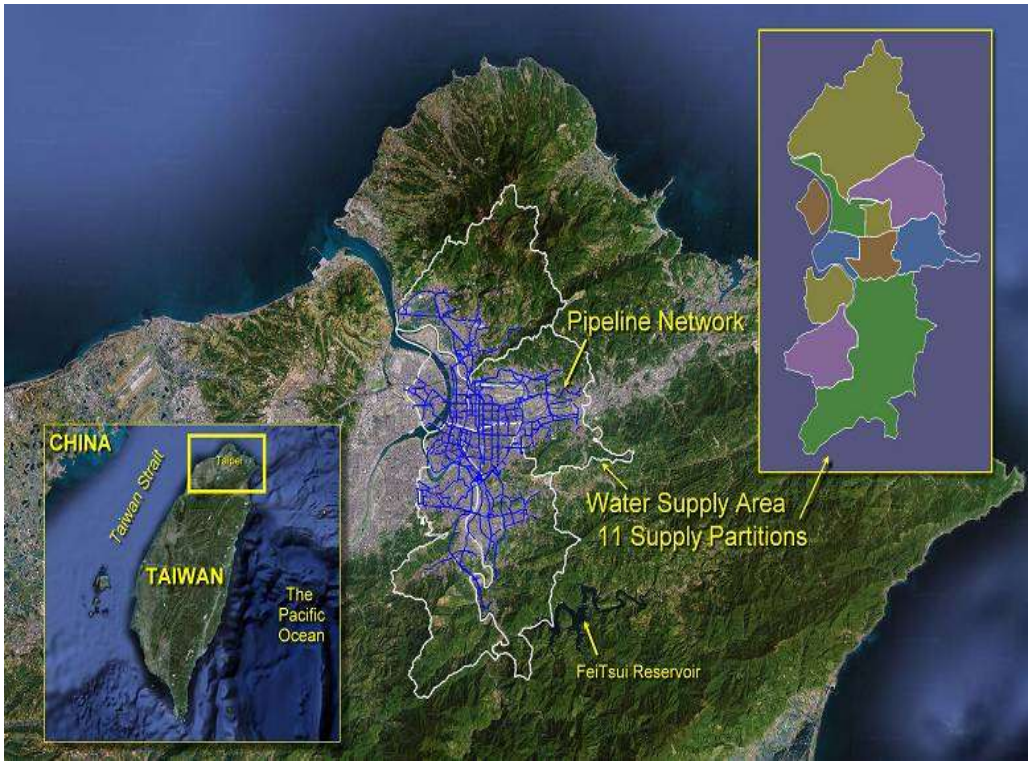
The Plan of Taipei Water to Battle against Natural Hazards

Yang-Long Wu

Commissioner of Taipei Water Department

About Taipei Water Department

The profile of TWD	
Area	434 km^2
Population	3.94 million
Percentage of population served	99.6%
Household	1.64 million Households
Water treatment capacity	3.7 million CMD
Water mains	3,920 km
Service pipe	2,539 km
Distribution basin	123 Capacity 418 thousand tons
Booster station	60

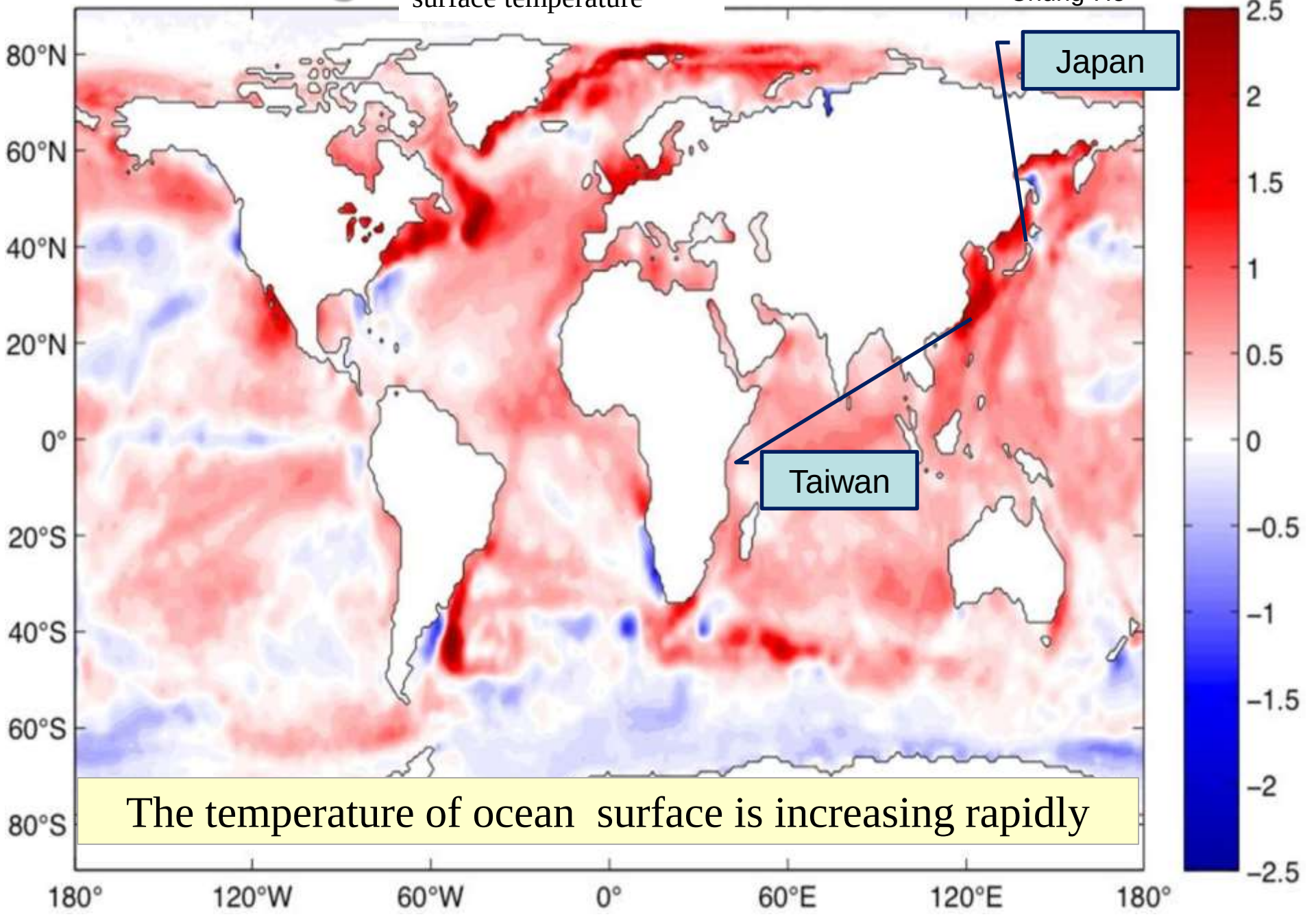


TWD: Taipei Water Department

Climate Change

Variation of ocean surface temperature (°C, 1959 – 2008)

