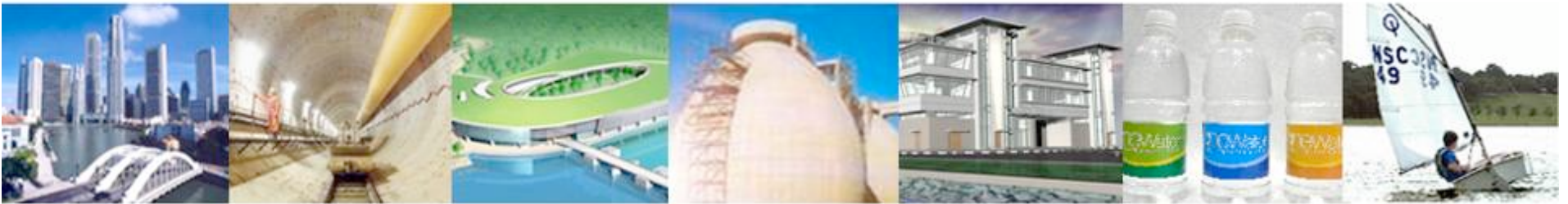


Water for All  
Conserve, Value, Enjoy

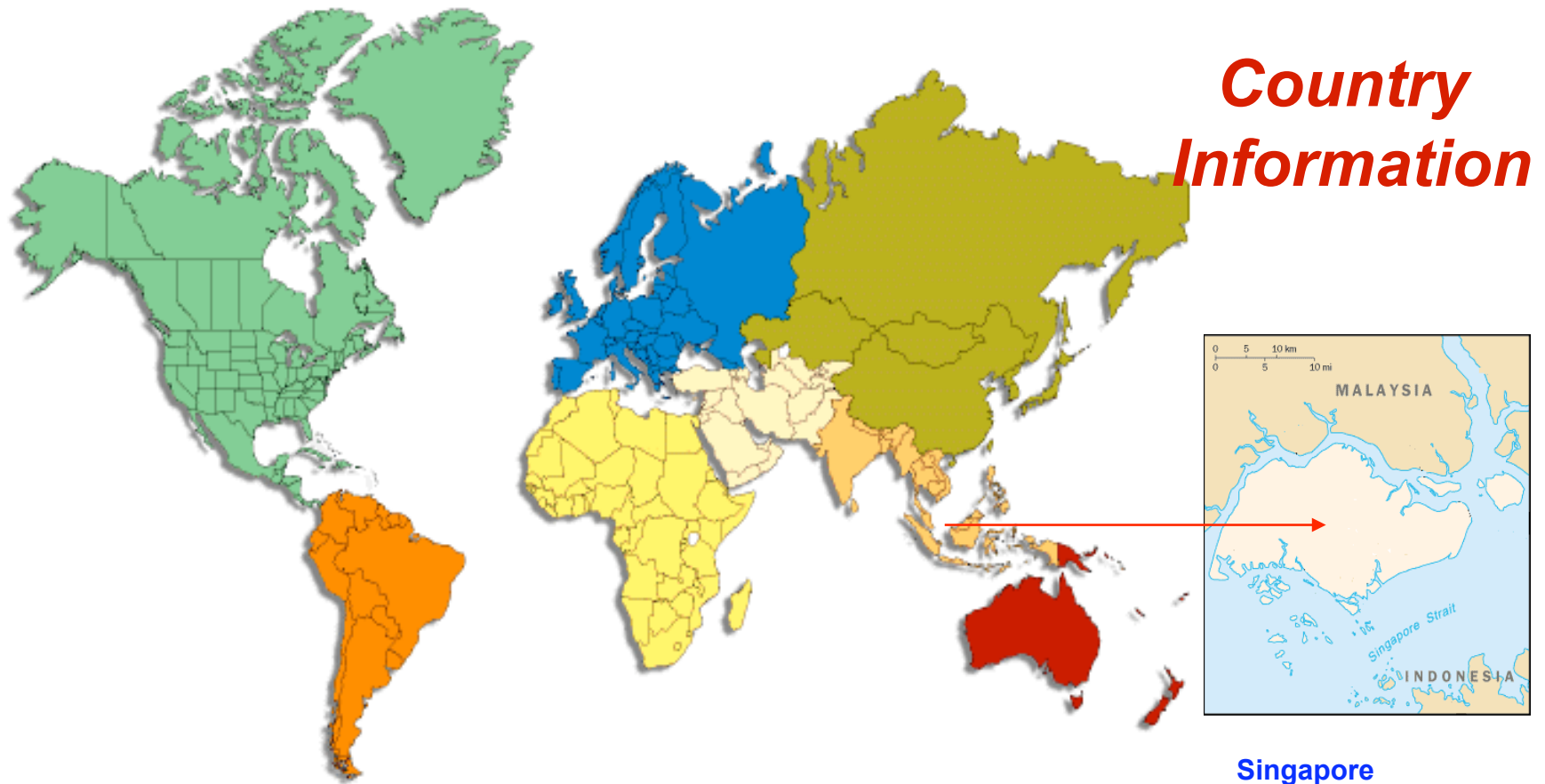


## Water Demand Management -Singapore's Experience

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**Chua Chor Pheng, Deputy Director  
Water Supply Network Department PUB**

A vertical blue line is positioned on the left side of the slide, below the speaker's name.

