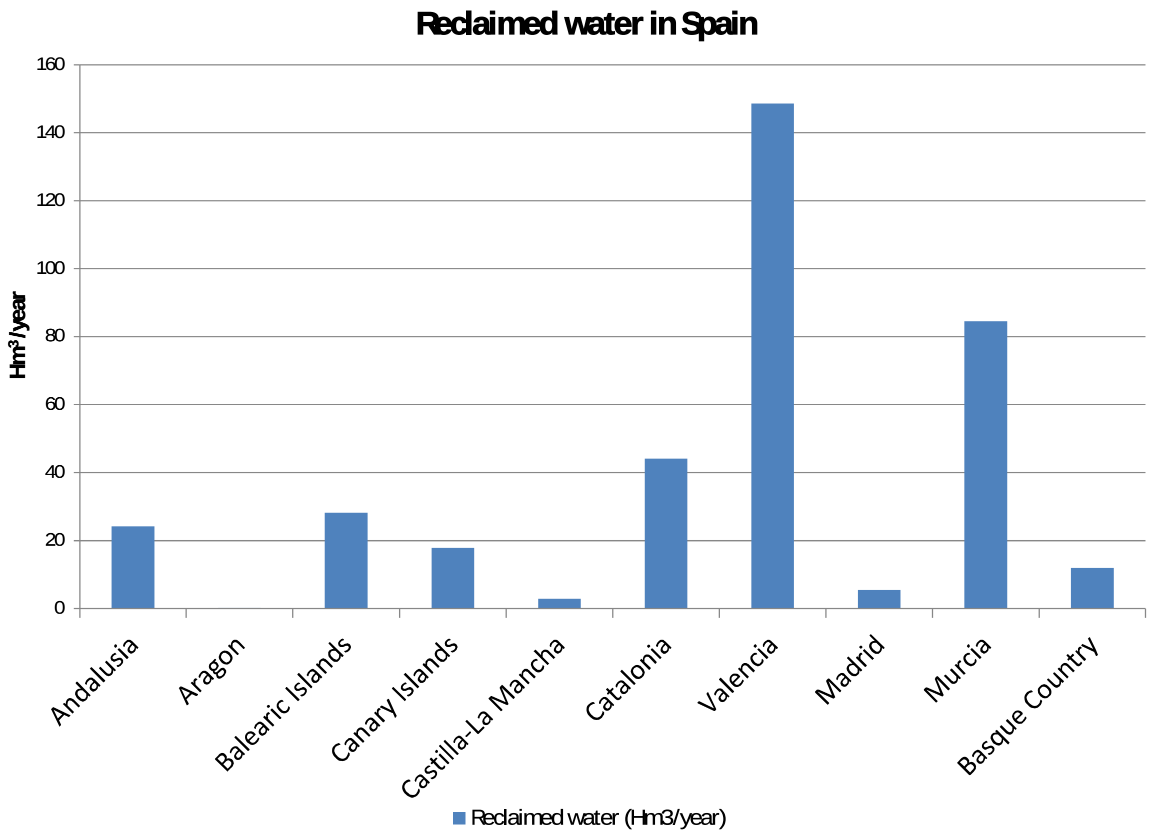
18% of current volume of reclaimed water is used for

Royal Decree 1620/2007 establish the legal framework for the reuse of treated wastewater

need to use reclaimed water. Mainly use it the ... the Mediterranean area and those with strong agricultu



Region	Reclaimed water (Hm^3/year)
Andalusia	24.21
Aragon	0.17
Balearic Islands	28.24
Canary Islands	17.8
Castilla-La Mancha	2.96
Catalonia	44.16
Valencia	148.66
Madrid	5.48
Murcia	84.52
Basque Country	12
	368.2



Water reuse requirements

Social acceptance

Social awareness

People should understand the benefit of its use

Real demand

It is necessary to justify the investment

Guarantee required quality

To avoid health risks

The quality of the effluent of the WWTP is covered by the current tariff. **However, subsequent improvements in quality will be paid by users**

Storage and distribution infrastructure

To ensure appropriate management of the service

Water reuse requirements

- Social acceptance
- Social awareness → Population should understand the benefit of its use
- Real demand → It is necessary to justify the investment
- Achieving correct quality → To avoid health risks
- Storage and distribution infrastructure → To ensure appropriate management of the service

The quality of the effluent of the WWTP is covered by the current tariff. **However, subsequent improvements in quality will be paid by users**

Hence… first of all, for implementing reclaimed water in Spain it is required

Feasibility study

Including:

- **Economic costs and benefits**
- **Environmental costs and benefits**

It is needed to determine the real feasibility of reclaimed water use in any territorial area.

Benefits of reclaimed water

- Increase available water resources
- It is not necessary build large infrastructure to increase water supply
- Reducing the arrival of pollutants to water bodies
- The use of reclaimed water ensures supply regularity
- Its use improves water management → Replacement of conventional uses
- Irrigation uses are favored by the presence of natural nutrients

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Main limitations for reclaimed water

- Uncontrolled industrial discharges
- Increased salinity in the wastewater pipe system
- Adaptation of supply infrastructure
- Lack of market for reclaimed water

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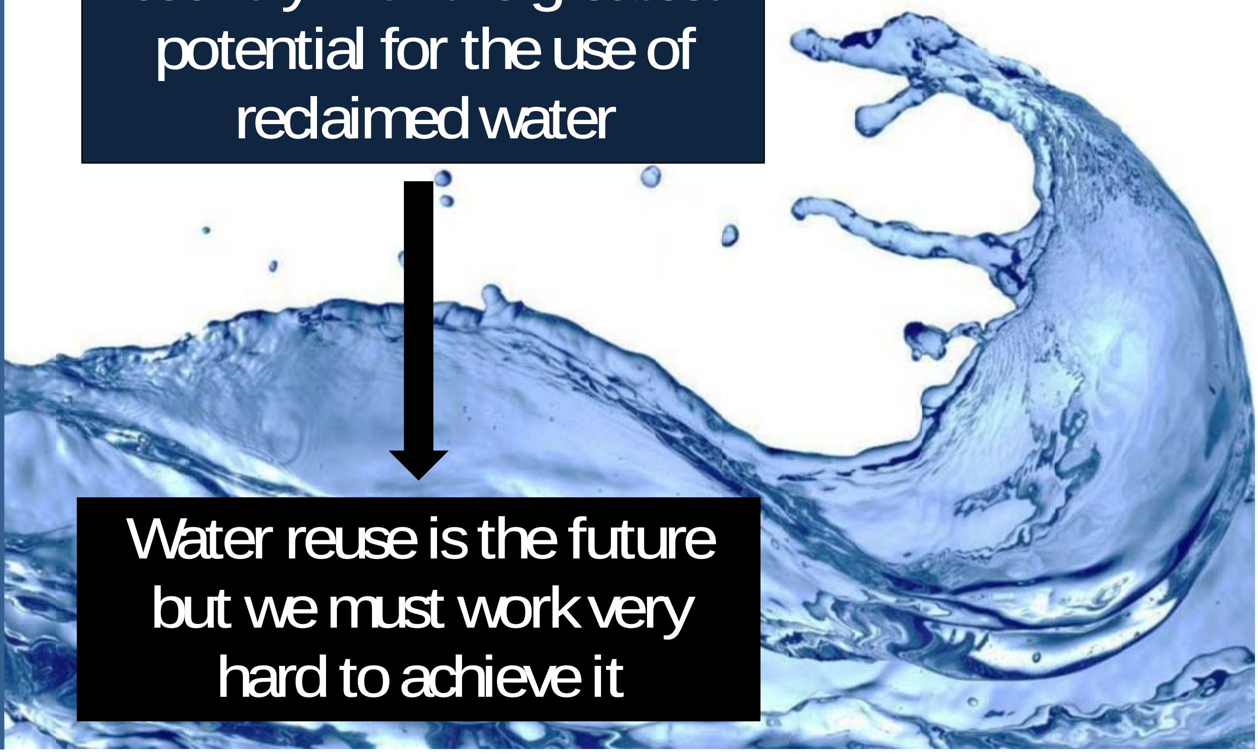
VNIVERSITAT ID VALÈNCIA

Spain is the European country with the greatest potential for the use of reclaimed water



Water reuse is the future but we must work very hard to achieve it

IWA Specialist Group Statistics and Economics

THANK YOU FOR YOUR ATTENTION

Water Economics Group
VNIVERSITAT ID VALÈNCIA

Contact: francesc.hernandez@uv.es

1. **Mr. Jan Hammenecker**

2. Organization: **De Watergroep, Belgium**

3. Job Title: **commercial director**

4. Profile

ABOUT THE AUTHOR

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Jan Hammenecker is commercial director of De Watergroep, the largest public water company in Belgium.

He has been working for more than 30 years at the company, he started as a geologist, and moved later on to the commercial side of the water business.

His areas of interest are water tarification and billing techniques in general, and in particular customer behaviour, price elasticity, developing new markets and water sector innovation..

Relation to IWA:

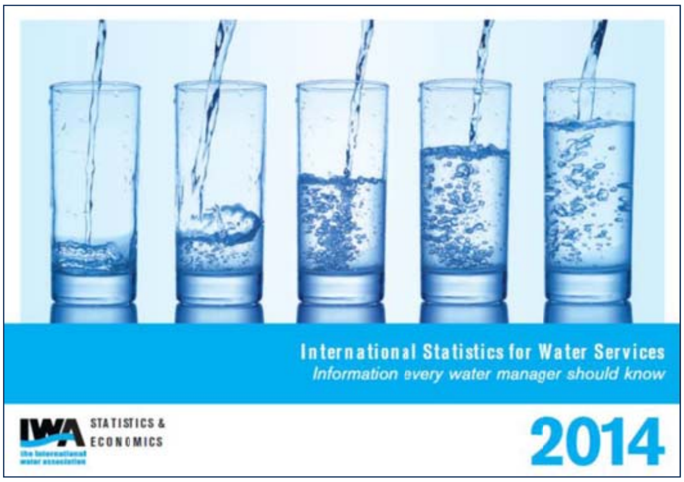
As the leader of the IWA Working Group on Statistics, he is the leading author of the biannual leaflet on water tarification, which is distributed at IWA world congresses.