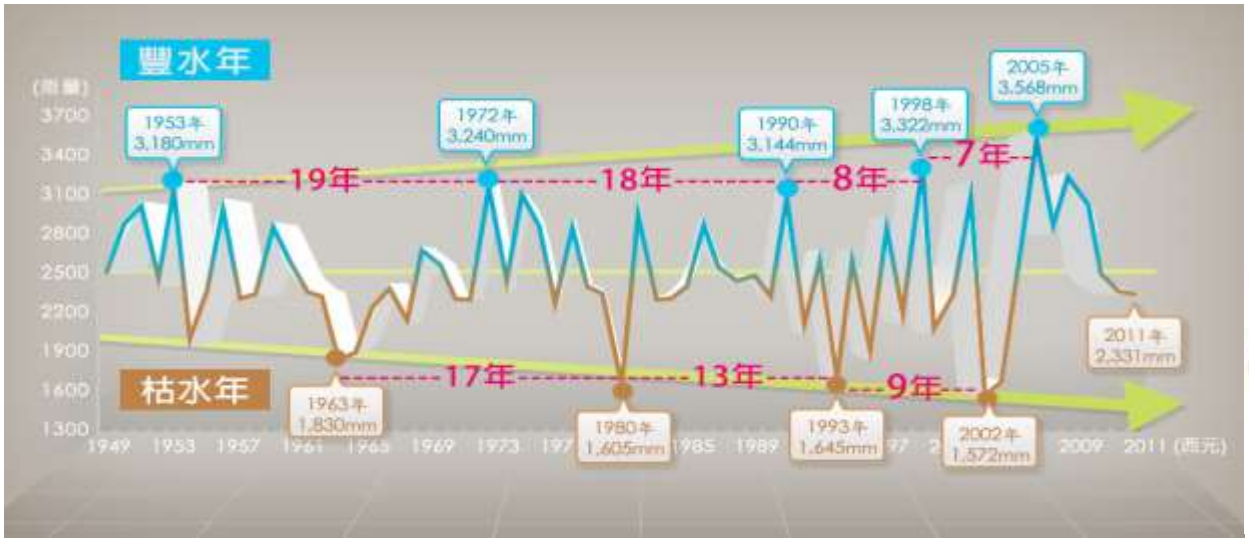
Data resource: Wang Chung-He



The temperature of ocean surface is increasing rapidly

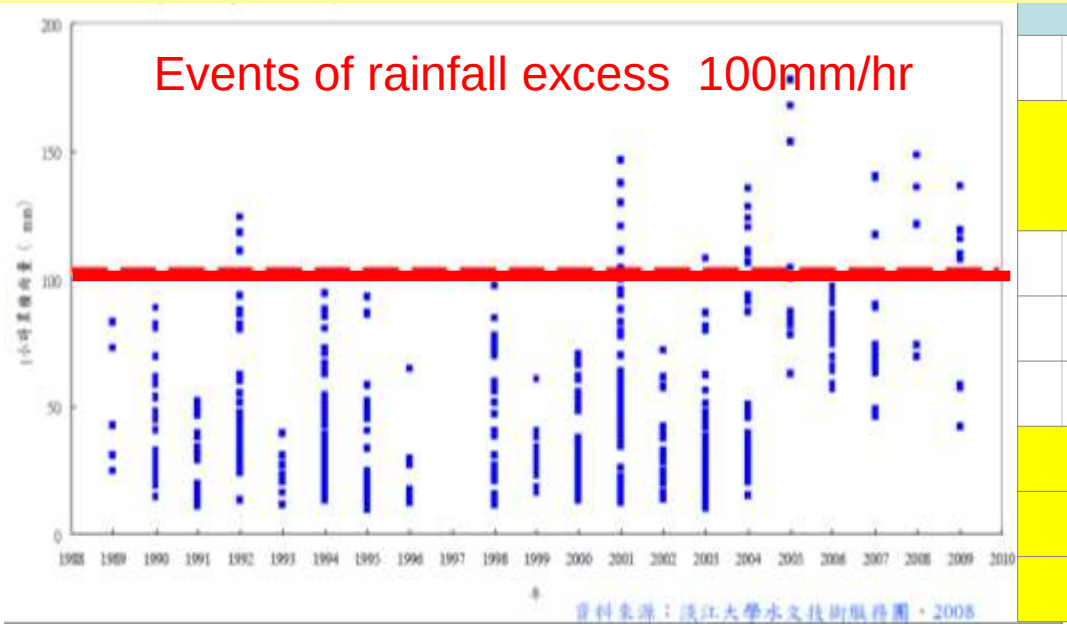
Extreme climatic events become more serious.

Data resource: Dr. Wang Chung-He



Heavy rainfall events cause high turbidity

Frequency of severe rainfall is increasing.



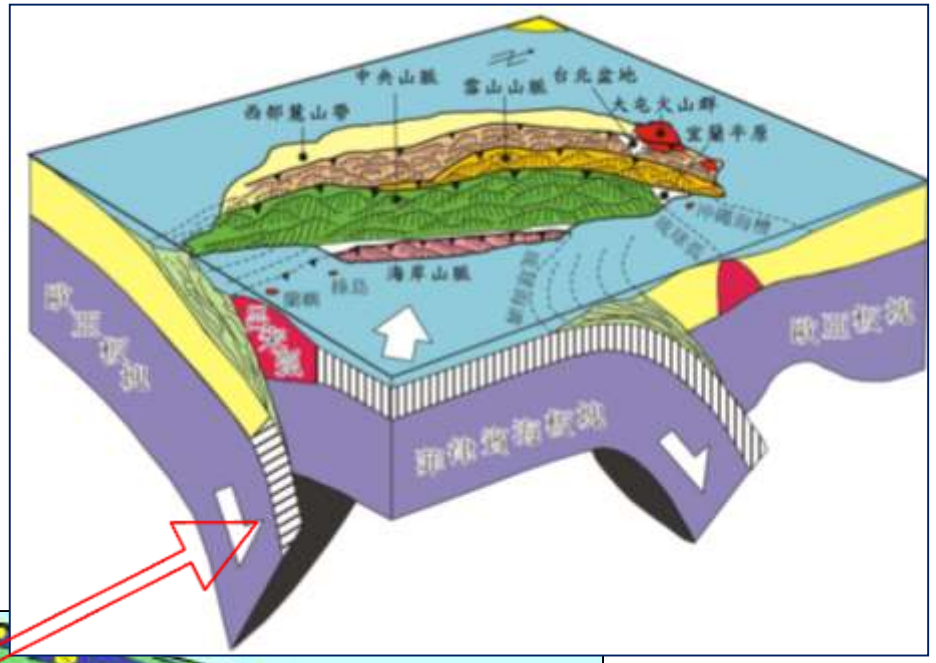
年	Typhoon	Turbidity(NTU)
96	聖帕	2,040
97	辛樂克	3,068
	薔蜜	**10,500**
98	莫拉克	4,972
99	凡那比	9,138
100	南瑪都	1,299
101	**蘇拉**	**12,000**
102	**蘇力**	**9,027**
102	**潭美**	**3,360**