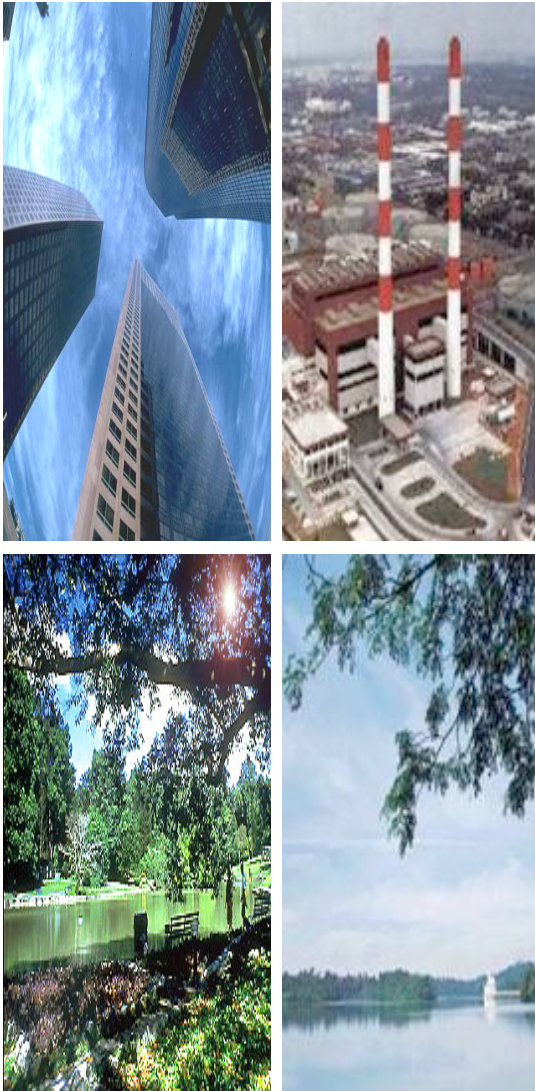


## ***Country Information***

### Singapore

<b>Land Area</b>	<b>704 km<sup>2</sup></b>
<b>Population</b>	<b>4.85 mil</b>
<b>Average Annual Rainfall</b>	<b>2,400 mm</b>
<b>Average Water Demand</b>	<b>1.3 mil m<sup>3</sup>/day</b>

# OVERVIEW



Ministry of the Environment  
and Water Resources

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



***“To ensure a sustainable quality environment in Singapore”***

- ❖ Clean Land
- ❖ Clean Air
- ❖ Public Health



*Water for All: Conserve, Value, Enjoy*

***“To ensure an efficient, adequate & sustainable supply of water”***

- ❖ Clean Water

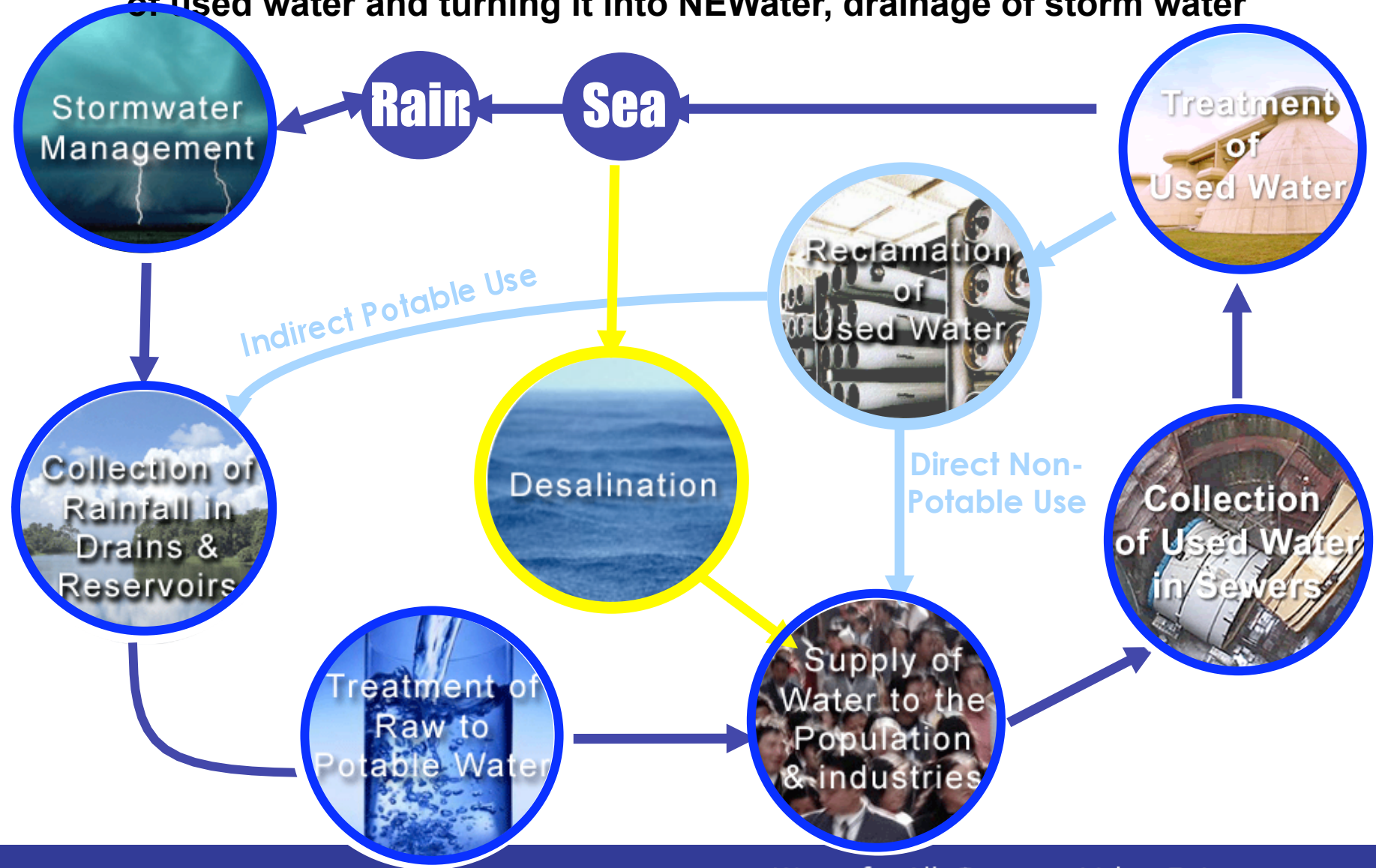
A STATUTORY BOARD CONSTITUTED UNDER THE  
PUBLIC UTILITIES ACT 2001 TO PROVIDE  
INTEGRATED WATER SUPPLY, SEWERAGE AND  
DRAINAGE SERVICES

Water for All: Conserve, Value, Enjoy



## ***PUB Manages the Complete Water Cycle***

**From sourcing, collection, purification and supply of drinking water, to treatment of used water and turning it into NEWater, drainage of storm water**

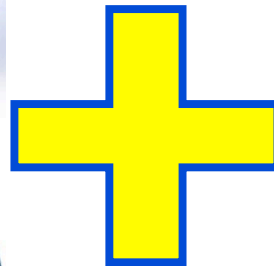
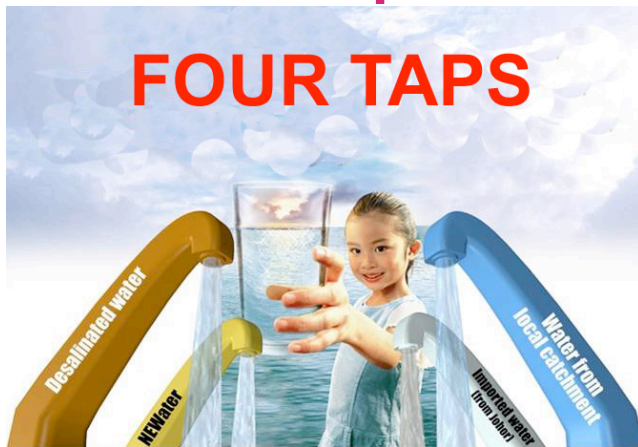