5. Title of presentations:

Part I: Water price around the globe

Part II: Uncovering the Belgian Water sector

PART I: WATER PRICE AROUND THE GLOBE



Jan Hammenecker

commercial director of De Watergroep, Belgium

BIANNUAL IWA LEAFLET

LEAFLET 2014: CONTENT

- 34 countries, 160 cities
- Drinking water, sewerage and wastewater
- Content
  - Abstraction (2012)
  - Delivered (2012)
  - Consumption (2012)
  - Charges for 100 m³ and 200 m³ (2013)
  - Regulation (2013)

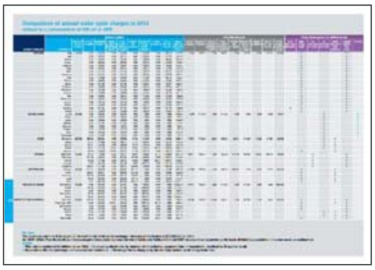
www.dewatergroep.be/leaflet2014

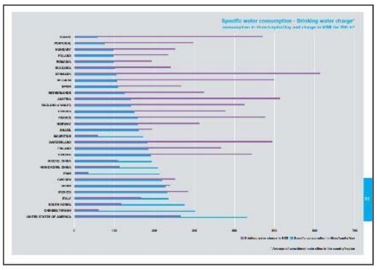
LEAFLET: CHALLENGES

- Questionnaire: easy to complete
- Validation / quality checks
- Stability of parameters and time series
- Country and city level

HOW TO READ THE LEAFLET

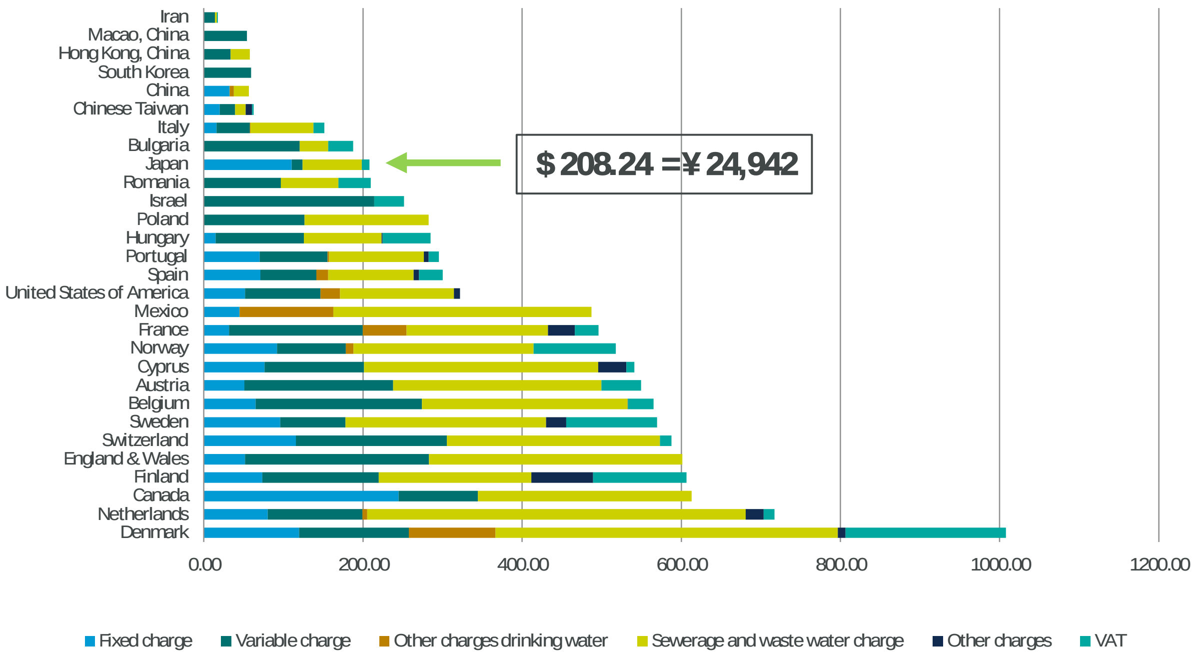
- Statistics Group provides data
  - Consumption
  - Tarification
  - Regulation
- Data → knowledge
- Graphs and tables → trends
- Graphs can serve as templates





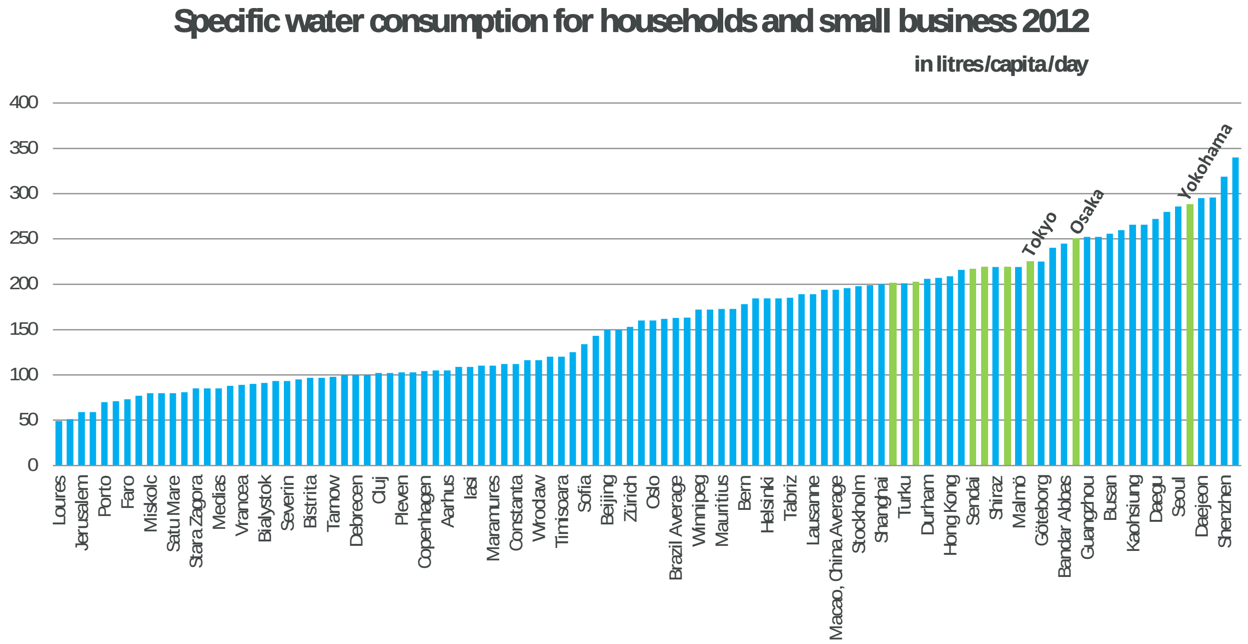
TARIFF STRUCTURE

Average annual water cycle charges in 2013 for a consumption of 100 m³
in US$/100 m³



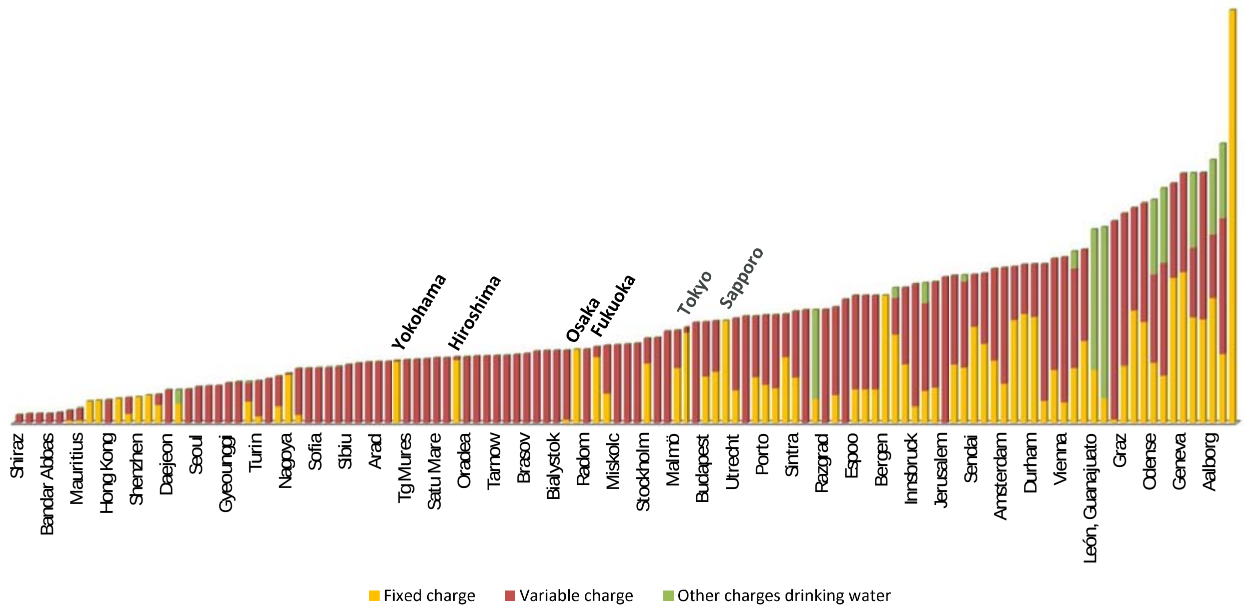
CONSUMPTION GAP
"FROM 49 LITRES TO 340 LITRES PCPD"

the international water association

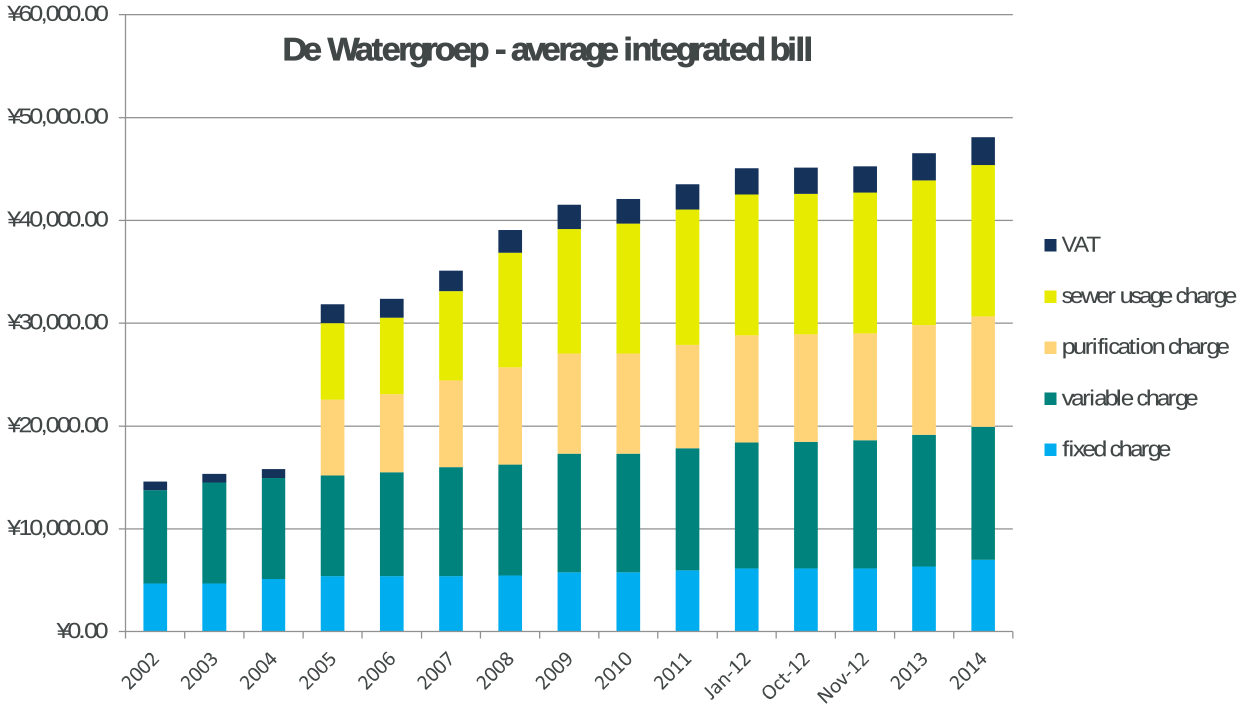


PRICE GAP
"FROM ¥ 1,500 TO ¥ 72,000 FOR 100 M³"