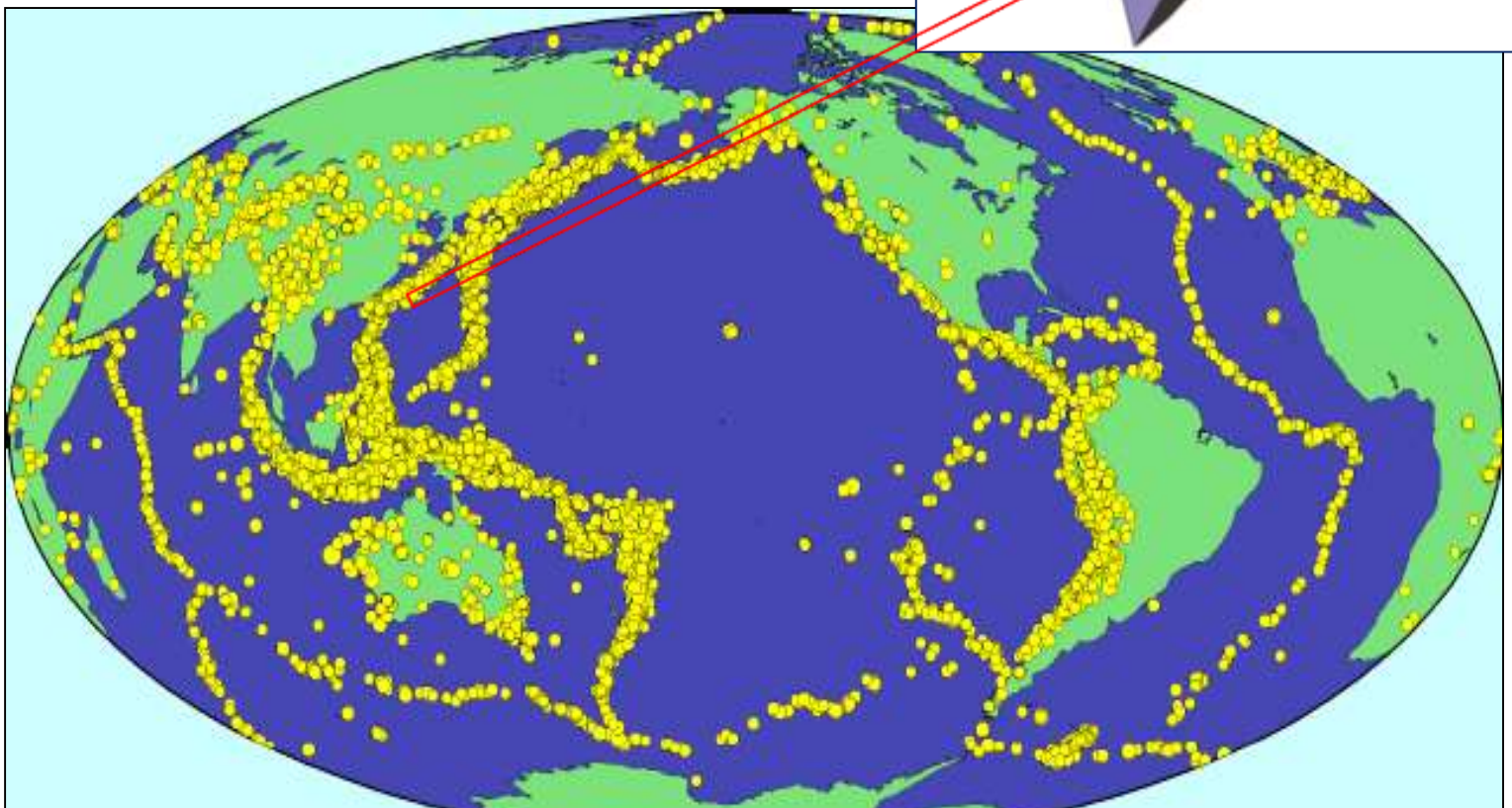
Flood

Drought

Earthquake

In 2010 and 2011, there were more than 20 earthquakes over magnitude of 7 all over the world. It's a brand new record which anticipates the active tectonics on earth.





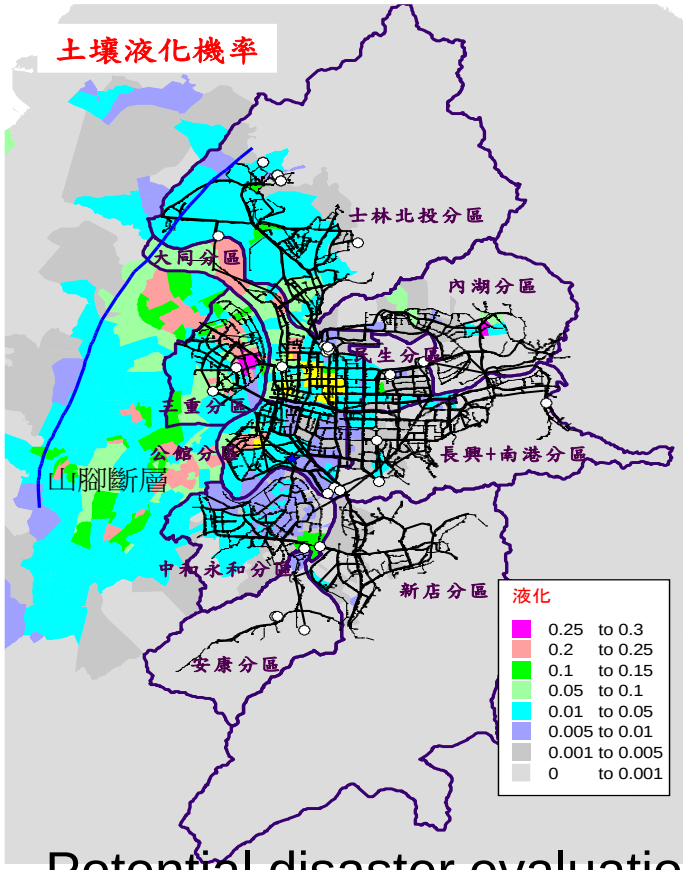
Earthquakes will damage water supply facilities

Chi-Chi earthquake in 1999, which damaged Shi-Keng Dam , Feng-Yuan Water purification plant and some transmission mains, caused a water outage for 2.2 million people.