Water for All: Conserve, Value, Enjoy



# Integrated Water Resource Management

## 4 Taps



## 3P Approach



Local catchment

Imported water

NEWater

Desalinated water

**“Water for All”**

**“Conserve Water”**

**“Value Our Water”**

**“Enjoy Our Waters”**

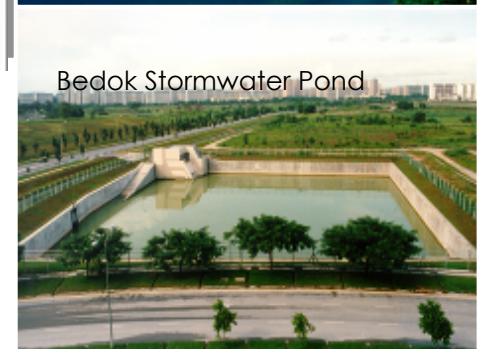
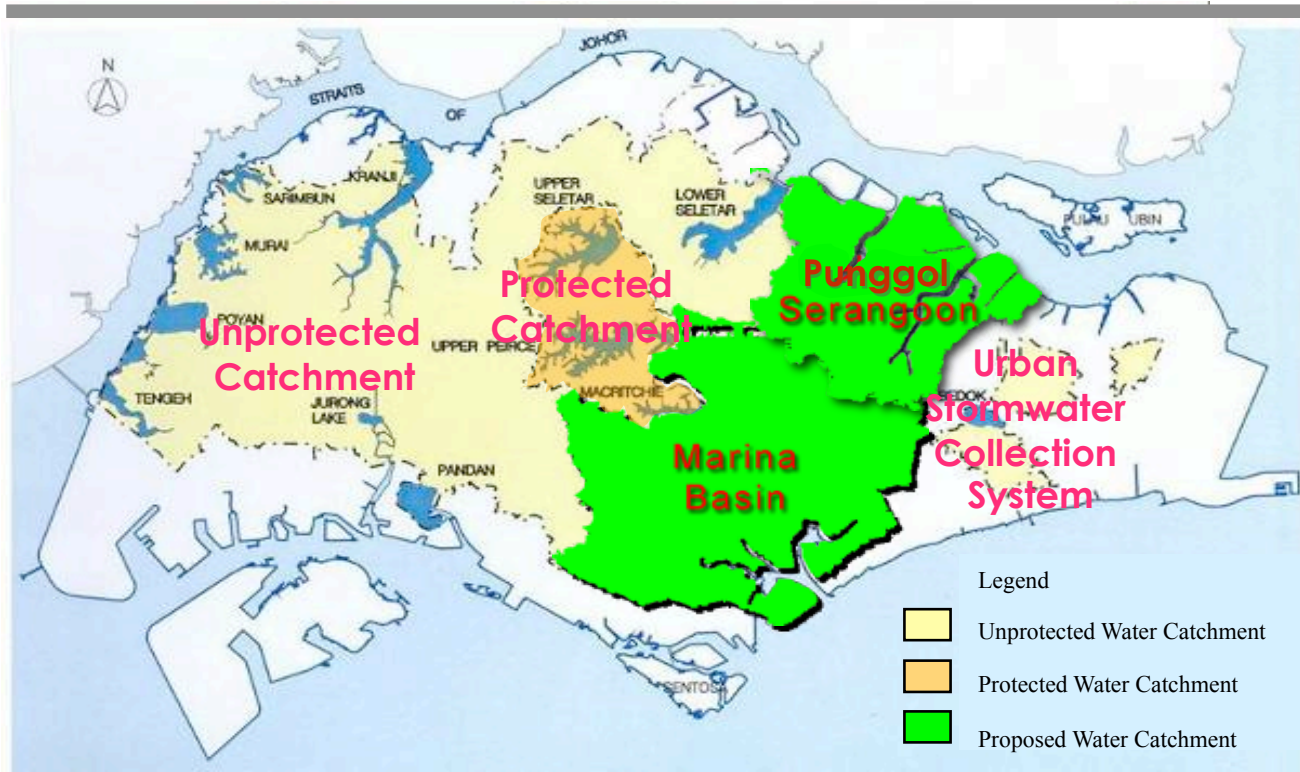
**“Conserve, Value, Enjoy”**

Water for All: Conserve, Value, Enjoy



## First Tap

# Local Catchments Waters



- **Half of Singapore** is already water catchment
- Catchment area will be increased from half to **two-thirds by 2011**



# Local Catchments: Marina Barrage

## *Creating a reservoir in the city*

- URBAN CATCHMENT COMPRISING A SEVENTH OF SINGAPORE
- LOCATED AT THE EDGE OF THE CENTRAL BUSINESS DISTRICT
- 3-IN-1 FUNCTION: WATER STORAGE, FLOOD CONTROL, LIFESTYLE ATTRACTION
- OFFICIALLY OPENED BY THE PRIME MINISTER ON 31<sup>ST</sup> OCT 08