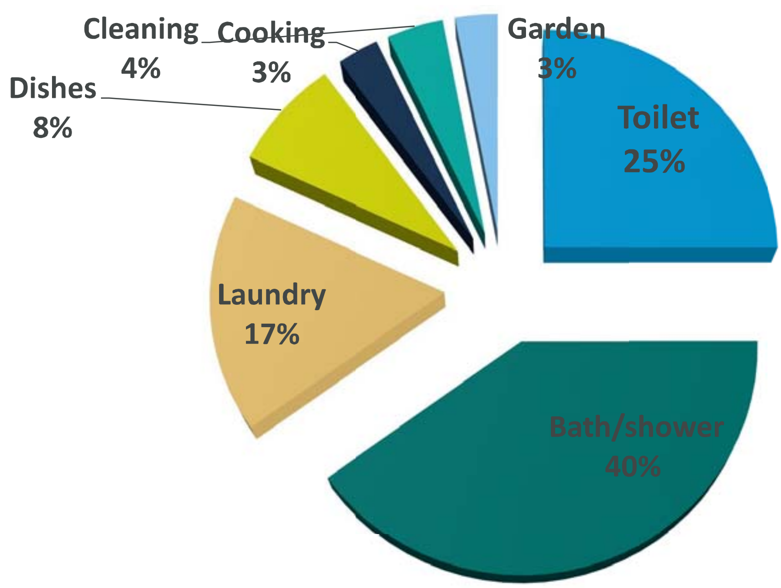
the international water association



AVERAGE WATER BILL: 42,000 JPY



DOMESTIC WATER USE IN BELGIUM



85 l per capita per day

TARIFF STRUCTURE:
WATER PRICING MEETS ETHICS

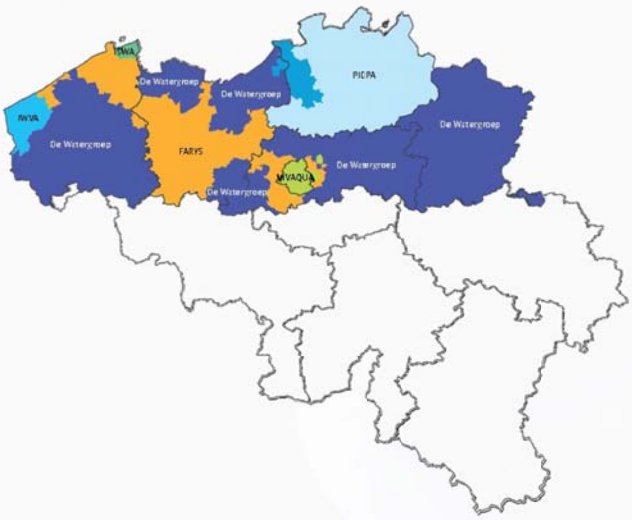
- Economic aspect
  - Fixed >< variable charge
  - Total cost recovery
- Ecologic aspect
  - Progressive >< decreasing blocks
- Social aspect
  - Target group
  - Affordability

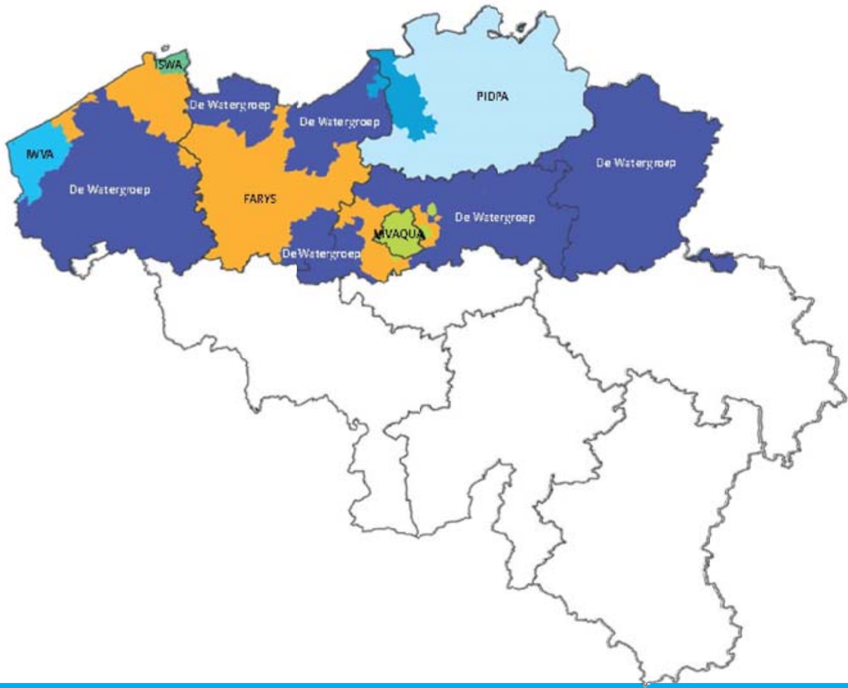
SPECIALIST GROUP STATISTICS AND ECONOMICS

- Platform to discuss
  - Pricing policies
  - Tariff structures
  - Price elasticity
  - Regulation
  - Total cost recovery
- Please visit

  www.dewatergroep.be/leaflet2014

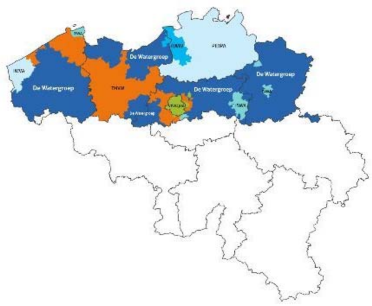
PART II: UNCOVERING THE BELGIAN WATER SECTOR





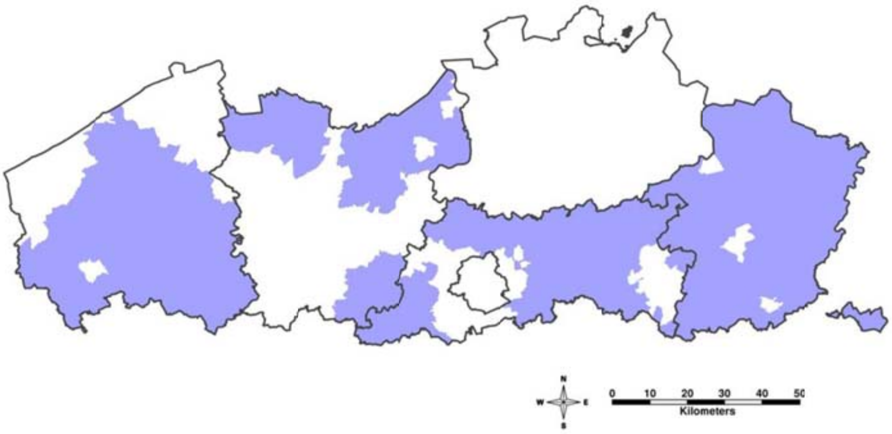
5 LARGE PLAYERS IN FLANDERS + BRUSSELS

ALL PUBLIC AND FULLY INTEGRATED

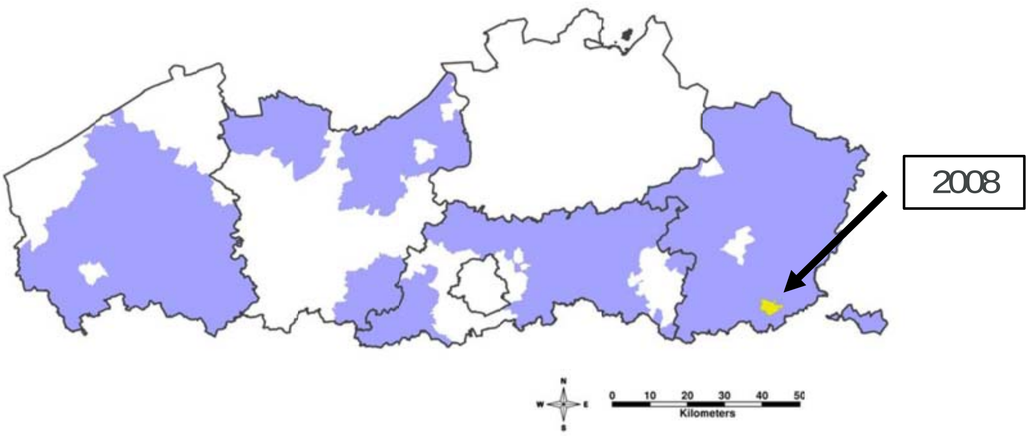


	# connections	# inhabitants	Production source	Disitribution 1,000 m³ / year
De Watergroep	1,200,000	3,000,000	80% GW 20% SW	150,000
Farys	700,000	1,500,000	No production Buy & Sell	70,000
water-link	200,000	500,000	100% SW	92,000
Pidpa	500,000	1,200,000	100% GW	64,000
Vivaqua	600,000	1,500,000	GW + SW	80,000