溢洪道下游面受損情形

輸水隧道斷裂

Steel pipe damaged in Chi-Chi Earthquake



Potential disaster evaluation overlay mapping on water supply systems

Strategy – Five layers of protection

Invest $USD 1.4 billion from 2006 to 2025 to set up five protection layers.

Increasing efficiency of water resource.

Enhance water supply system .

Drought

Storm rain

Accident

Earthquake

Level 1

Decrease leakage under 10%

Level 2

Implement household water Conservation

Decrease 16% of using water

Level 3

Increase efficiency of water purification

Back-up rate to 50%

Level 4

Build back-up system for 11 supply zones

Dual system for water supply

Level 5

Establish emergency water supply system and take aseismic measure

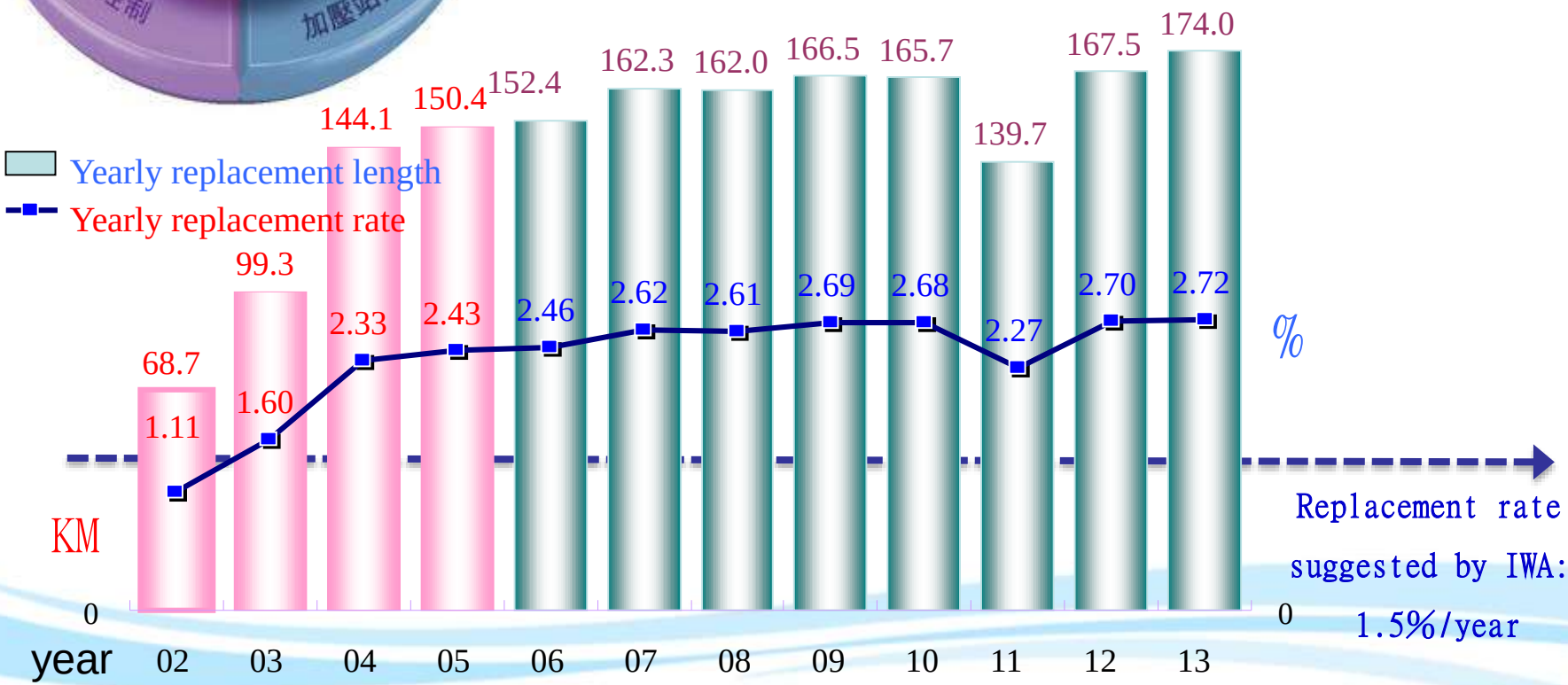
I. Reducing Leakage of Pipe Network

Long-term Network Management Plan(2006-2025)