## Expanding the First Tap

# Punggol – Serangoon Reservoir Scheme



*The 16<sup>th</sup> and 17<sup>th</sup>  
reservoirs of Singapore*





## Second Tap

# Imported Water from Johor

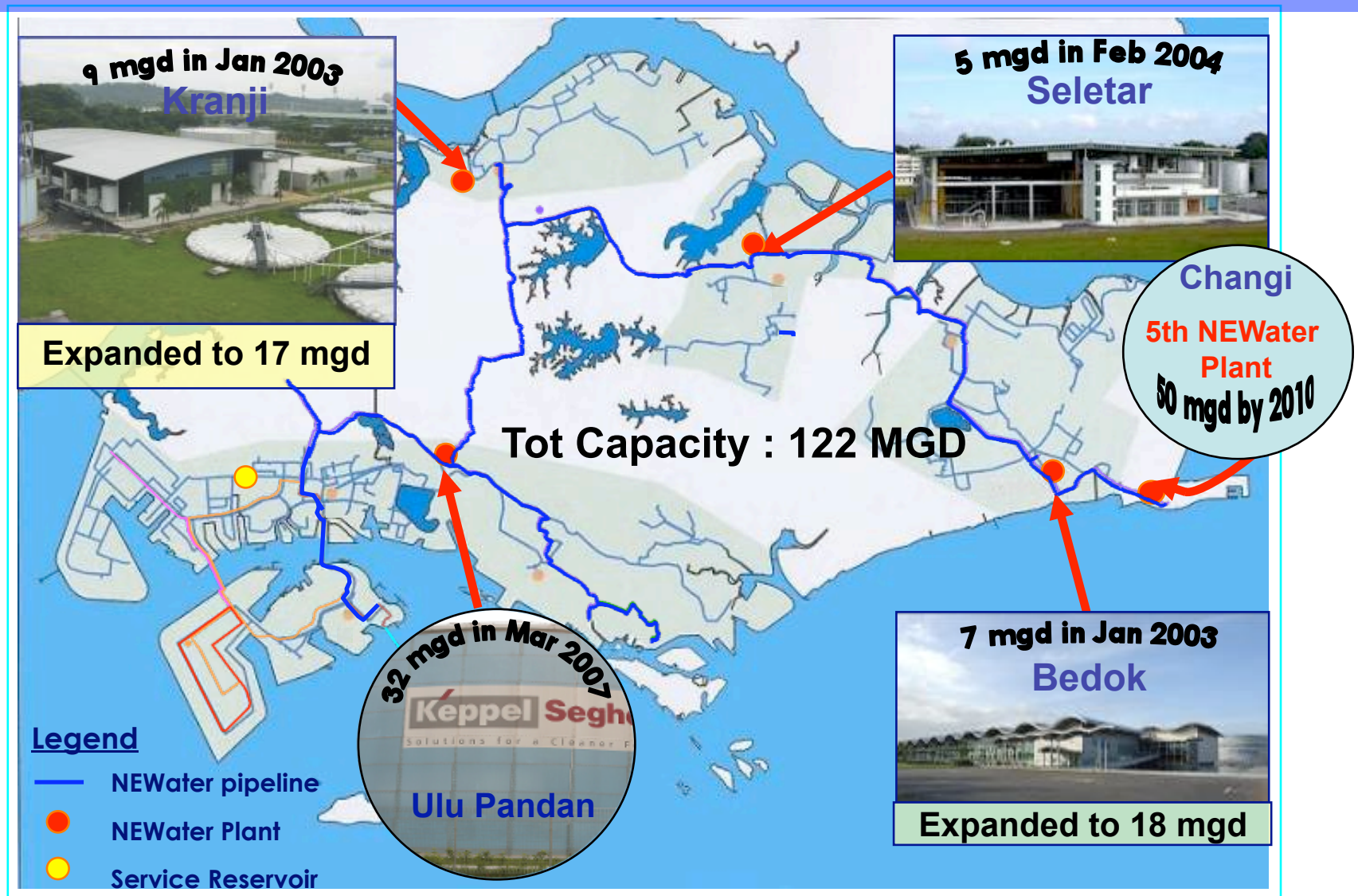
- **Two water agreements with Johor, Malaysia**

0 1961 TO 2011

0 1962 TO 2061

## Third Tap

# NEWater



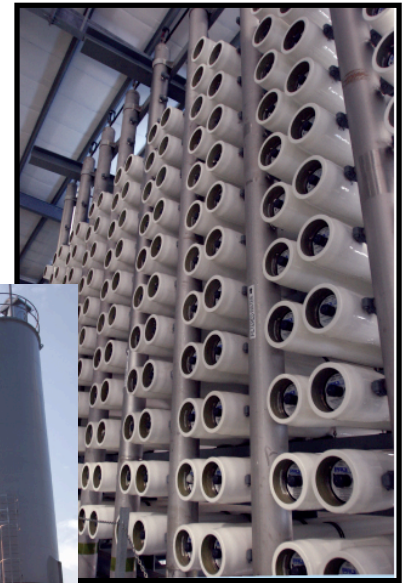
Water for All: Conserve, Value, Enjoy



## Fourth Tap

### Desalinated Water

- To augment and diversify our water resources
- SingSpring Pte. Ltd., under a 20 year DBOO arrangement with PUB
- One of the largest seawater RO plants
- Supply of 30 mgd for 20 years
- Opened on 13 Sep 05

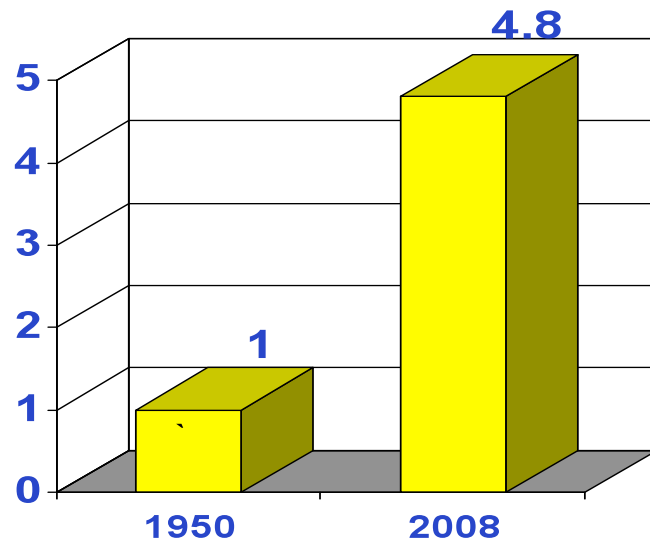


# Water Demand Management



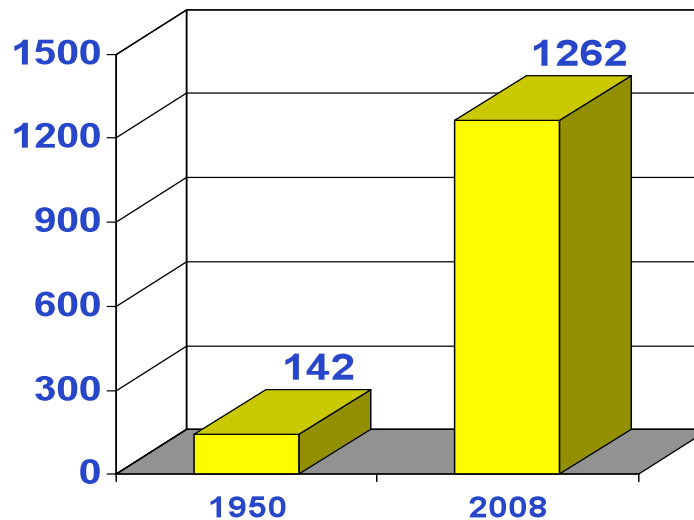
# Increasing Water Demand

Population  
( in millions )