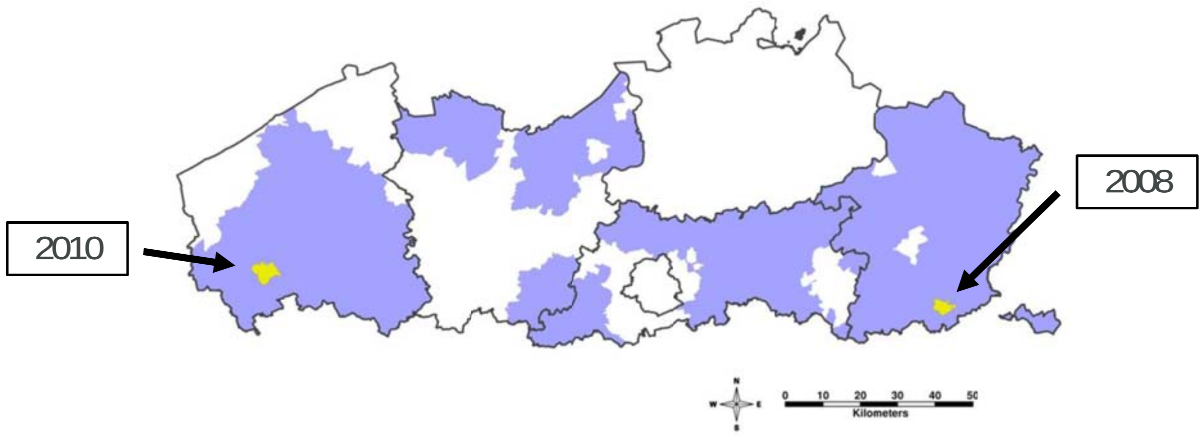
RECENT ACQUISITIONS OF DE WATERGROEP



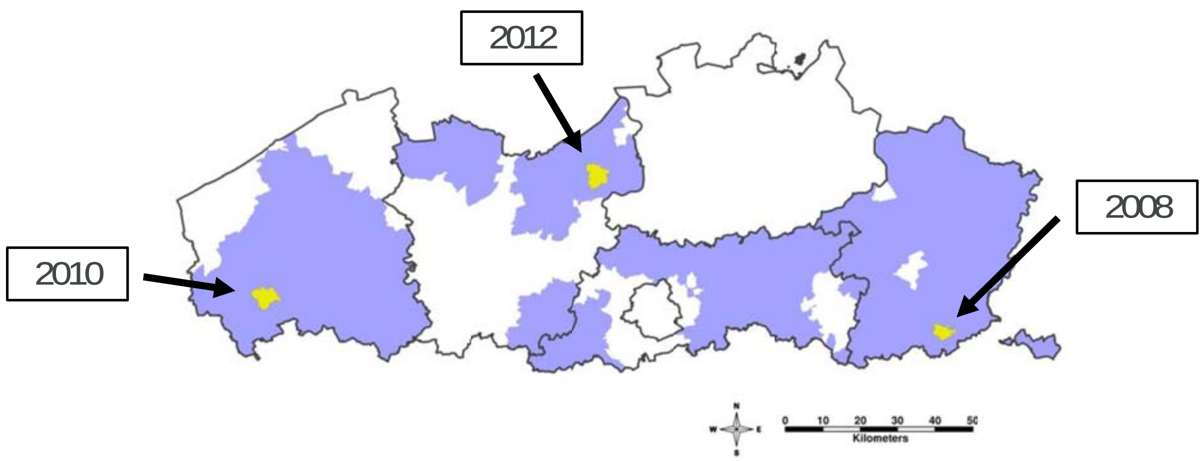
RECENT ACQUISITIONS OF DE WATERGROEP



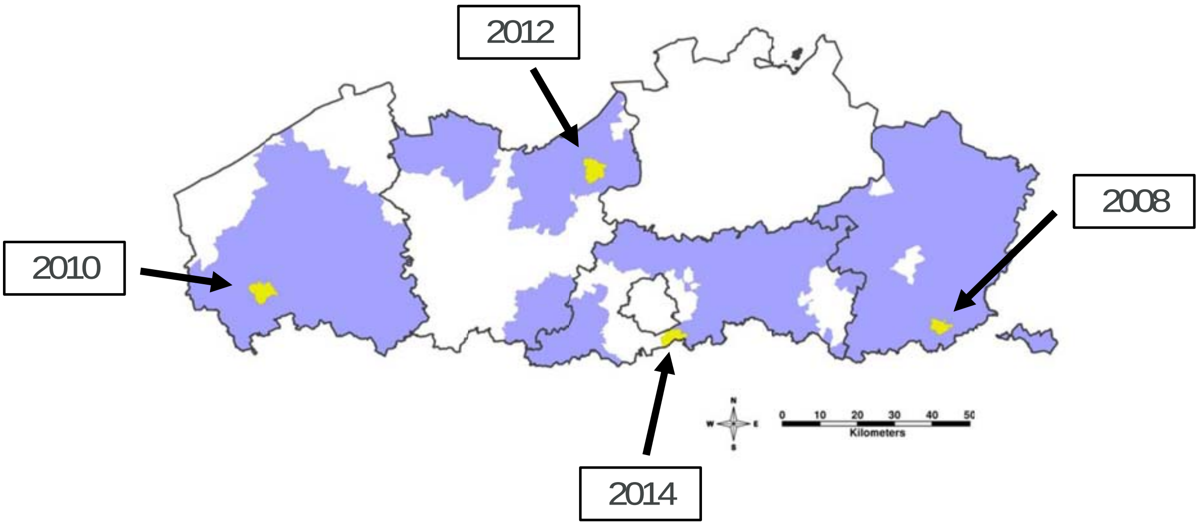
RECENT ACQUISITIONS OF DE WATERGROEP



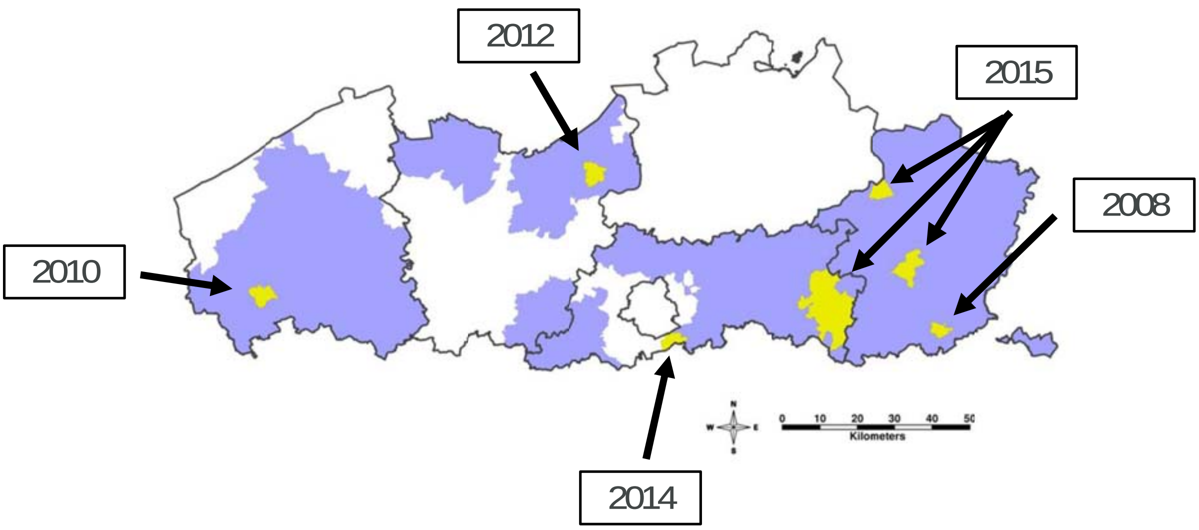
RECENT ACQUISITIONS OF DE WATERGROEP



RECENT ACQUISITIONS OF DE WATERGROEP

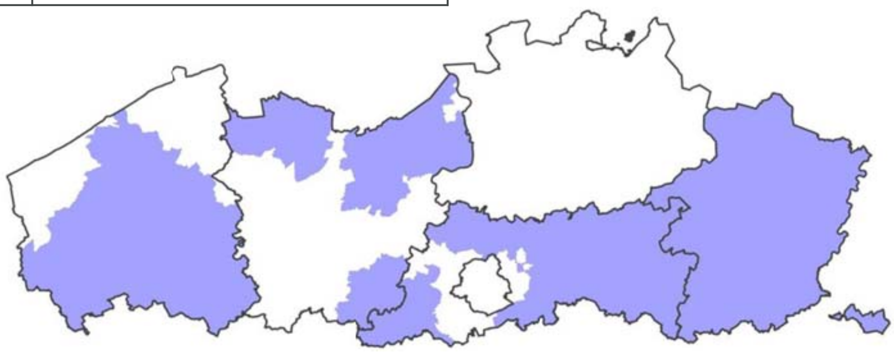


RECENT ACQUISITIONS OF DE WATERGROEP

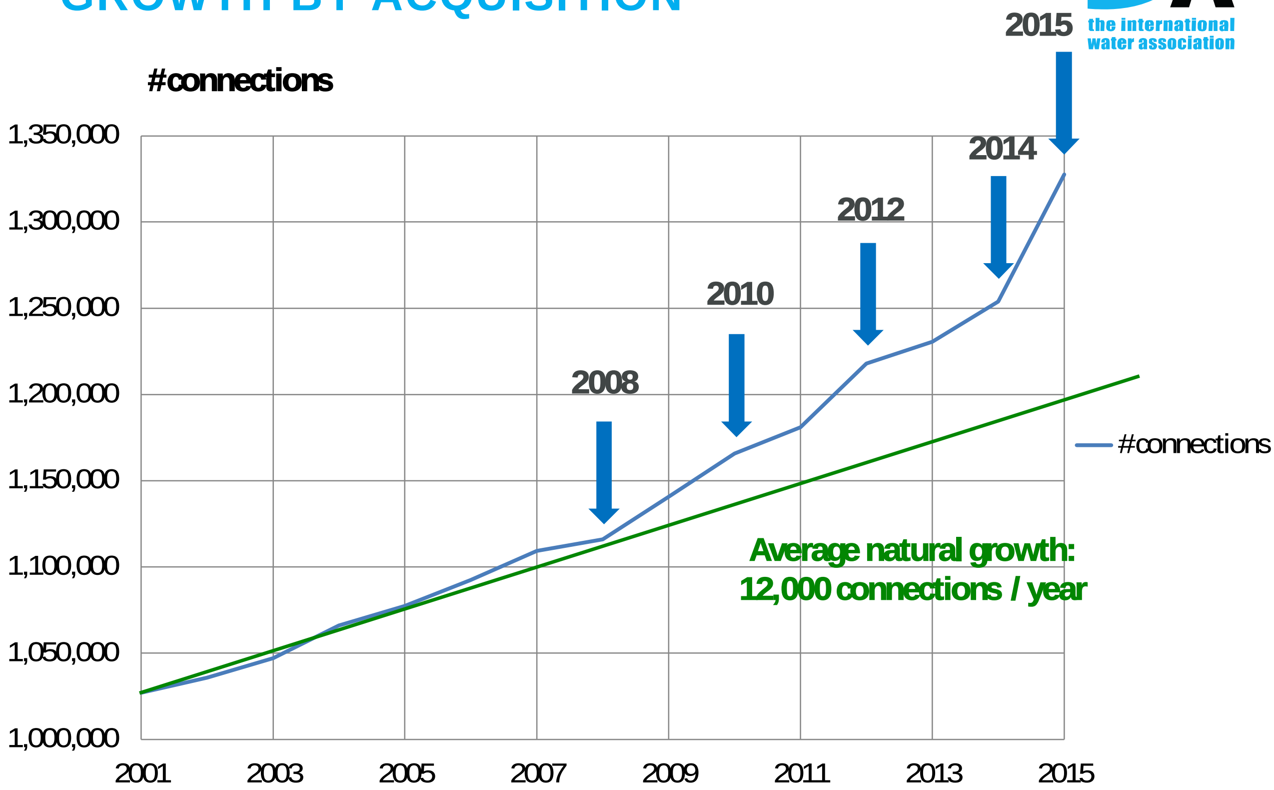


DE WATERGROEP TODAY

#Connections	1,200,000
#Customers	3,000,000
Turnover	55,550 million ¥
#Employees	1,500
Mains	31,000 km

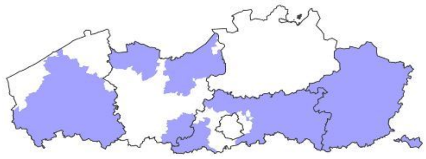


GROWTH BY ACQUISITION



DRIVERS FOR ACQUISITION

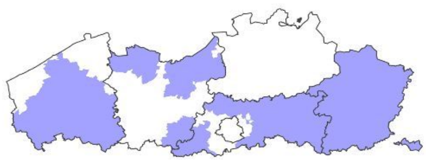
WHY MUNICIPALITIES LOOK FOR INTEGRATION?



- Shortage of cash
  - for investments, maintenance
  - for renewal of assets
  - for software
- Lack of technical knowledge (high-tech, rapid evolution)
- Lack of knowledge concerning challenges
  - legislation, tarification, environmental
- Disadvantage of scale
- One shot at making money

ADVANTAGES OF CONSOLIDATION

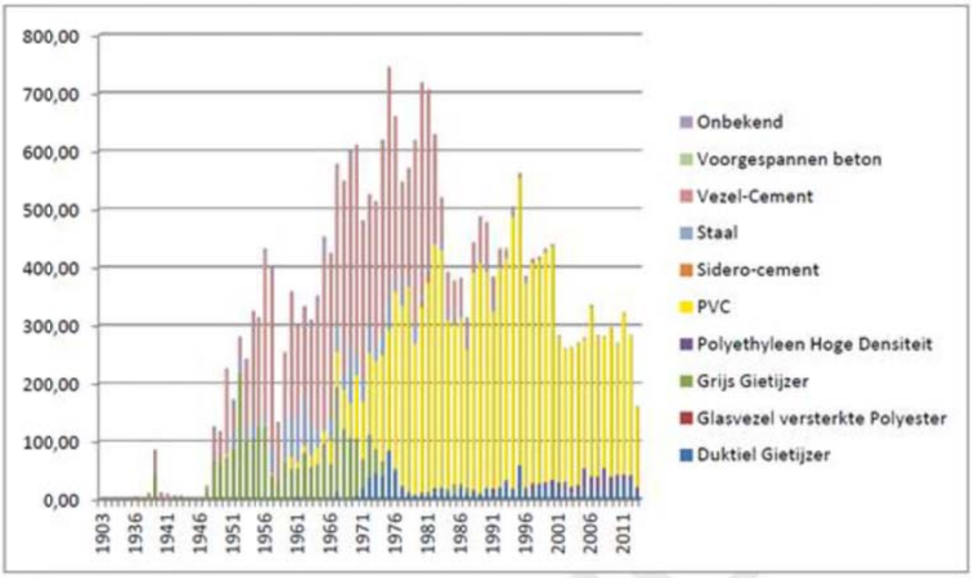
WHY DO WE INTEGRATE MUNICIPALITIES?