1st stage（2006-2012） $USD 250 million

2nd stage（2012-2016） $USD 210 million

3rd & 4th stage（2016-2025） $USD 330 million

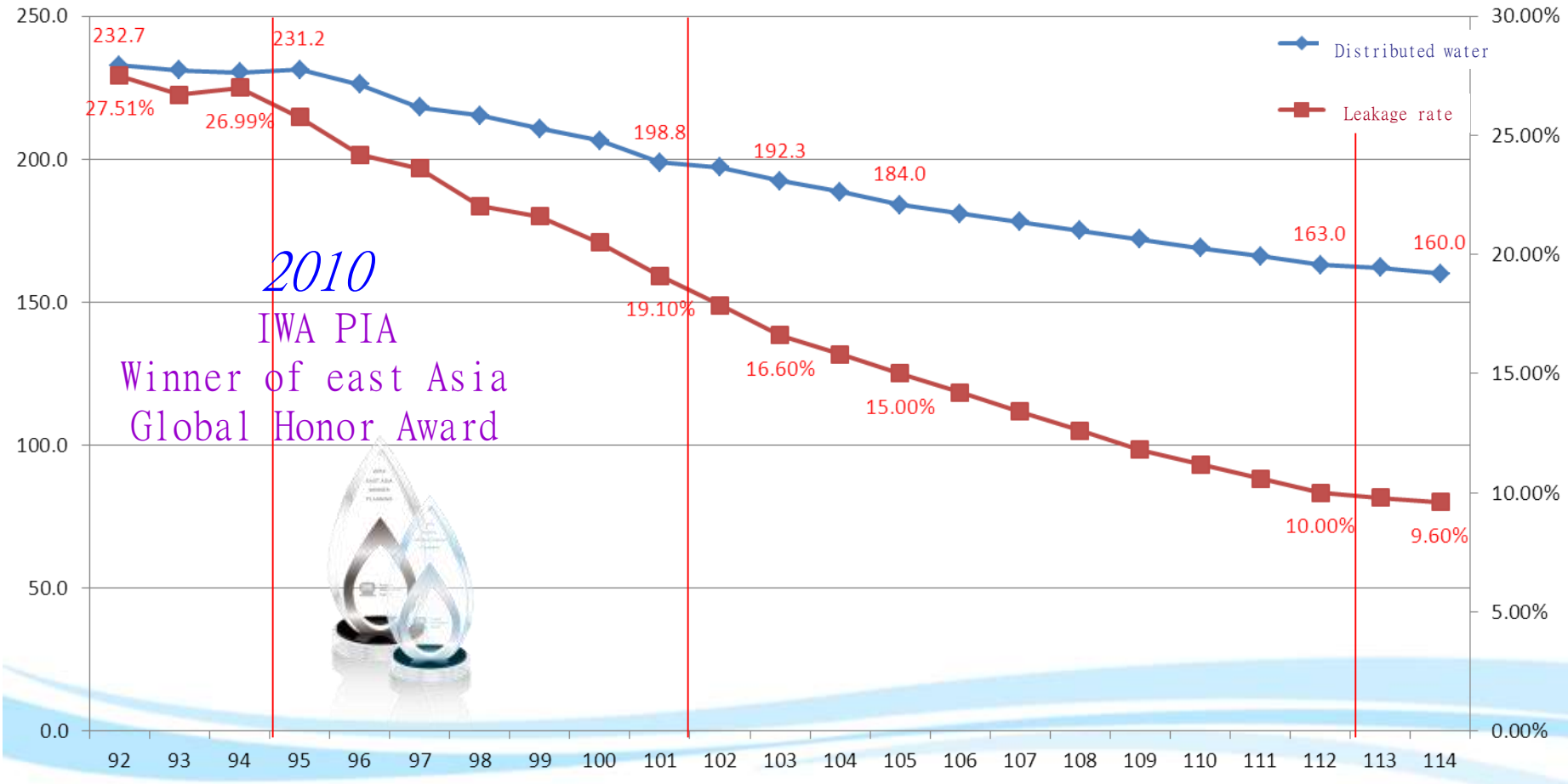


CONT'D

1st stage（2006-2012） decreasing 9.11% of leakage

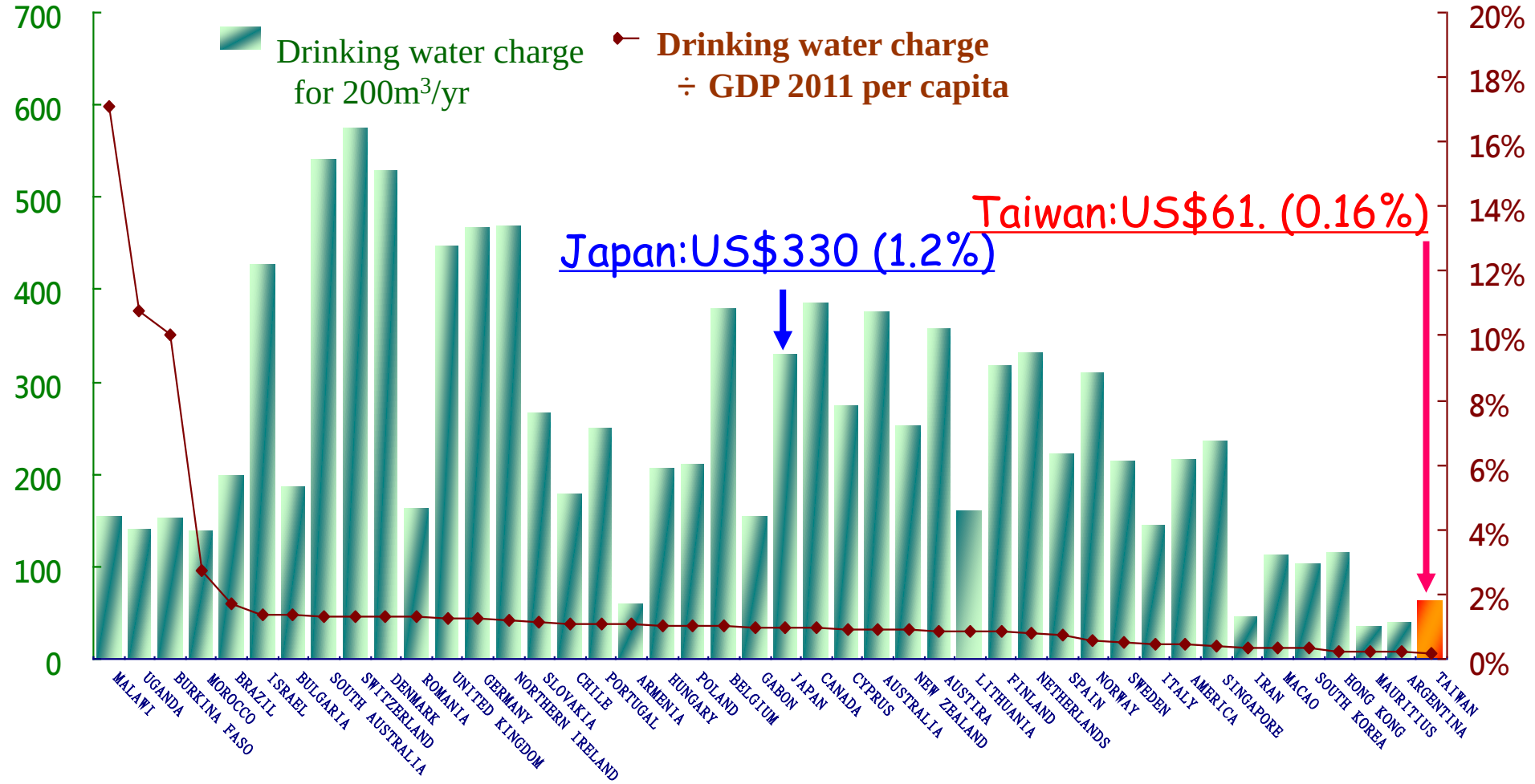
2nd stage（2012-2016） The leakage rate in 2014 is 16.6%