**4.8 Times**

Daily water consumption  
( in thousand cubic metres )

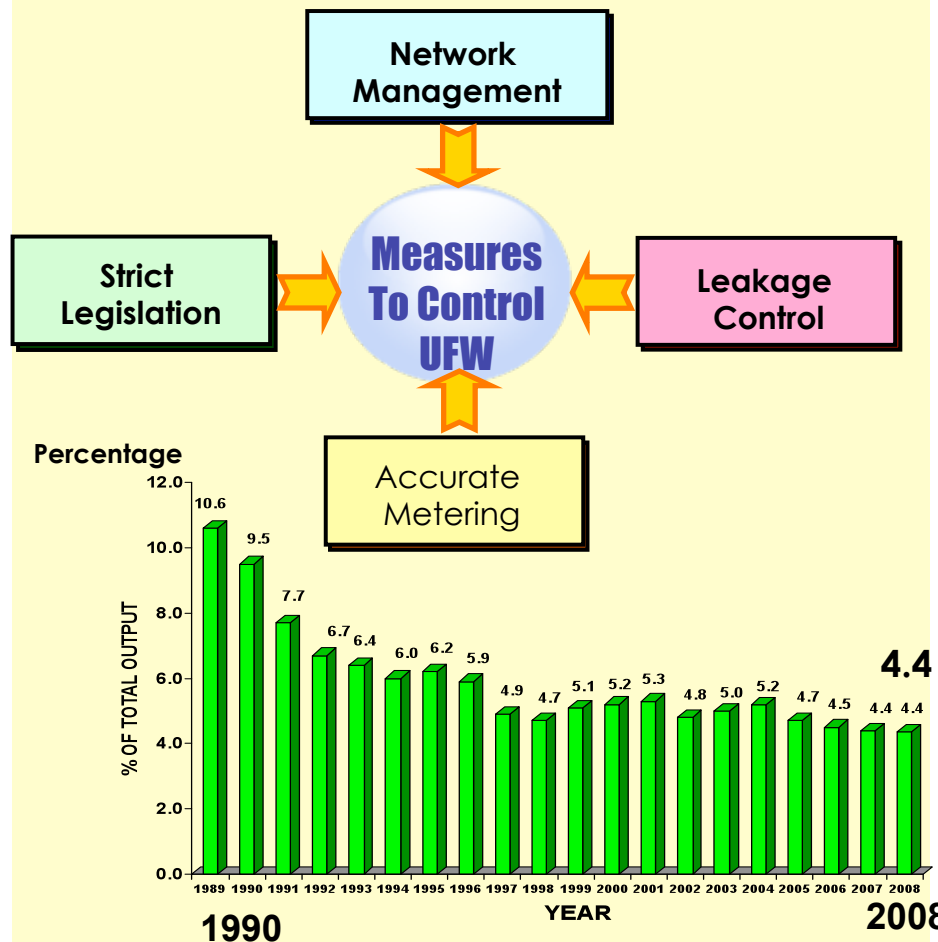


**8.9 Times**

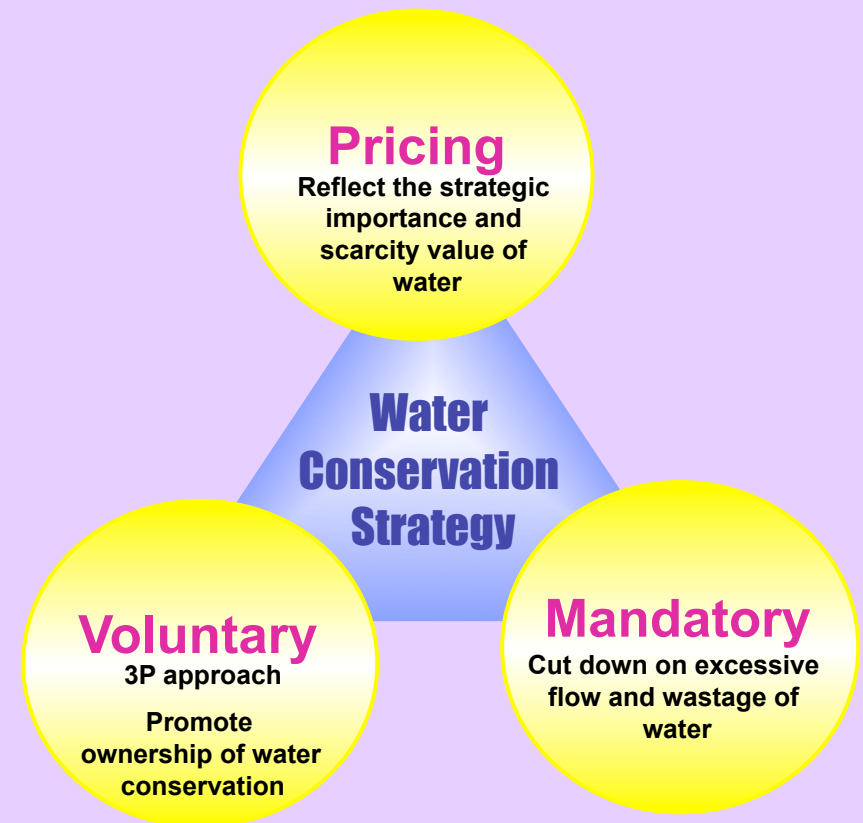
# Conserving our Waters

## Water Demand Management

### UFW Control



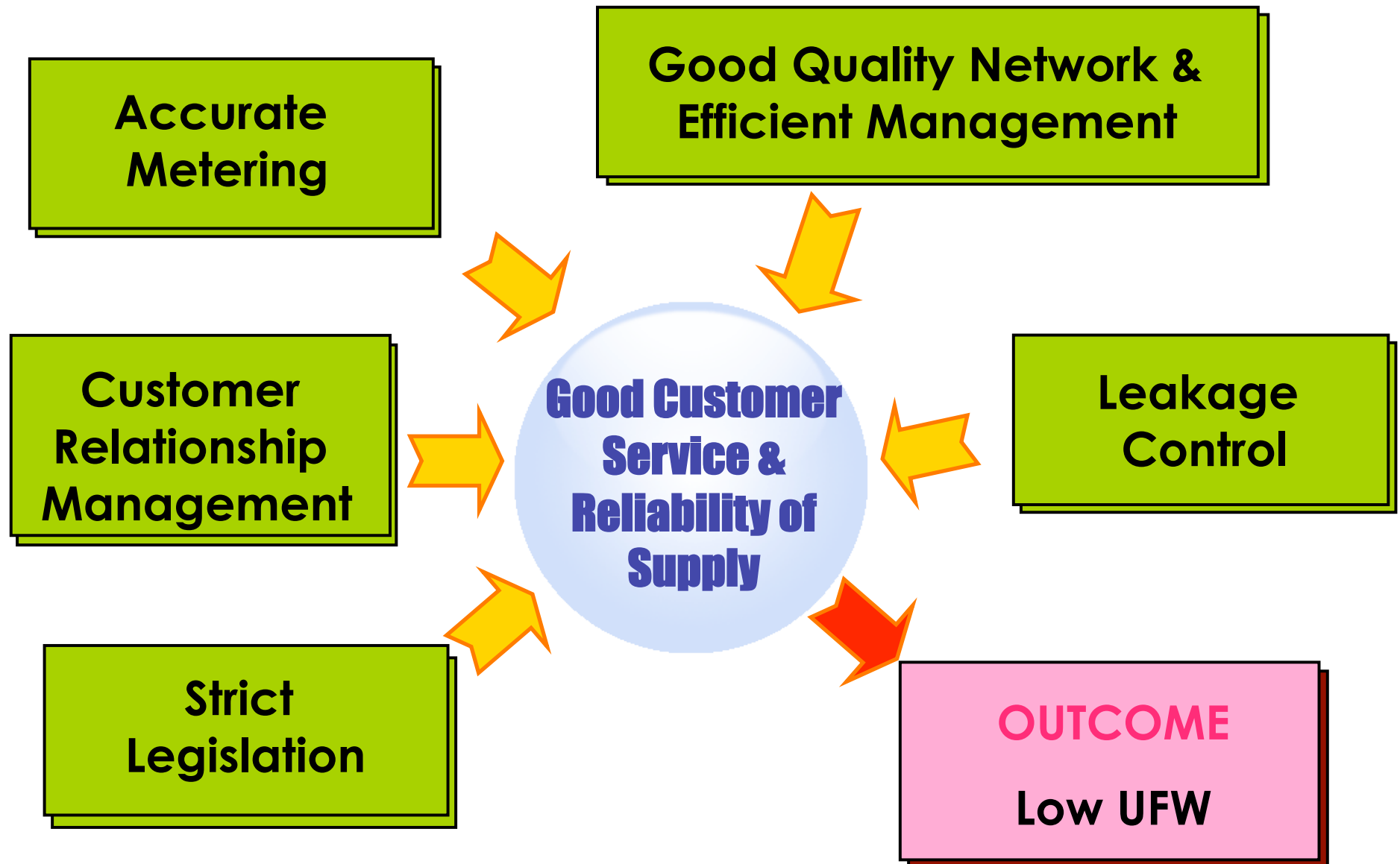
### Water Conservation



Water for All: Conserve, Value, Enjoy



# Integrated Network Management System



# Good Quality Network & Efficient Management

## New Network

- Good planning & design – sizing of pipes, location of valves, alternate supplies, etc
- Strict supervision & control on workmanship
- Use Good quality / corrosion resistant material
  - Connections : Copper
  - Mains (100 – 300 mm) : cement-lined DI
  - ( $\geq 700$  mm) : cement-lined steel

## Existing network

- Servicing and maintenance of valves / hydrants
- Mains Renewal Programme
  - Unlined CI mains and GI connections (in 80s / 90s)
  - Old problematic CI Mains (2000 – 2004)
  - Asbestos Cement Mains (2003 – 2008)
- Ongoing pipe replacement programme



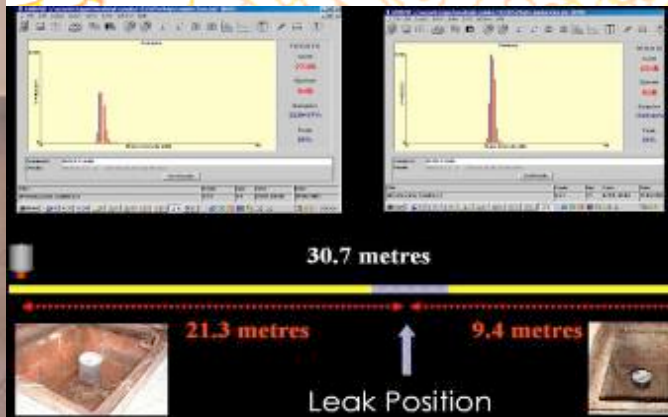


# Active Leakage Control

## Dynamic Leak Detection Programme

- Divide Singapore into ~ 300 zones
