

**Water for All  
Conserve, Value, Enjoy**  
*PUB*

**IETF - WATER INDIA 2011  
Integrated Water Resource Management  
- Singapore Experience**

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Mr Tan Thai Pin, Director (Water Supply Plant)  
PUB, Singapore

**Country  
Information**

Land Area	710 km <sup>2</sup>
Population	5 mil
Average Annual Rainfall	2,400 mm
Average Water Demand	1.6 mil m <sup>3</sup> /day

**PUB : Part of Singapore's MEWR Family**

**Ministry of the Environment  
and Water Resources**

*To deliver and sustain a clean and healthy environment and water resources for all in Singapore.*

**National  
Environment  
Agency**

*To ensure a sustainable quality environment in Singapore*

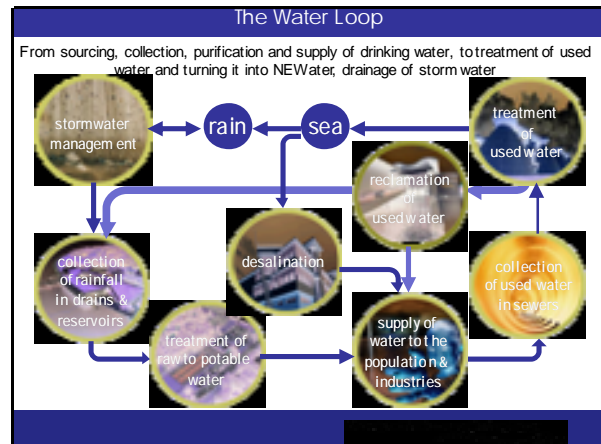
- ✓ Clean Land
- ✓ Clean Air
- ✓ Public Health

**PUB**  
*Water for All. Conserve, Value, Enjoy*

*To ensure an efficient, adequate and sustainable supply of water*

- ✓ Water Supply
- ✓ Used Water
- ✓ Drainage

Background of PUB



## Ensuring Water Sustainability for Singapore

4 National Taps



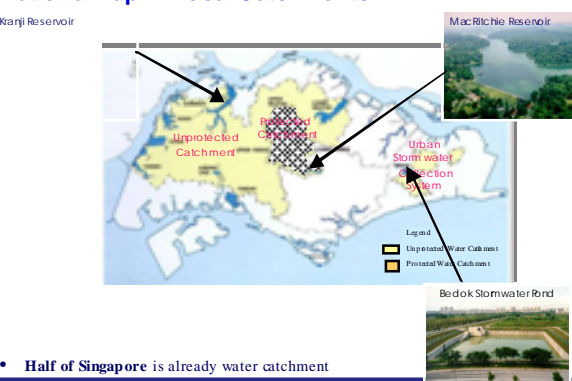
Local catchment  
Imported water  
NE Water  
Desalinated water  
"Water for All"

3P Approach



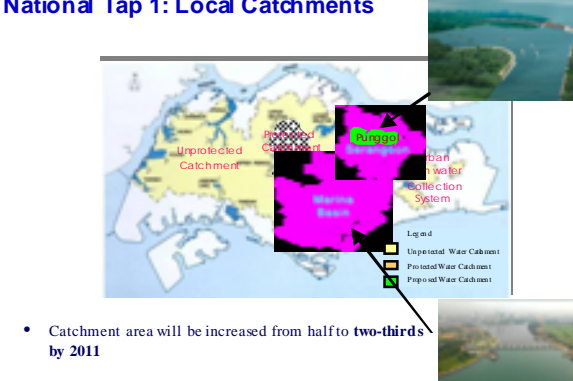
"Conserve Water"  
"Value Our Water"  
"Enjoy Our Waters"  
"Conserve, Value, Enjoy"