- Economies of scale
- Efficiency gain
- Optimizing costs
  - most costs are fixed costs (independent of volume)
  - income is variable (dependent of volume)
- Knowledge centre
  - valorisation of knowhow (technical, juridical, environmental …)
  - asset management
  - combination water + wastewater
  - quality control
- Financial capacity
- Best value for money for the (water)customer

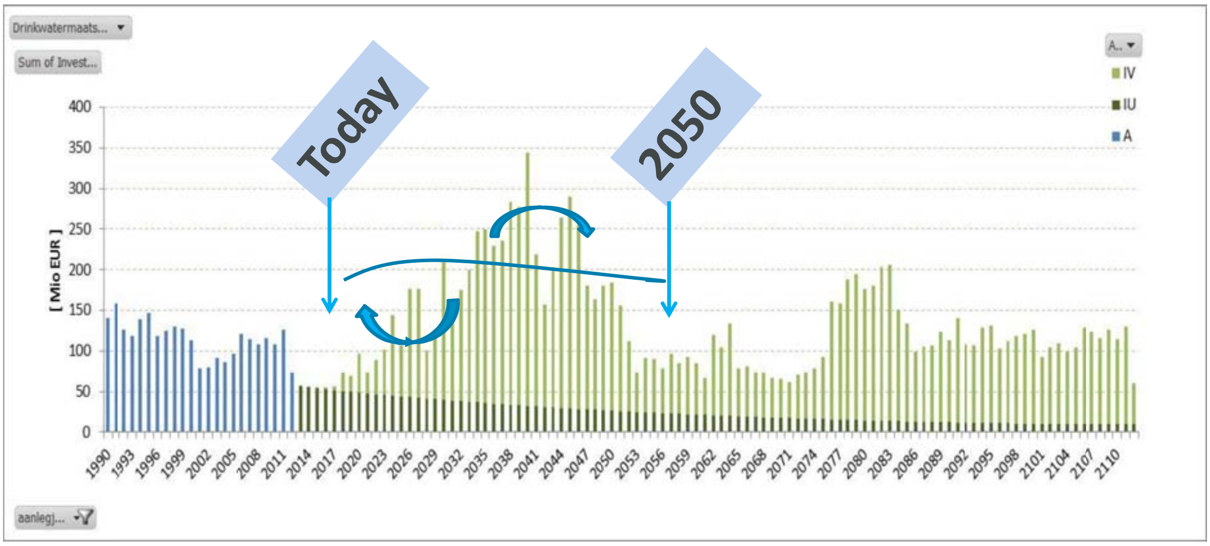
CONSTRUCTION RYTHM OF MAINS 1945-2015

2015: 300KM/YEAR



Figuur 2: Aantal kilometers actieve leiding per type materiaal, weergegeven per aanlegjaar (Bron: GIS).

RENEWAL OF ASSETS: 27,000 MILLION JPY



REGULATION IN FLANDERS

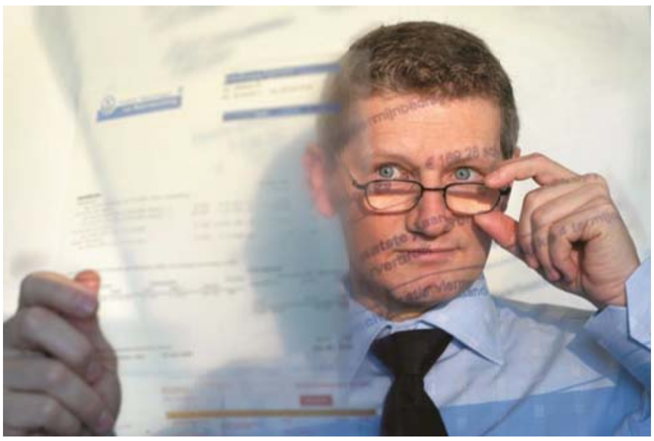
“Regulation is like a pizza

There is not one single recipe, but common ingredients.“

1. Rate-of-return regulation
2. Revenue-cap regulation
3. Price-cap regulation
4. Performance-based regulation
5. Benchmarking-based regulation

KEY INGREDIENTS OF THE PIZZA

- Long-term strategy
- Efficient water companies
- Ability to invest



- Total cost recovery
- Transparancy
- Affordability
- Uniform tariff structure

CHALLENGES FOR THE WATER SECTOR
RE-INVENTING OUR BUSINESS

the international water association

Financial…………………………....investments
Environment…………………….…water safety plans
Technical challenges…………...state of the art
Customer needs………………….soft water, re-use rainwater
Industry needs…………………...re-use waste water

Re-invent your business model

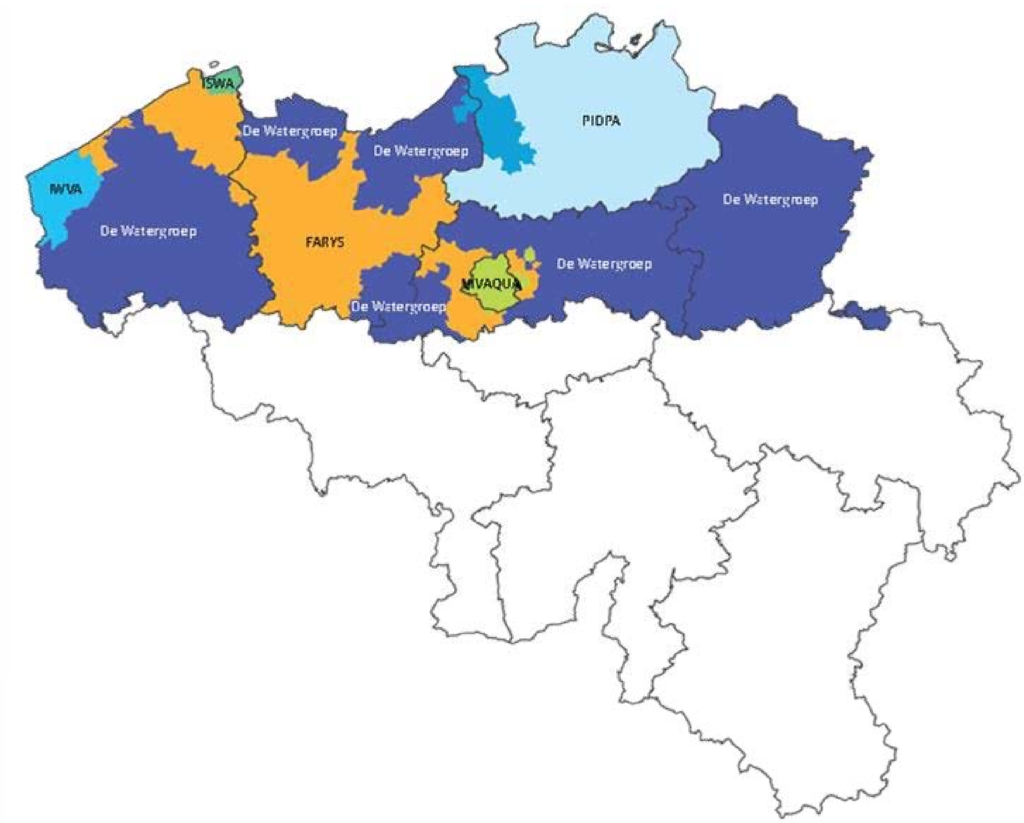
Key statistics of De Watergroep and the Flanders region (order of magnitude)

① Population, coverage, connection ratio, billed water consumption ...

		De Watergroep	Flanders + Brussels
Surface area	km²	7.766 km²	13.522 + 189 km²
Total population	capita	3.000.000	6.000.000 + 1.000.000
Connection ratio		99%	99%
Daily maximum water supply volume	m^3	Normal day peak +20% approx	
Daily average water supply volume	m^3/day	424.000	

② Water utilities in Flanders and Brussels (northern region of Belgium)

Situation as of 01-01-2015



All water companies in Flanders (Belgium) are all public and “fully integrated” water companies, covering both the water and wastewater business.

Shareholders of the water companies in the Flanders and Brussels region are:

	Type of organisation	**2015**
Flanders region	Small municipalities - public (ISWA and IWVA)	**2**
	Large municipalities - public (Pidpa, water-link, Farys - shares: municipalities, cities, provinces, or a mixture but NO state-owned shares)	**3**
	De Watergroep - public (shares: state 25%, provinces 5% municipalities 70%)	**1**
Brussels region	Large municipality - public (Vivaqua-Brussels)	**1**

③ **Water production data 2014 @ De Watergroep**

2014	**m³**
Groundwater production	+87.500.000 m^3
Surface water production	+35.000.000 m^3
Imported water	+41.000.000 m^3
Exported water	-8.700.000 m^3
Total volume available	**160.000.000 m^3**
Water made to measure*	6.000.000 m^3

** Re-use of wastewater, production of water, with other specifications than drinking water*

④ Common water purification techniques @ De Watergroep

Surface water treatment

- **Coarse sieve:** removal of coarse particles, preventing the intake of aquatic animals, e.g. fish (mesh width 5-10 mm)
- **Fine screen**: removal of fine particles (mesh width ≤0,5 mm)
- **Coagulation and flocculation**: chemical pre-treatment for capturing very small particles into removable flocs, e.g. natural organic matter
- **Flotation or sedimentation**: physical separation and removal of formed flocs and algae
- **Aeration**: oxidation of chemical compounds, mostly iron, manganese and ammonium
- **Rapid submerged sand filtration**: physical removal of iron, biological transformation and removal of manganese and ammonium
- **Activated carbon filtration:** removal through adsorption of odor-, taste and color producing compounds and micropollutants (pesticides)
- **Disinfection by chlorine dosing, sometimes combined with UV disinfection**

Groundwater treatment

- **Softening**: reduction of the calcium carbonate precipitation potential
- **Aeration**: addition of oxygen for oxidation of chemical compounds (iron, manganese, ammonium) and removal of unwanted gasses (like carbon dioxide and hydrogen sulfide)
- **Rapid submerged sand filtration**: physical removal of iron, biological transformation and removal of manganese and ammonium
- **Activated carbon filtration**: removal through adsorption of odor-, taste and color producing compounds and micropollutants (pesticides)
- **Disinfection by chlorine dosing**

Please note that this is a summary of the most common technologies.
If and how they are implemented is case dependent, based on the raw water quality at hand. Furthermore, due to the increasing pressure on the quality of ground- and surface water, the need for additional and more efficient treatment techniques increases, e.g. membrane filtration and ozone treatment.

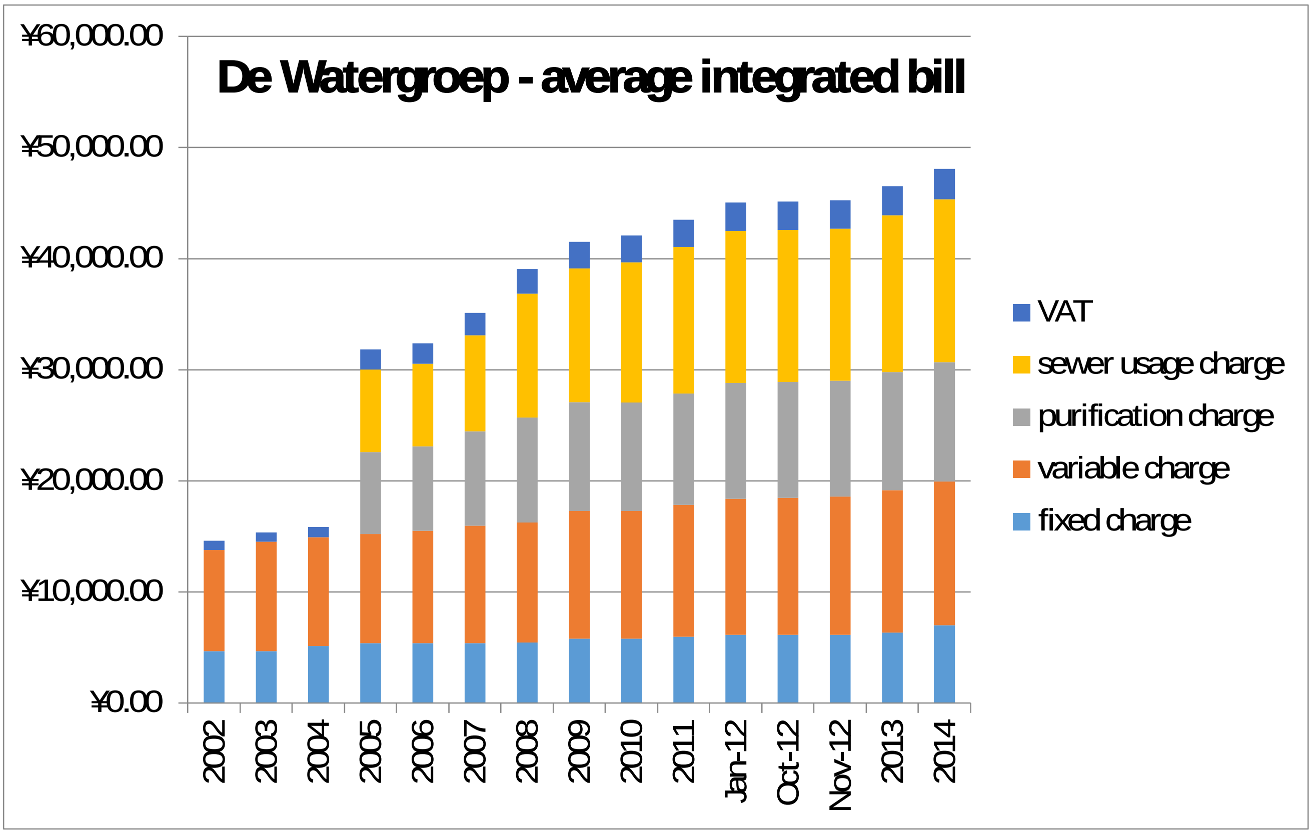
⑤ **Total mains length @ De Watergroep**