- Frequency of checks based on age/material type of mains & leak history
- Use of advanced leak detection equipment including leak localisers
- Cover 10 – 20 km length of pipes / day

Dry weather flow by other PUB in charge of drains and waterways



# Accurate Metering

**100 % metering** for usage and billing

**Type of meters** in use

- Electromagnetic meters at waterworks
- Class C volumetric meters at households
- Compound meters to capture both low and high flows in non-domestic premises



**Electromagnetic meter**  
**(Check every month)**



**15 mm meter**  
**(Replace every 15 yrs**  
**or > 4,000 m3)**

**Compound meter**  
**(Replace every 2-7 yrs)**



# Strict Legislation – Deter Illegal Draw-Offs

- Very Few Cases
- Strict Enforcement
- Public Utilities Act
- Prosecution in court - Max Penalties:
  - \$50,000 fine or;
  - 3 years jail term or;
  - both fine & jail term



# Customer Relationships Management

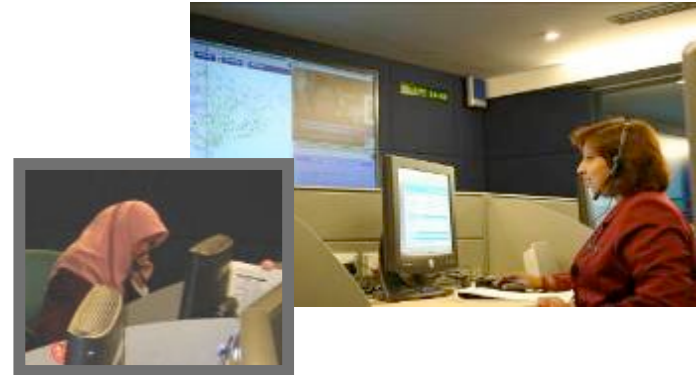
- **Quick Response to Public Reports**
  - **24 x 7 Contact / Operations Centre:**
    - ✓ PUB – One
    - ✓ WSOC