3rd & 4th stage（2016-2025）Goal: Reducing leakage to 10%



Water tariff

Unit : US.$

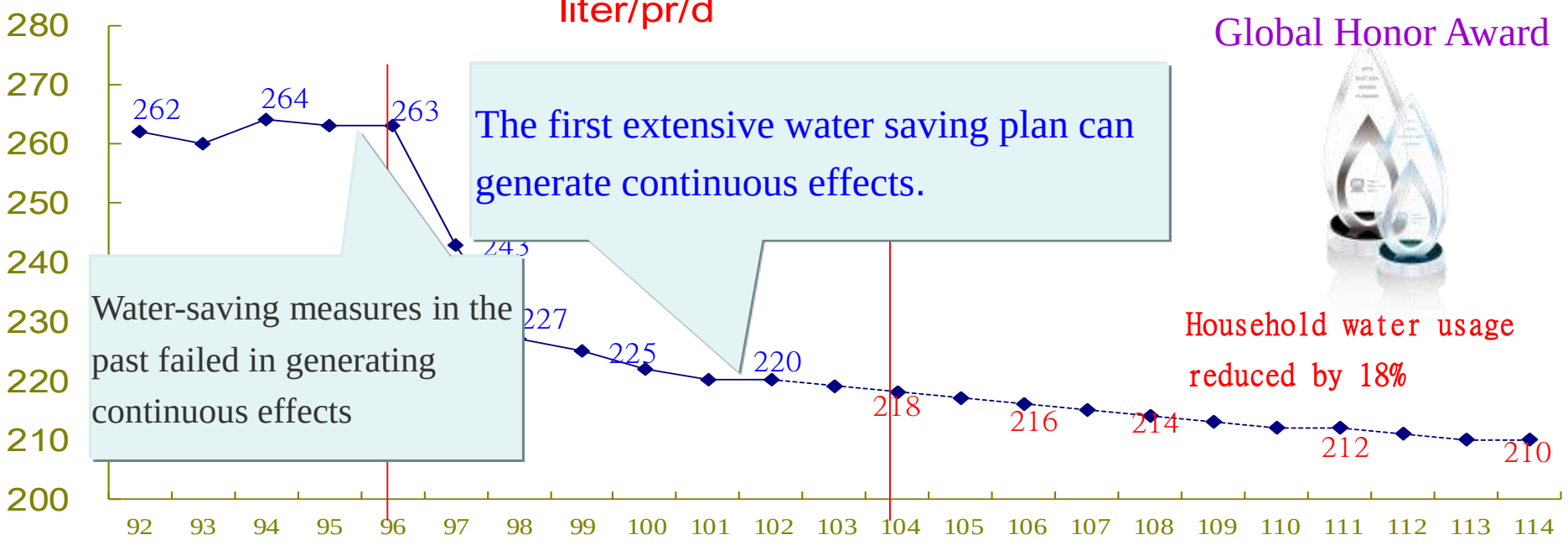


Source： 2012 IWA World Congress Busan.

II. Promoting Household Conservation

- Target：Household water usage reduced from 263 lpcd(2007) to 218 lpcd(2015) and to 210 lpcd (2025)
- Result：220 lpcd in 2013, and 218.5 lpcd in 2014

2012
IWA PIA
Winner of East Asia
Global Honor Award



Layer 3,4,5- Improving the supply system

concept illustration of Taipei water

1.Construct back-up raw water pipe.

2. Raise water purification capacity.

3. Strengthen backup pipes and booster stations in the network.

4.Establish city emergency water supporting system.

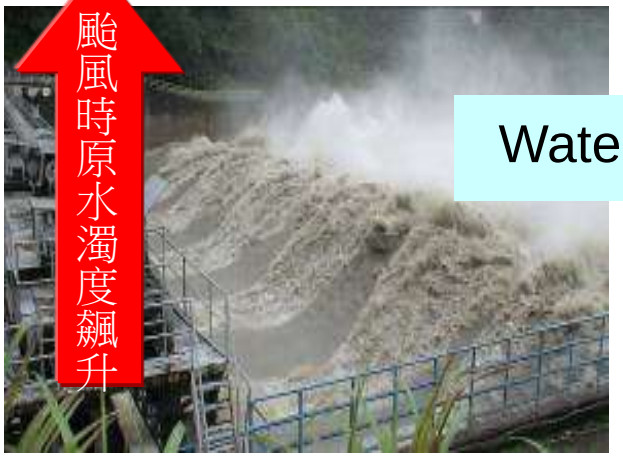
III. Improvement of Water Purification Efficiency

Invest $USD 131 million from 2008 to 2019

1.Able to deal with the sudden raising of raw water turbidity

2.Increase the water treatment back-up capacity

Against Storm rain



Water purification

13% → 34% → 40% ⇢ 56%

06 07 08 09 10 11 12 13 14 15 16 19

5th facility of Zhi-tan

6th facility of Zhi-tan

Improvement of Chang-xin

Improvement of Zhi-tan

Result

Increase of capacity of water purification equipment

Performance:
raw water → clean water
7,803NTU → 0.08NTU
in Typhoon Soulik in 2013 .