## National Tap 1: Local Catchments



- **Half of Singapore** is already water catchment

## National Tap 1: Local Catchments




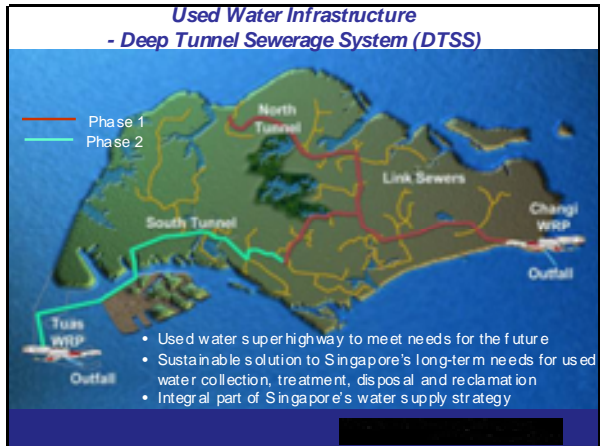
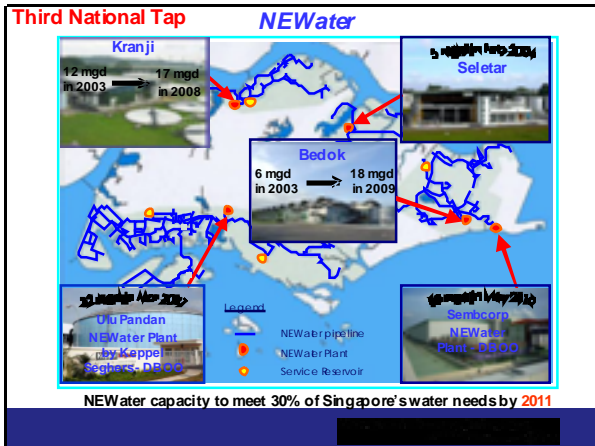
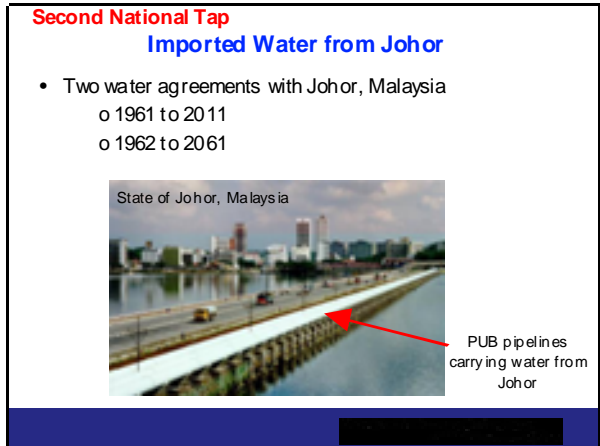
- Catchment area will be increased from half to **two-thirds** by 2011

## Local Catchments: Marina Barrage

*Creating a reservoir in the city*


- Urban catchment - 1/6 of Singapore
- 3-in-1 function: water storage, flood control, lifestyle attraction
- Officially opened by the Prime Minister on 31<sup>st</sup> Oct 08
- > One million visitors to date






## Deep Tunnel Sewerage System (DTSS)


**DEEP TUNNEL**



Completed in Feb 2005



DTSS (\$3.6 billion: 2000 to 2008)



Changi NEWater Plant - Completed in 2010

Completed in 2008

## Opening of Changi Water Reclamation Plant

- § Officially opened by PM on 23 Jun 09
- § Centralised reclamation of Used Water from eastern half of Singapore
- § Treated Used Water at Changi WRP is a vital feedstock for large scale production of NEWater






Key Achievements



CHANGI WATER RECLAIMATION PLANT Opening Ceremony


## Fourth National Tap

### Desalinated Water



Desalination Plant








- ⊘ Officially opened by PM Lee on 13 Sep 2005
- ⊘ 136,000 m<sup>3</sup> per day
- ⊘ 20 year DBOO plant by Sing Spring Pte Ltd, a Hyflux subsidiary

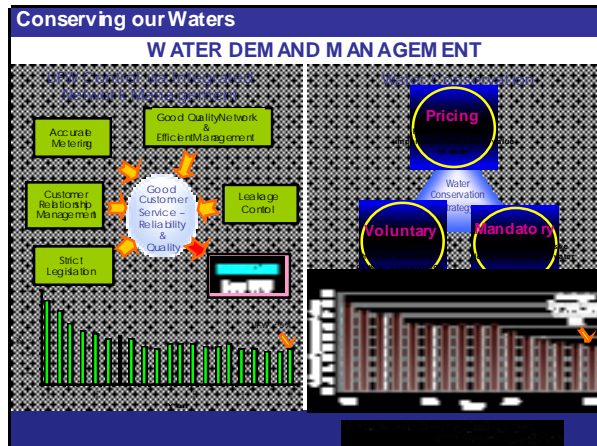
## Ensuring Water Sustainability for Singapore

### 3P Approach

- "Conserve Water"
- "Value Our Water"
- "Enjoy Our Water"

"Conserve Value Enjoy"



### Conserve: Pricing

- Volume-based billing
- Regulated by Ministry (Environment & Water Resources)

Tariff category	Consumption block (m <sup>3</sup> per month)	Potable Water			Used Water	
		Tariff (¢/m <sup>3</sup> )	WCT <sup>1</sup> (%)	Total (¢/m <sup>3</sup> )	WBF <sup>2</sup> (¢/m <sup>3</sup> )	SAF <sup>3</sup> (¢/appliance)
Domestic	1 to 40	117	30	152	30	300
	Above 40	140	45	203	30	300
Non-domestic	All units	117	30	152	60	300