## PUB-One

- **One-stop contact centre** for Board's services
- Customers can contact us thru:  
Telephone, Email, Fax, SMS, VoIP, WebChat

## WSOC (Water Service & Operations Centre)

- Quick response  
service van crew





# UFW - Sustainable Work Processes Involving Everyone

*Effective Management, Staffing & Training*



## Planning & Design

- Proper positioning of valves
- Optimise network design



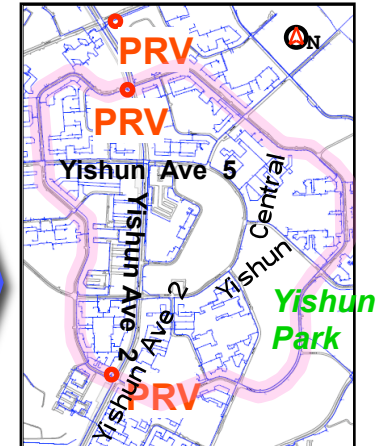
## Mainlaying

- Use good quality pipes
- Good workmanship



## Network management

- Maintenance of network
- Replace old/leaking mains
- Proper Records - AIMS



## Network Optimisation

- Optimise system pressure
- Reduce likelihood of leaks



## Leakage Control

- Dynamic leak detection
- 24/7 contact centre



## Proper accounting through Metering

- use good quality and accurate meters
- Size meters according to usage



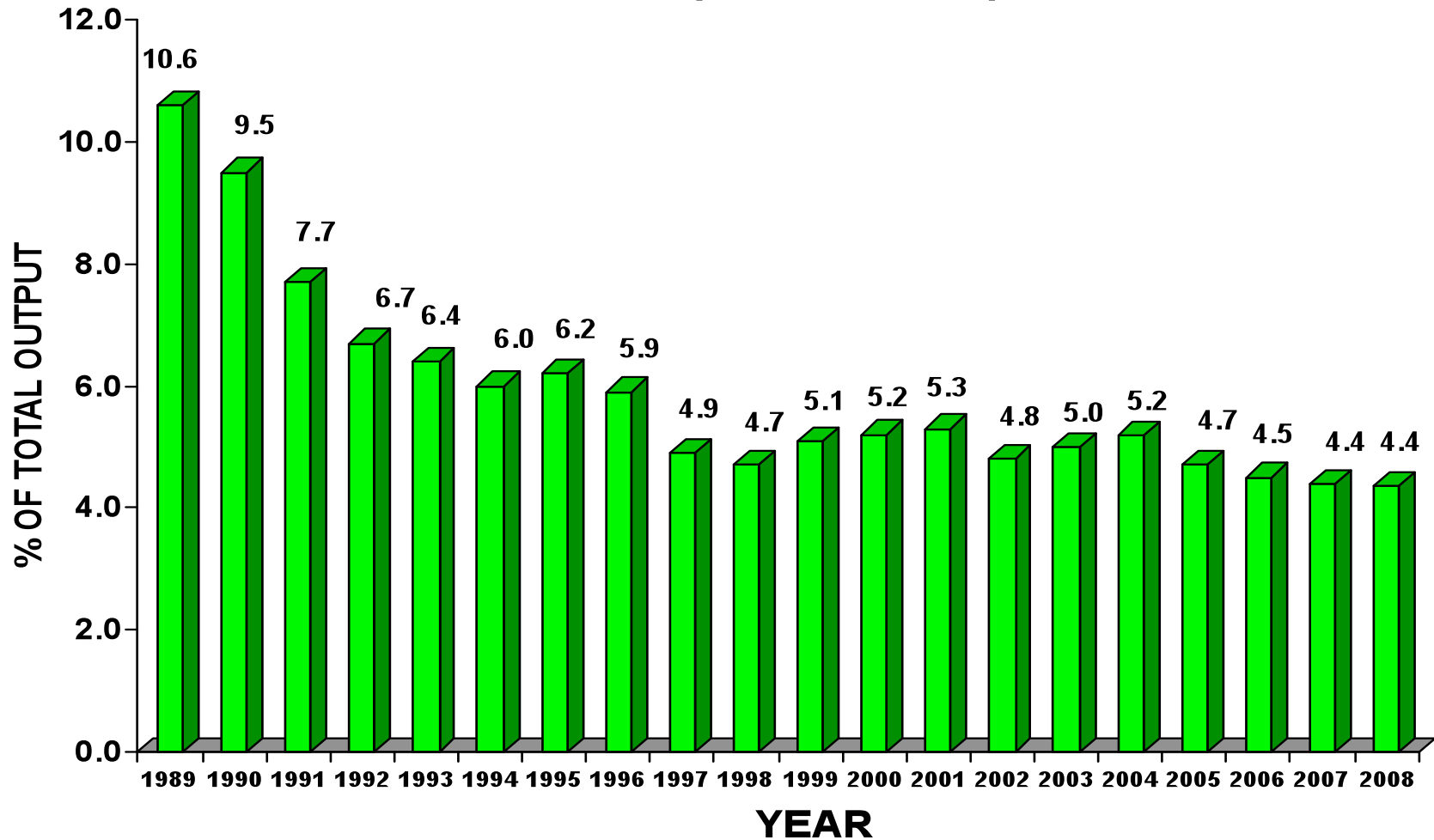
## Enforcement

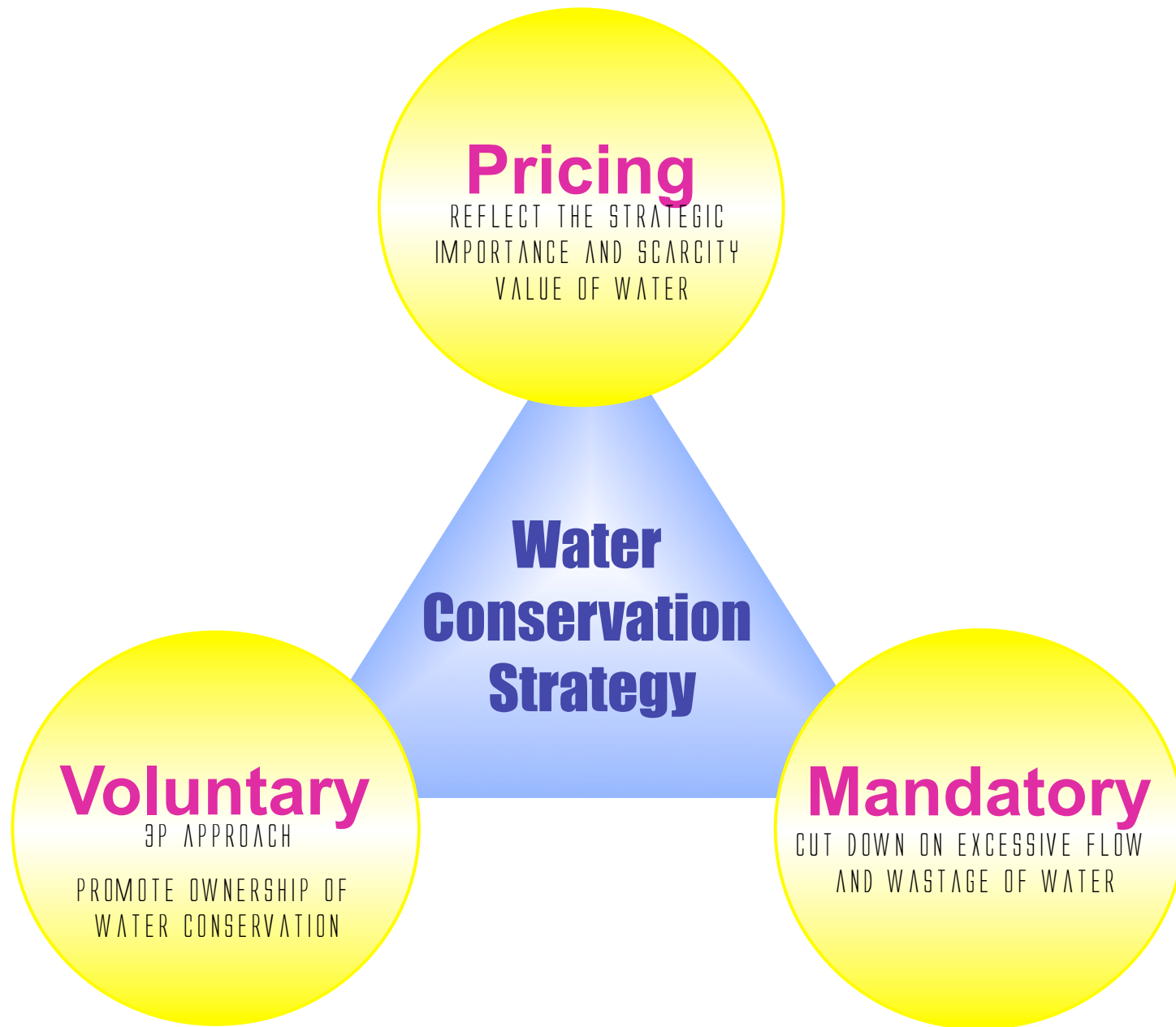
- high penalty
- very few cases

Water for All: Conserve, Value, Enjoy



## ACHIEVEMENT : Low Unaccounted-For-Water (about 5%)





Water for All: Conserve, Value, Enjoy



# PRICING

## Water Tariff Structure

Tariff Category	Consumption Block (m3 per month)	With Effect from 1 July 2000	