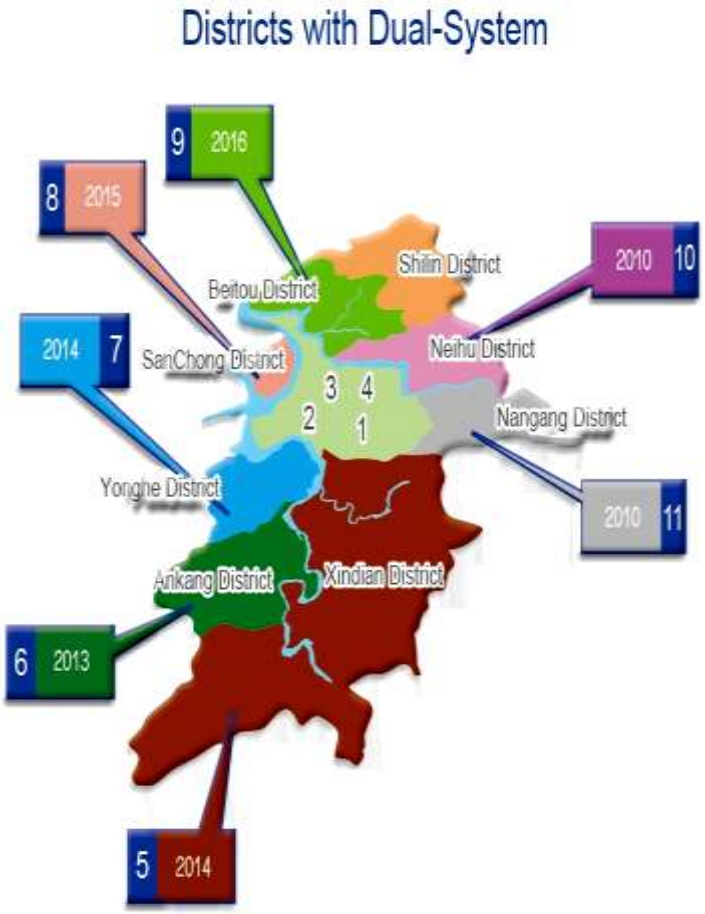
Average water consumed: 2.3 M CMD

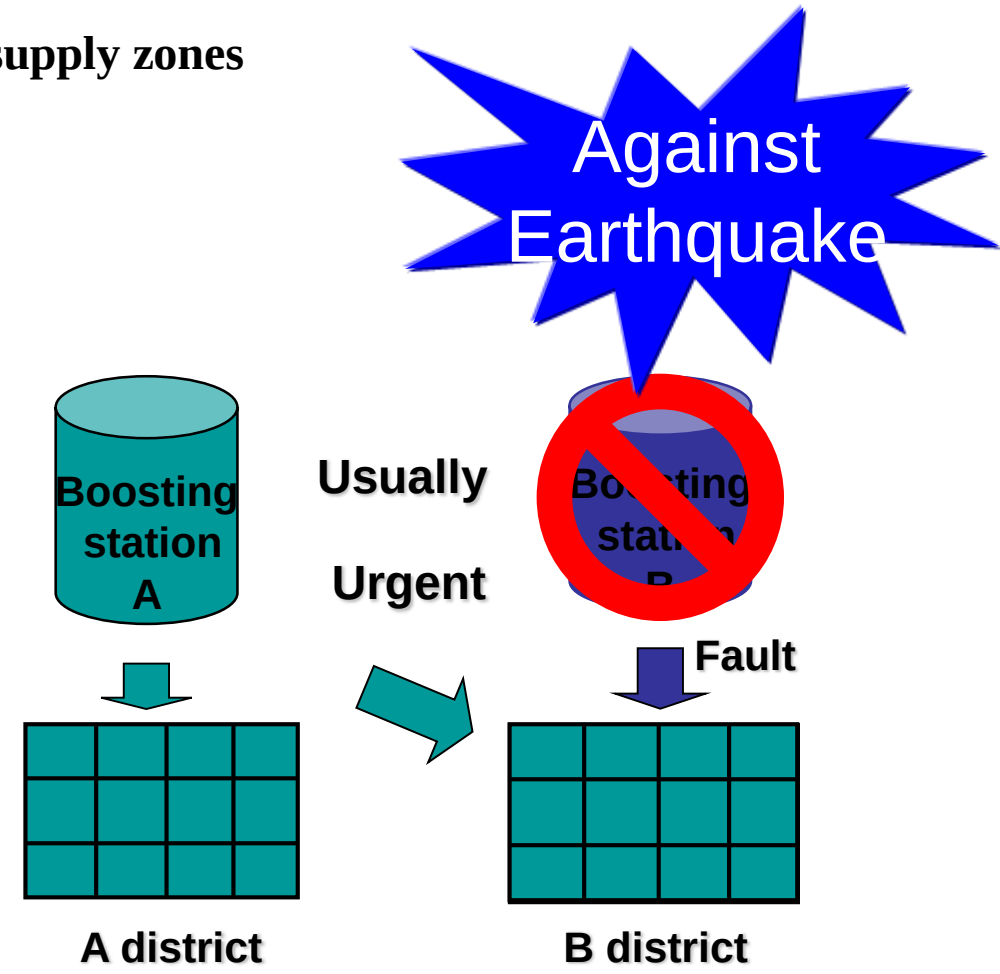
IV. Dual System for Each Water Supply Zone

Goal: **Dual supply system for 11 water supply zones**

Budget: **US$ 534million**

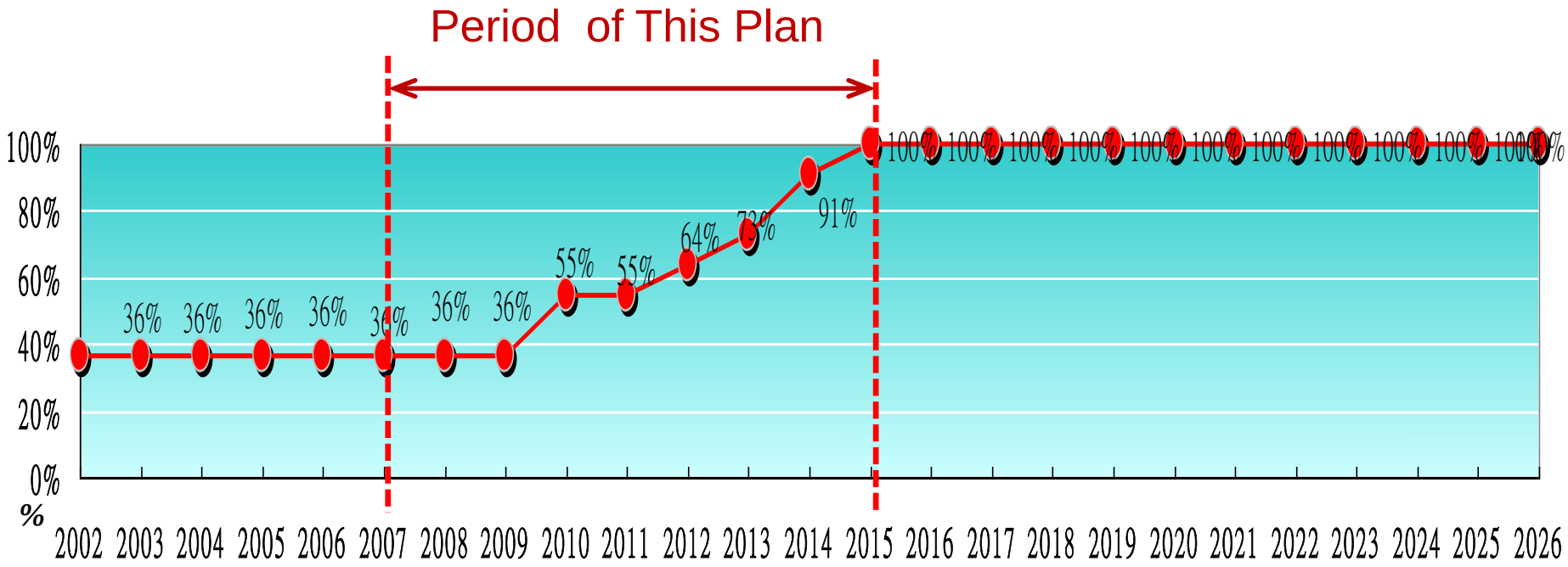
Period: **2007~ 2015**





Result

Dual System Accomplished in 11 Water Supply Zones



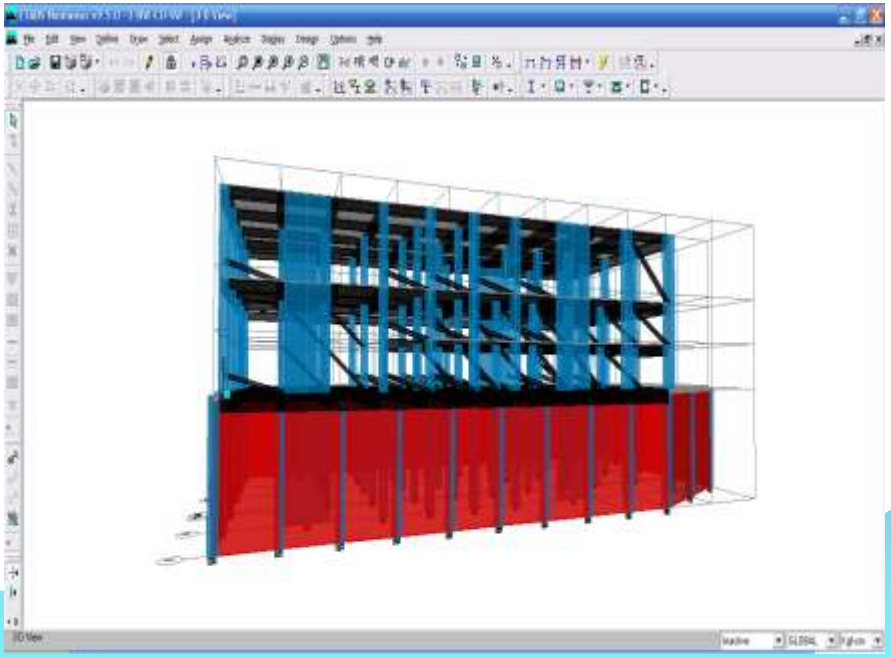
V. Establish Emergency Water Supply System and Take Aseismatic Measures