- Water Conservation Tax – Tax on consumption to reinforce the water conservation message
- Waterborne Fee – Volume-based used water fee
- Sanitary Appliance Fee – Fixed used water fee based on the number of sanitary appliances

### ABC Waters Programme

Launched in 2006, ABC Waters Programme is about:

- A. ACTIVE  
New recreational spaces
- B. BEAUTIFUL  
Integration of waters with urban landscape
- C. CLEAN  
Improved water quality  
Cultivating environmental responsibility among people

**“... Turn Singapore into a city of gardens and water”**  
 Prime Minister Lee Hsien Loong,  
 At ABC Waters Public Exhibition Opening  
 (Feb 07)

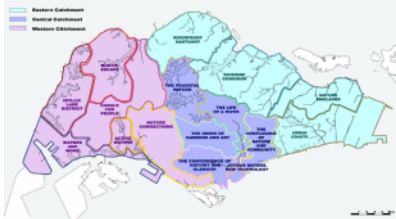
### The Blue Map of Singapore

- 17 reservoirs
- 32 major rivers
- 7,000+km of waterways



### The ABC Waters Master Plan

- ABC Waters Masterplan was developed and published in early 2008
  - 28 key projects identified for implementation over 5 years
  - Over 100 sites to be implemented by FY2030
- Takes a holistic view of urban planning and the management of water



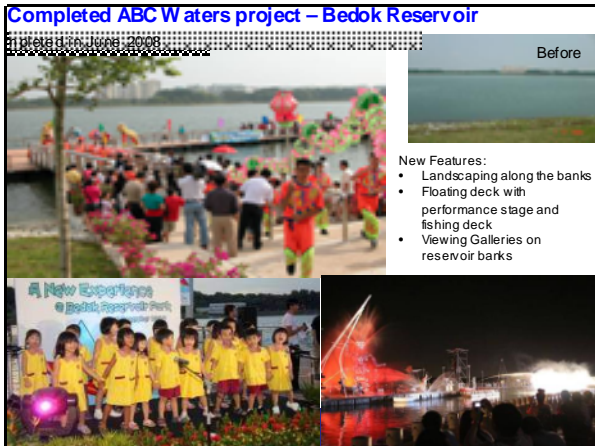
ABC Waters Masterplan can be viewed and downloaded from the following website: [www.pub.gov.sg/abcwaters/index.html](http://www.pub.gov.sg/abcwaters/index.html)

ABC Waters Masterplan included a floating platform for performance and educational interactive water features. Completed in April 2008.



### Completed ABC Waters project – Bedok Reservoir

Completed in June 2008



**Before**

**New Features:**

- Landscaping along the banks
- Floating deck with performance stage and fishing deck
- Viewing Galleries on reservoir banks

### Completed ABC Waters project – Lower Seletar Reservoir – Family Bay

Completed in May 2008



**Multi-purpose stage & Heritage Bridge**

Completed ABC Waters project – Lower Seletar Reservoir – Family Bay  
Night Scene