Transmission mains (large feeders: diameter >150mm)	26.218 km
Distribution mains	5.015 km
Total length	**31.233 km**

⑥ **Water tariffs @ De Watergroep** (6%VAT included)

Household consumption tariffs JPY		
Fixed charge per year		7,411
15 m³ per person per year		*0*
Water price (per m³)		275
Industrial consumption tariffs JPY		
Fixed charge per year		34,980
Water price per m³	0 - 6,000 m³	220
	6,001 - 60,000 m³	186
	>60,000 m³	176
Sewer and purification charges per m³ JPY		
Sewer usage charge (varies per municipality)		235
Purification charge		168

In 2005 legislation changed and water companies evolved from potable water companies to fully integrated water companies. From 2005 onwards, the water bill became a fully integrated bill:



In 2014 the average, fully integrated water bill from De Watergroep was 48,000 JPY per year, for an average household consumption.

Self-accounting system based on corporate accounting principles			2013 (JPY)
Financial conditions			
Operating revenue & expenditure			
	Operating income		76,855,435,765
		Revenue on water supply	
		Revenue on trusted construction	
		Others	
	Non-operating income		670,805,256
		Subsidy	
		Others	
	Extraordinary gain		131,185,274
Total income			**77,657,426,295**
	Operating expenses		- 74,276,232,635
		Personnel expenses	
		Depreciation expenses	
		Others	
	Non-operating expenses		- 868,522,418
		Interest expense	
		Others	
	Extraordinary loss		- 507,446,154
Total expenses			**- 75,652,201,207**
Balance			**2,005,225,088**

Name: Deborah Galardi

Organization: Galardi Rothstein Group

Job Title: Owner and Consultant

Profile:

Provides strategic financial and management consulting services to government agencies and special districts in North America. Core practice focuses on providing solutions to management, economic, and financial challenges associated with the development and delivery of major infrastructure services and addressing resource limitations.

Member of American Water Works Association and Water Environment Federation. Was a primary author of Water Environment Federation Manual of Practice: *Financing and Charges for Wastewater Systems*.

Member of the IWA Economics and Statistics Specialist Group Management Committee since 2013. Authored two articles for IWA with Eric Rothstein:

"Financial Sustainability in an Uncertain World", Water Utility Management International, December 11, 2011.

"Financial Sustainability as a Foundation for Infrastructure Development and Management: Best Practices", presented at the IWA World Water Congress, September 2006, Beijing, China

Education: B.S., Economics, University of Oregon, 1988

Water Utilities in the United States

Current Status & Strategies to Enhance
Financial Sustainability

GALARDI ROTHSTEIN GROUP

IWA Workshop
March 19, 2015

Outline

- Current Status of U.S Water Utilities
- Strategies to Enhance Sustainability
  - Cost recovery
  - Credit management
  - Planning and forecasting
  - Tariff structures
  - Customer Affordability
  - Stakeholder Education

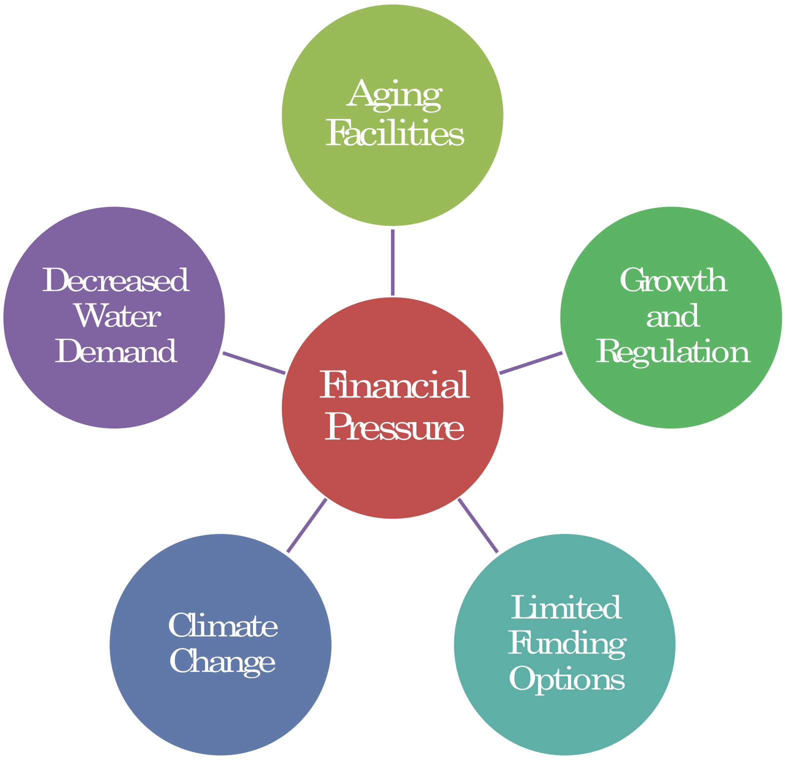
Current Status of U.S. Water Utilities

Water Utility Governance Structures

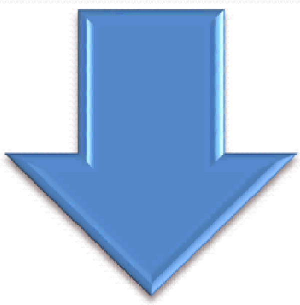
Structure	Decision Authority	Disadvantages	Advantages
Municipal*	City Council	Competing interests; heavily influenced by elections	Flexibility to fund future reserves; broad taxing authority
Special District	Board	Focused on single service; limited election influence	Flexibility without taxing authority
Private Investor-Owned Companies	Public Utilities Commission	Focus on historical costs; limit to use of reserves	Promotes full cost pricing

*Only 3 states have comprehensive regulation of government owned utilities, though other states regulate some aspect of tariff process (for example, California).

Water Utility Challenges



The "New Normal"



Consumption Decline

- Technological
- Economic
- Customer Education

Rising Costs

- Deteriorating infrastructure
- Regulatory requirements
- Reduced federal support

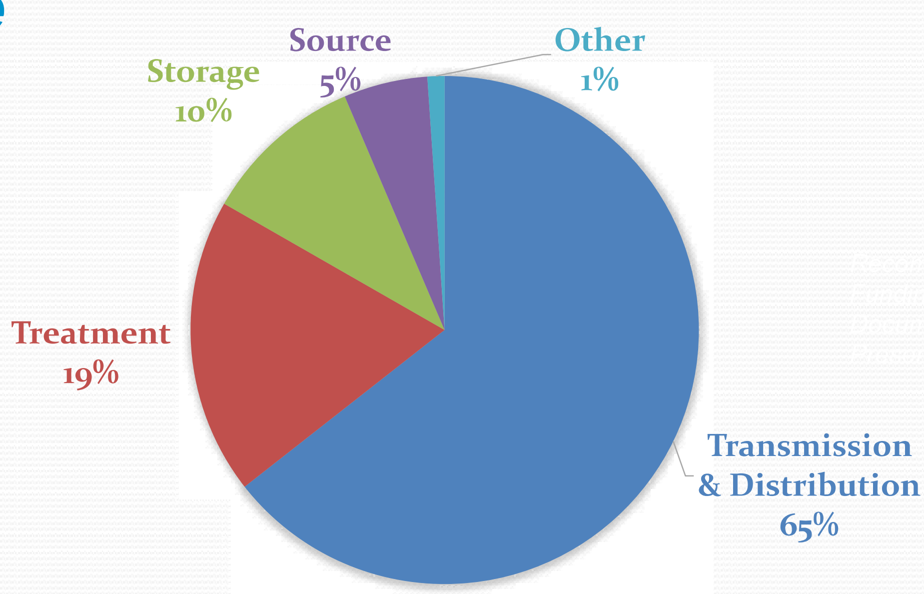
20-Year Drinking Water Infrastructure Needs Assessment (2011-2030)*

System Size and Type	Population	20-Year Total $ billions
Community Water Systems		
Large	>100,000	$145.10
Medium	3,301-100,000	$161.80
Small	< 3,300	$64.50
Other Systems		$12.80
Total		**$384.20**

Drinking Water Infrastructure Needs Survey and Assessment (April 2013), US EPA

*Includes projects related to new infrastructure, rehabilitation, expansion and replacement of existing infrastructure. Excludes improvements for population growth and operation and maintenance costs.

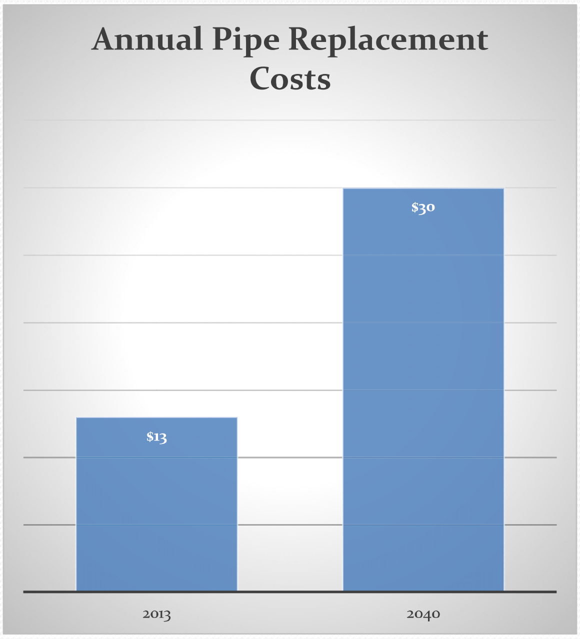
Drinking Water Needs by Infrastructure Type



Drinking Water Infrastructure Needs Survey and Assessment (April 2013), US EPA

2013 Report Card for America's Infrastructure (ASCE*)

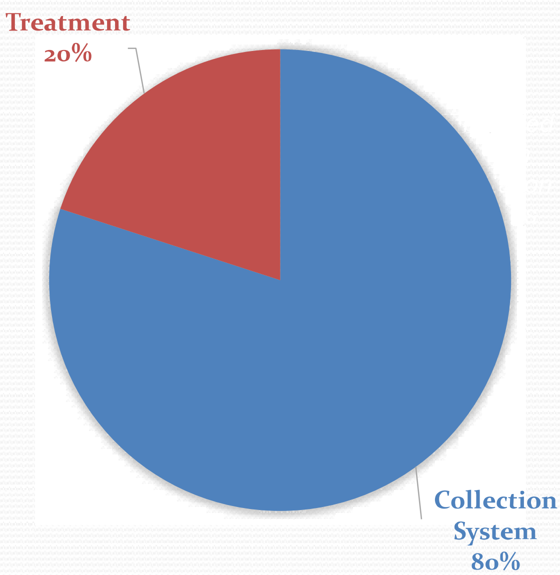
- Drinking Water
  - 1 million miles of water mains
  - 240,000 main breaks per year
  - 6 billion gallons of water lost daily (14%)
  - Water line replacement costs more than double in next 25 years