1. **increase seismic resistance ability of important structures**

Reason: **continue water supplying after earthquakes**

Budget: **US$ 1.02 million**

Period: **2007~ 2014**



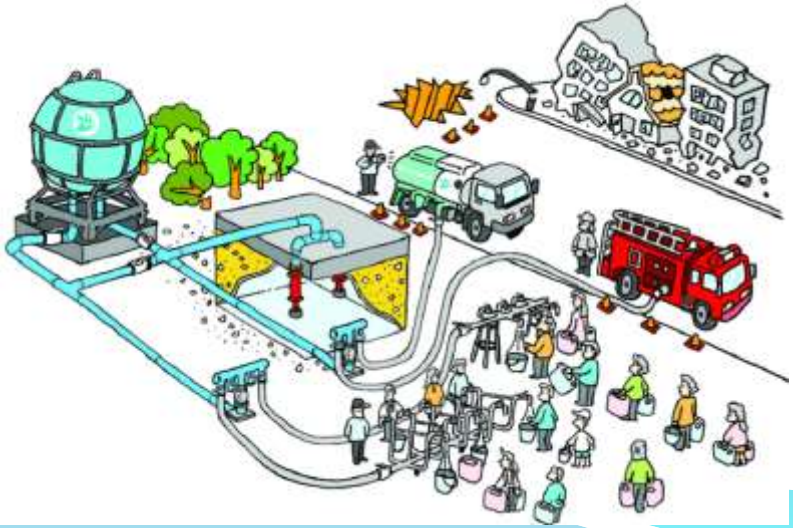
2. Establishing 46 Emergency Water Supporting Stations

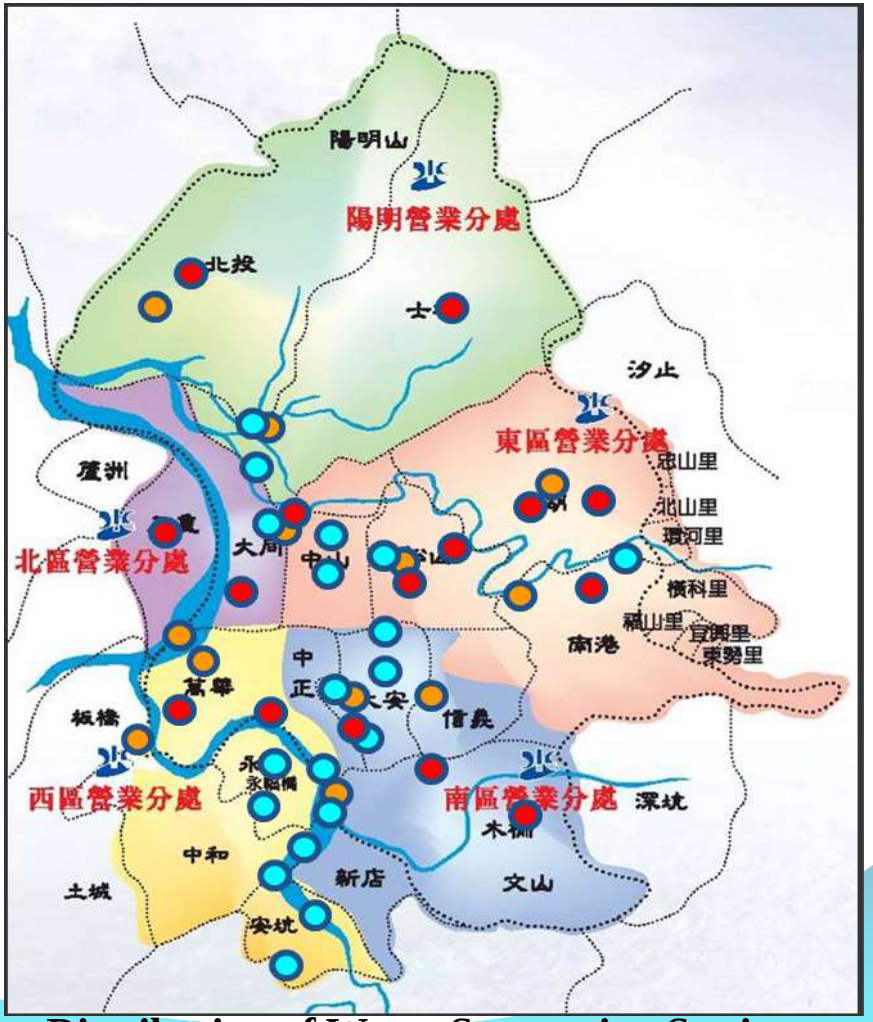
Goal: Provide each citizen 3 liter of life-supporting water daily for 28 days

Reason: To have enough time to repair the damaged facilities if needed.

Budget: **US$ 4.94 million**

Period: **2007~ 2013**





Distribution of Water Supporting Stations

2014 IWA PIA Winner of East Asia

Layer 3

Improvement of Water Purification Efficiency

Back-up rate to 56%

Layer 4

Dual System for Each Water Supply Zone

100% of dual system

Layer 5

Establish Emergency Water Supply System and Take Aseismatic Measures

46 Emergency Water Supporting stations

Conclusion

- Location on the seismic area and the world climate change that we can not avoid, But we can do our best to strengthen the water system and do well prepared to face the coming hazards.
- In response to the challenges, We help the people decrease the day water demand and improving the old facilities, establishing supporting and backup system. The infrastructure is not redundant, during the normal time, we support more water to the neighboring entity.
- Different environments face different disasters, we suggest focusing on the most critical threats and engaging in the proper solutions.

肆、結語

一.大台北供水的穩定有賴於，劃定水源特定區，確保了水質水量，各機關協力與居民合作，管制開發行為與減少污染，讓水庫與集水區能永續供水。(翡管局、水源特定區管理局、農委會林務局、新北市環保局、台北自來水處)

二.感謝市民配合自來水管線汰換與節約用水，一年節省水量1.5億噸，幾乎0.4座翡翠水庫的蓄水量，以能調適少雨旱象，並充分支援板新與桃園地區用水。

三.防災重於救災 離災優於防災

Thank You for Your Attention

Taipei Water Department