The Plan of Taipei Water to Battle against Natural Hazards

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Commissioner of Taipei Water Department
## About Taipei Water Department

### The profile of TWD

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>434 km²</td>
</tr>
<tr>
<td>Population</td>
<td>3.94 million</td>
</tr>
<tr>
<td>Percentage of population served</td>
<td>99.6%</td>
</tr>
<tr>
<td>Household</td>
<td>1.64 million Households</td>
</tr>
<tr>
<td>Water treatment capacity</td>
<td>3.7 million CMD</td>
</tr>
<tr>
<td>Water mains</td>
<td>3,920 km</td>
</tr>
<tr>
<td>Service pipe</td>
<td>2,539 km</td>
</tr>
<tr>
<td>Distribution basin</td>
<td>123 Capacity 418 thousand tons</td>
</tr>
<tr>
<td>Booster station</td>
<td>60</td>
</tr>
</tbody>
</table>

TWD: Taipei Water Department

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*Image: Map of Taipei showing pipeline network, water supply area, and 11 supply partitions.*
The temperature of ocean surface is increasing rapidly.
Extreme climatic events become more serious.

Heavy rainfall events cause high turbidity.

Frequency of severe rainfall is increasing.

<table>
<thead>
<tr>
<th>年</th>
<th>Typhoon</th>
<th>Turbidity (NTU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>96</td>
<td>聖帕</td>
<td>2,040</td>
</tr>
<tr>
<td>97</td>
<td>辛樂克</td>
<td>3,068</td>
</tr>
<tr>
<td></td>
<td>蕃蜜</td>
<td>10,500</td>
</tr>
<tr>
<td>98</td>
<td>莫拉克</td>
<td>4,972</td>
</tr>
<tr>
<td>99</td>
<td>凡那比</td>
<td>9,138</td>
</tr>
<tr>
<td>100</td>
<td>南瑪都</td>
<td>1,299</td>
</tr>
<tr>
<td>101</td>
<td>蘇拉</td>
<td>12,000</td>
</tr>
<tr>
<td>102</td>
<td>蘇力</td>
<td>9,027</td>
</tr>
<tr>
<td>102</td>
<td>潭美</td>
<td>3,360</td>
</tr>
</tbody>
</table>

Events of rainfall excess 100mm/hr
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.

Steel pipe damaged in Chi-Chi Earthquake
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.

Level 1
Decrease leakage under 10%
Implement household water Conservation
Decrease 16% of using water

Level 2
Drought
Back-up rate to 50%

Level 3
Increase efficiency of water purification
Build back-up system for 11 supply zones
Dual system for water supply

Level 4
Earthquake
Accident
Storm rain

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
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%

2010
IWA PIA
Winner of east Asia Global Honor Award
Water tariff

Unit: US$

Drinking water charge for 200m³/yr

Drinking water charge \( \div \) GDP 2011 per capita

Japan: US$330 (1.2%)

Taiwan: US$61. (0.16%)

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

*The first extensive water saving plan can generate continuous effects.*

Water-saving measures in the past failed in generating continuous effects.

Household water usage reduced by 18%
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 $\rightarrow$ clean water
7,803 NTU $\rightarrow$ 0.08 NTU in Typhoon Soulik in 2013.

Period of This Plan

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$ 534 million

**Period:** 2007~ 2015

Against Earthquake
Result

Dual System Accomplished in 11 Water Supply Zones

Period of This Plan

%
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
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