*American Society of Civil Engineers

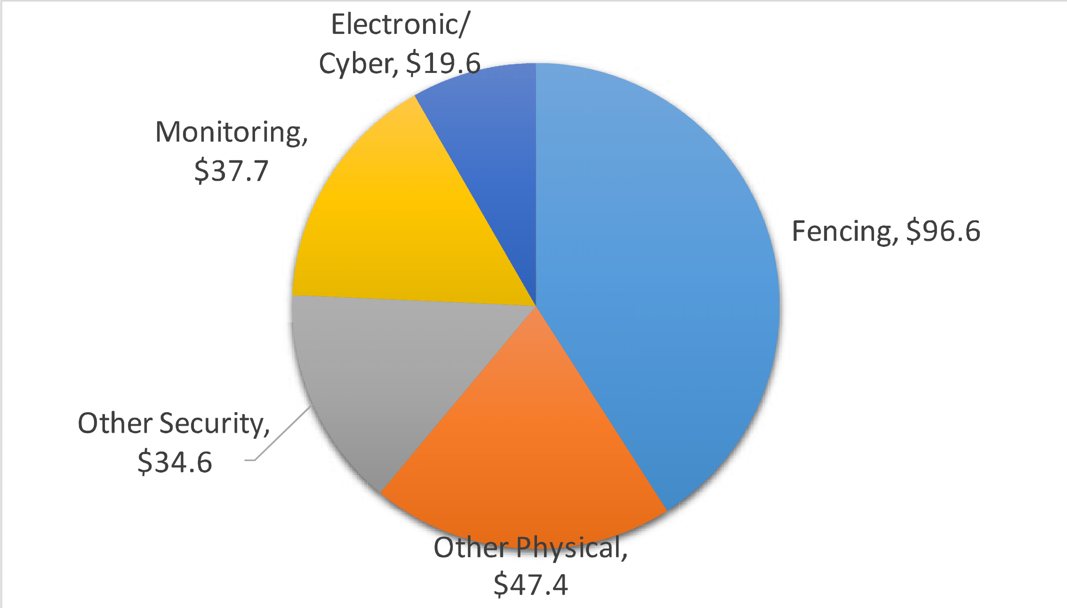
2013 Report Card for America's Infrastructure (ASCE*)

- Wastewater & Stormwater
  - 800,000 miles of sewer mains
  - Total needs = $298 billion (20 years)



*American Society of Civil Engineers

Drinking Water Security Needs ($235.9 billion)*

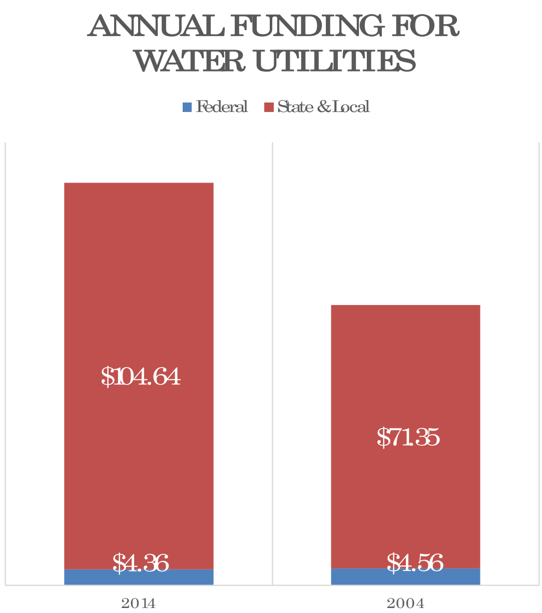


*2002 Public Health Security and Bioterrorism Preparedness and Response Act requires systems >3,300 population to prepare vulnerability assessments

Drinking Water Infrastructure Needs Survey and Assessment (April 2013), US EPA

Funding Challenges

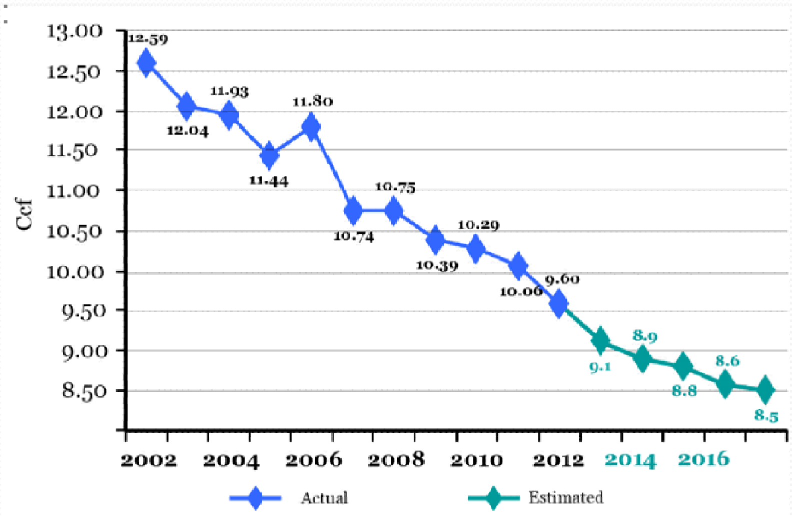
- Decreased federal support
- Credit market risks
  - Credit ratings
  - Interest rates
- Consumption decline
- Ratepayer resistance



*Congressional Budget Office

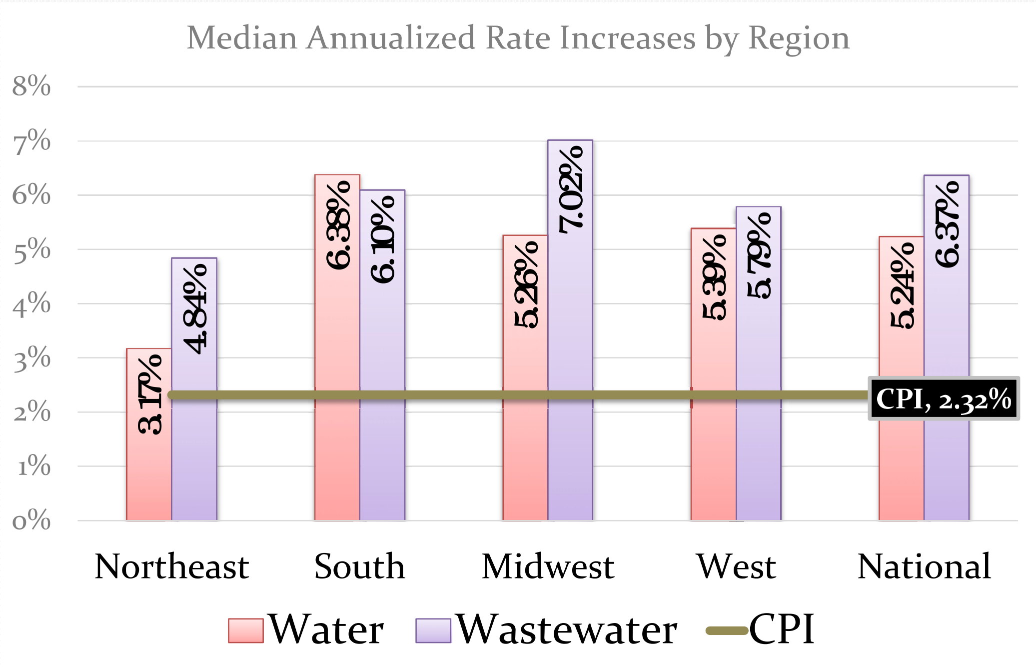
Consumption Decline

- National trend: 25% decrease between 2000 and 2012 150 gpcd - 112 gpcd (568-423 litres)
- Southwest City Example (31% decline in ccf per month per account):



gpcd = gallons per capita per day, ccf = hundred cubic feet

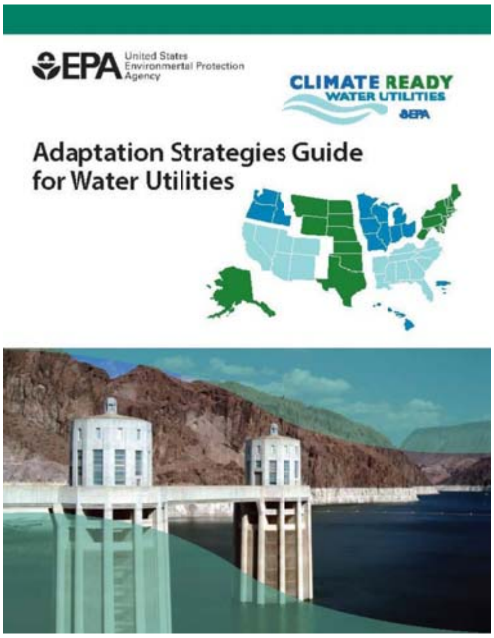
Tariff Increases Outpacing Inflation*



*2014 Water and Wastewater Rate Survey (American Water Works Association and Raftelis Financial Consultants

Climate Change

- Additional Costs
  - Short-term planning
  - Longer term resource adaptation
- Revenue instability
  - Extreme weather conditions



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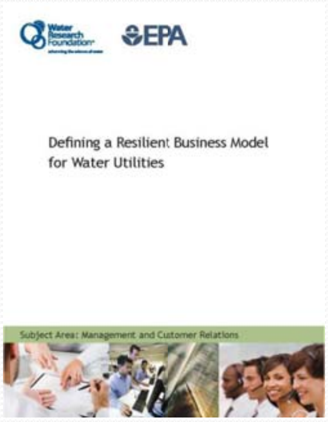
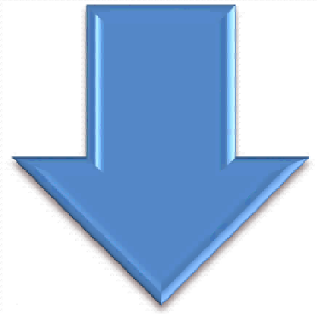
Strategies to Enhance Financial Sustainability

Risks and Opportunities





External Risks

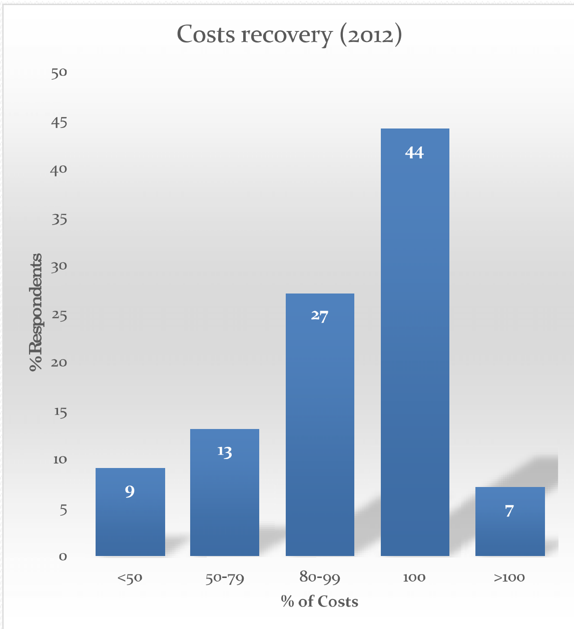
- Planning and forecasting
- Tariff structures and composition

Internal Resilience

- Cost recovery
- Credit management

Full Cost Recovery: Tariffs

- Tariff levels
  - Price indexing
  - Marginal cost pricing
- Tariff surcharges
  - Environmental
  - Security
  - Repair & replacement
  - Drought



*2012 State of the Water Industry Report (Journal AWWA, Murphy, Maripat)

Cost Recovery Enhancements

- New fees and charges
  - Antenna leases on water towers
  - Bottled water sales
- On-site energy production
- Customer assistance programs