Ongoing Project - Sengkang Floating Island

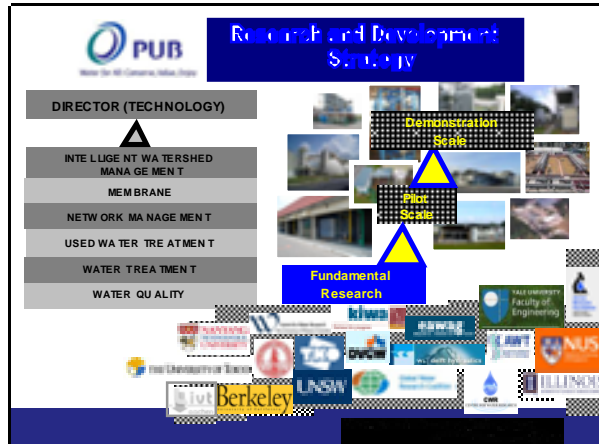


Ongoing Project- Kallang River @ Bishan Park



Ongoing Project – MacRitchie Reservoir Phase 2





### Investment in R&D – 200 projects at \$110 m

#### Membrane Bioreactor

Test bed of various membranes to lower cost and improve water quality

#### Variable Salinity Plant

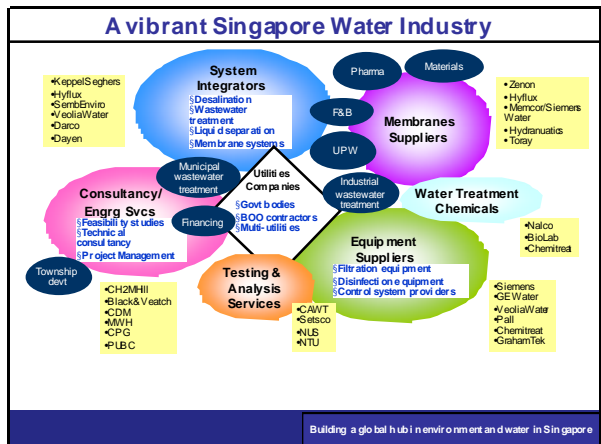
2-in-1 plant capable of treating both freshwater and seawater

#### Membrane Distillation

Combination of existing membrane & conventional distillation technologies

#### 16-in Reverse Osmosis Membranes

First plant in world of 16-in RO membranes for water reclamation





## Growing the Water Sector

- National Research Foundation set aside S\$330m over five years to grow the water industry
- 2015 Targets:
  - Increase value-add from S\$0.5bn to S\$1.7bn
  - Double number of jobs to 11,000
- Agencies
  - Funding:
  - Key Agencies:
    - Ministry of the Environment and Water Resources
    - PUB, the national water agency
    - Economic Development Board
    - National University of Singapore
    - Nanyang Technological University

## Three Strategic Thrusts

Cluster Development	Technology Development	Internationalisation
<ol style="list-style-type: none"> <li>1. Attract &amp; anchor major international companies</li> <li>2. Groom local companies to become world-class "champions"</li> <li>3. Proliferate start-up companies in EWT</li> </ol>	<ul style="list-style-type: none"> <li>Environment &amp; Water Research Programme</li> <li>Strengthen international R&amp;D linkages</li> <li>Singapore as a global test-bed</li> <li>Encourage early adoption of new technology</li> <li>Bring new technologies to the market</li> <li>Groom talent and manpower</li> </ul>	<ol style="list-style-type: none"> <li>1. Government-led export initiatives           <ul style="list-style-type: none"> <li>Government-to-government efforts</li> <li>Trade missions &amp; international conferences</li> </ul> </li> <li>2. Market and brand Singapore's water industry           <ul style="list-style-type: none"> <li>Engage international organisations</li> <li>Singapore International Water Week</li> </ul> </li> </ol>

*Technology as the Key Pillar*

**Singapore International Water Week** 4 - 8 July 2011

*Sustainable Water Solutions for a Changing Urban Environment*

- The global platform for water solutions
  - Brings together policymakers, industry leaders, experts and practitioners
  - Address challenges, showcase technologies, discover opportunities & celebrate achievements
- Key highlights include Lee Kuan Yew Water Prize, Water Leaders Summit (by invitation only), Water Convention, Water Expo & Business Forums

Year	No. of attendees	No. of countries participated	Value of deals, tenders & investments announced	No. of co-located events	No. of participating companies in Water Expo
2008	8,500	79	S\$3.80m	42	350
2009	10,000	82	S\$2.2b	76	420
2010	14,000	112	S\$2.8b	120	514

**India Business Forum 2011**

Contribution of India Industry Since 1988

**Theme: Sustainable Water Investments in India**

- One of the most popular business forums during past 3 SIWW
- India Business Forum 2011 will focus on policies, strategies & incentives that serve to sustain favourable & long-term water project partnership between India & Singapore
- The forum will offer enriching insights from public and private industry players as well as potential development projects, trends and policies

**Some of the Honourable Ministers & Senior Government Officials who had attended SIWW s**

• SIWW 2008

HE **Shri Ranjeet Kamble**, Minister for State for Water Supply & Sanitation Dept., MJP

Dr. **M Ramachandran**, Secretary, Ministry of Urban Development, Government of India

Mr. **A K Jain**, Principal Secretary, Water Supply & Sanitation Dept., MJP

• SIWW 2009

HE Gen (Ret'd) **JJ Singh**, Governor of Arunachal Pradesh

HE **Mr Lal Thanawla**, Chief Minister of Mizoram

HE **Mr Mahipal Maderna**, Minister for Water Resources & PHED, Government of Rajasthan

Mr. **Ram Lubhaya**, Principal Secretary, Water Resources & PHED, Government of Rajasthan

• SIWW 2010

His Excellency **Shri Vincent H Pala**, Minister of State for Water Resources, Government of India

His Excellency **Professor L K D hoble**, Minister for Water Supply & Sanitation, Government of Maharashtra

Mr. **Umesh Narayan Panjjar**, Union Secretary, Ministry of Water Resources, Government of India



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