Managing Credit Factors

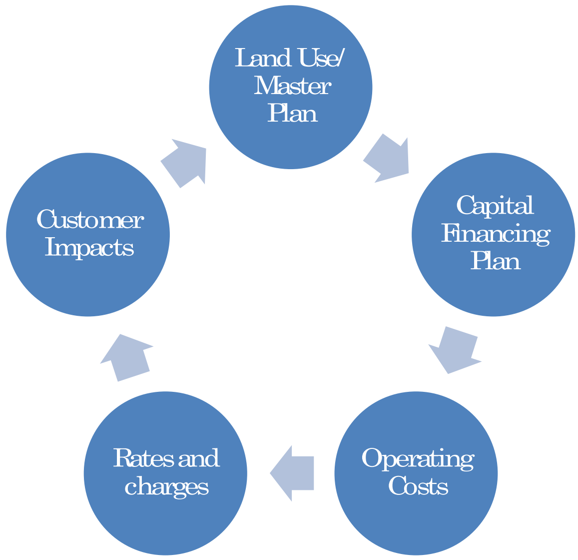
- Rate increase history
- Revenue recovery
  - Minimum 30% fixed
- Financial performance metrics

Key Water and Sewer Utility Ratios

Liquidity:	**Strong**	**Good**	**Adequate**	**Low**
Cash and Investments On Hand (days)	>120	60 - 120	30 - 60	<30
Financial Operations:	**Strong**	**Good**	**Adequate**	**Insufficient**
Debt Service Coverage (x)	>1.50x	1.26x - 1.50x	1.0x - 1.25x	<1.0x

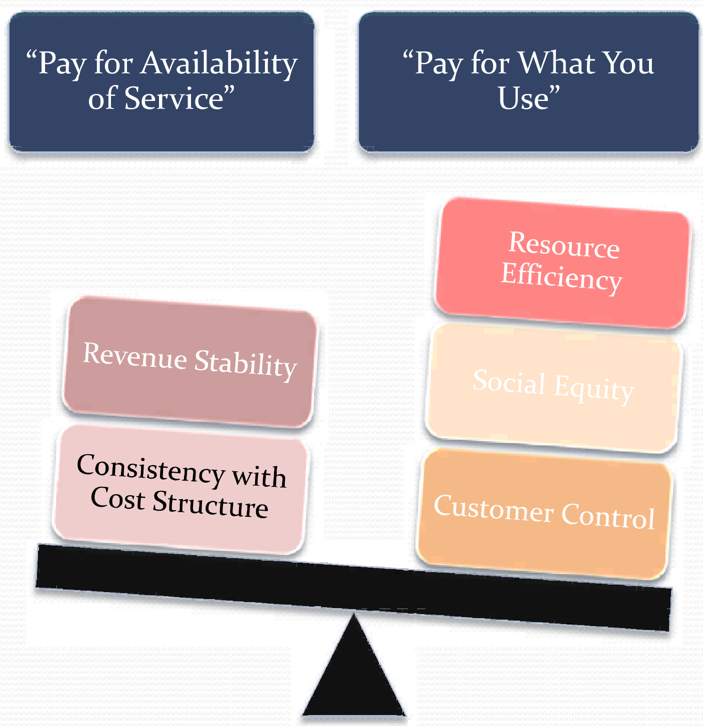
Planning and Forecasting

- Coordination of facility and financial Planning
- Asset management
- Consumption forecasting
  - Challenge historical assumptions
  - Understanding price elasticity
  - Improved meter technology

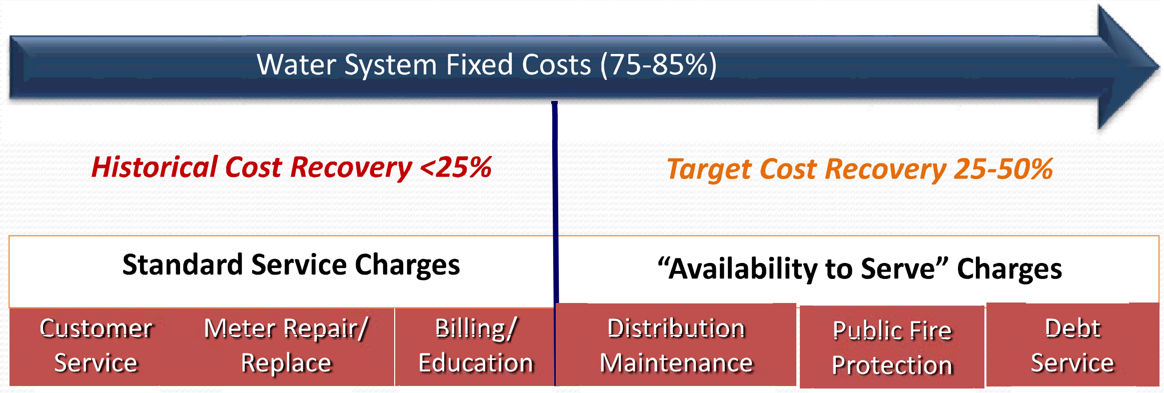


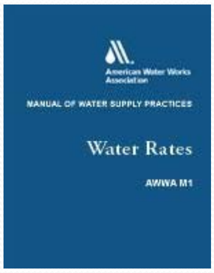
*

Re-Balancing Tariff Pricing Objectives



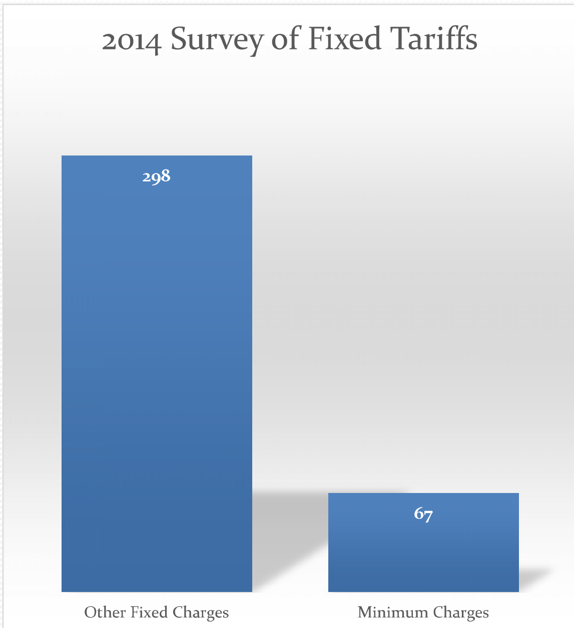
Fixed Charge Cost Recovery





Traditional Fixed Charge Structures

- Customer/billing
  - Uniform by customer
- Meter-based
  - Increase with size of meter
- Minimum Charges
  - Include pricing of minimum quantity



*2014 Water and Wastewater Rate Survey (American Water Works Association and Raftelis Financial Consultants

Consumption-Based Fixed Charges

- Base Charge reflective of individual consumption
  - Peak season (prior year)
  - Real-time (end of rate period)
- Advantages
  - Balance revenue stability with equity and conservation
- Disadvantage
  - Administrative burden
  - Lag in price signal

Fixed–Fixed
Meter installation and reading
Fire protection services
Administrative/billing costs
Fixed-Volumetric
Purchasing water rights
Planning and environmental costs
Water mains, pipelines, tanks, and wells
Building/maintaining treatment facility
Variable
Water purchases
Pumping costs
Water treatment costs

*2012 State of the Water Industry Report (Journal AWWA, Murphy, Maripat)

Fixed Charge Tiers

- City of Austin, Texas
- Based on customer water use (prior 12 months); applies in addition to meter charges

Single-Family Residential	
0-2,000 Gallons	$2.00
2,001-6,000 Gallons	$4.50
6,001-11,000 Gallons	$7.45
11,001-20,000 Gallons	$12.55
20,001– over Gallons	$12.55

Source: The Price of Water 2013 (Circleofblue.org)

Peak-Set Fixed Charges

- Similar to electric utility peak charges
- Fixed charge based on 3-year rolling average of customer's use ("peak" month)

	Prior Tariff Structure	Peak-Set Base Tariff Structure
% fixed annual revenue	18%	57%
Fixed Charge	$6.00 per meter	$1.85/1,000 gallons X Peak Base Volume
Volume (Variable) Charge	$3.46/1,000 gallons X actual month volume	$0.52/ 1,000 gallons X actual month volume

Source: Defining a Resilient Business Model for Water Utilities (Water Research Foundation #4366)

Customer Assistance Programs

- Regulatory threshold
  - 2.5% median household income
- Lifeline rates
- Targeted Programs
  - Income qualifying
  - Discounts to fixed/volume charges
- Conservation programming

*

Public Outreach: Messaging

"You're paying for the ability to <u>receive</u> water, whether you use it or not"

WaterReliability

Contact

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International Water Association

Workshop on Statistics and Economics

Water Statistics – United States

Key Statistics

1. Summary of Key Statistics

	Value	Units	%
Land Area	9,157,841	km^2	
Population	316,129	1,000 capita	

Source: United States Census (2013 estimate)

	Value	Units	%
Water Coverage			
Self-Supplied	44,500	1,000 capita	14%
Public supply	268,000	1,000 capita	86%

Source: US Geological Survey (Estimated Use of Water in the US in 2010)

2. Number of Water Utilities

	Number of Systems	Population Served (1,000)
Size of System		
Very Large (>100,000)	419	137,283
Large (>10,000)	3,802	108,770
Medium (3,300-10,000)	4,936	28,738
Small (<3,300)	42,083	24,425
Total	**51,240**	**299,216**

Source: Safe Drinking Water Information System (SDWIS)
Environmental Protection Agency

Ownership	Number of Systems	% Population
Private	26,700	11%
Public & Cooperative	24,540	89%

Source: Wikipedia

3. Water Supply

Category	Quantity (billion gallons per day)	% of Total
Pubic supply	42,000	12%
Self-supported domestic	3,600	1%
Irrigation	115,000	32%
Livestock	2,000	1%
Aquaculture	9,420	3%
Self-supplied industrial	15,900	4%
Mining	5,320	2%
Thermoelectric power	161,000	45%
Total	**354,240**	**100%**
Withdrawal sources		
Fresh surface water	230,000	65%
Fresh groundwater	76,000	21%
Saline surface water	45,000	13%
Saline groundwater	3,290	1%
Total	**354,290**	**100%**
Public Supply Sources		
Surface Water	26,300	63%
Groundwater	15,700	37%
Total	**42,000**	**100%**

Source: US Geological Survey (Estimated Use of Water in the US in 2010)

Financial Statistics

Country-wide financial statistics are not available for public and private utilities. The tables below provide public spending totals for water infrastructure for 2014 and 2004. Summary statistics from a recent national survey of water and wastewater utilities are also provided.

4. Summary of Public Spending for Water Utilities

	2014		2004	
Water Utilities Expenditure	%	$ Billions	%	$ Billions
Total Public Spending for Water Utilities*		$109		$76
Water Utilities Spending as % of GDP	0.6%		0.5%	
Spending Category				
Capital	33%	$35.97	37%	$27.97
O&M	67%	$73.03	63%	$47.93
Funding Source				
Federal	4%	$4.36	6%	$4.56
State & Local	96%	$104.64	94%	$71.35

* Spending by state and local government water utilities—including supply systems for distributing potable water as well as wastewater and sewage treatment systems and plants

Source: Congressional Budget Office, Public Spending on Transportation and Water Infrastructure, 1956 to 2014 (March 2015)

5. Financial Conditions: Utility Survey*

	Group A	Group B	Group C
Water Utilies			
Utility Size (water sold)	>75 MGD	20-75 MGD	<20 MGD
Max Day to Average Day Production	1.49	1.55	n/a
Equity to Assets Ratio	0.42	0.76	0.64
Operating Expense to Revenue Ratio	0.91	0.81	0.89
Revenue per Quantity Sold ($/m3)	$1.20	$1.63	$1.55
Wastewater Utilities			
Utility Size (volume treated)	>70 MGD	20-70 MGD	<20 MGD
Equity to Assets Ratio	0.41	0.55	0.68
Operating Expense to Revenue Ratio	0.91	0.83	0.84
Revenue per Quantity Treated ($/m3)	$1.20	$1.58	$1.93

*2014 Water and Wastewater Rate Survey (American Water Works Association and Raftelis Financial Consultants

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