		Tariff (cents per m3)	Water Conservation Tax or WCT (%)
Domestic	1 to 40	117	30
	Above 40	140	45
Non-Domestic	All Units	117	30

WCT : WATER CONSERVATION TAX - BROAD-BASED TAX LEVIED BY THE GOVERNMENT

# MANDATORY

## Installation of Water Saving Devices

### Since 1983

- SELF-CLOSING DELAYED-ACTION TAPS
- CONSTANT FLOW REGULATORS

### Since 1997

- LOW CAPACITY FLUSHING CISTERNS

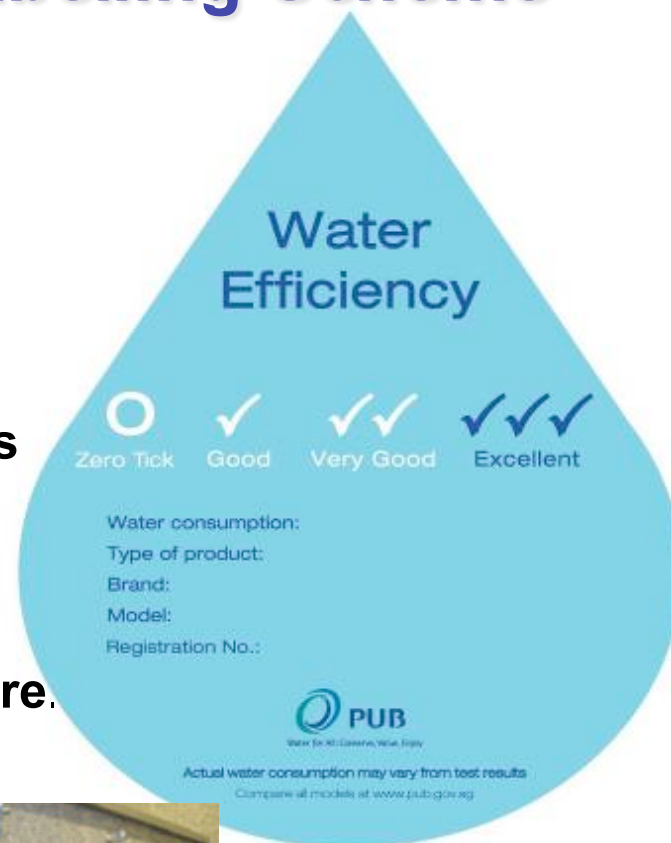


9 LITRE FLUSHING CISTERN      4.5 LITRE FLUSHING CISTERN

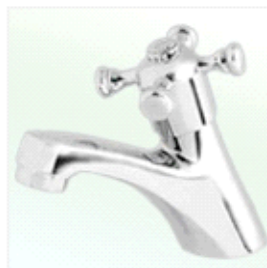


# Mandatory Water Efficiency Labelling Scheme

- **Mandatory WELS (MWELS) wef 1 July 09**
- **Type of water fittings under Mandatory WELS**
  - **Basin taps & mixers**
  - **Shower taps & mixers**
  - **Sink/bib taps**
  - **Dual flush low capacity flushing cisterns (LCFC)**
  - **Urinals & urinal flush valve**
- **Low flow showerheads and clothes washing machine will be looked into separately in future.**



Shower taps and mixers



Basin taps and mixers



Sink/Bib taps and mixers



Low capacity flushing cisterns

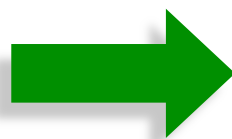


Urinals and urinal flush valves

# Mandatory Installation of Dual Flush Low Capacity Flushing Cisterns (LCFCs)



Single Flush LCFC  
(4.5L or lesser)

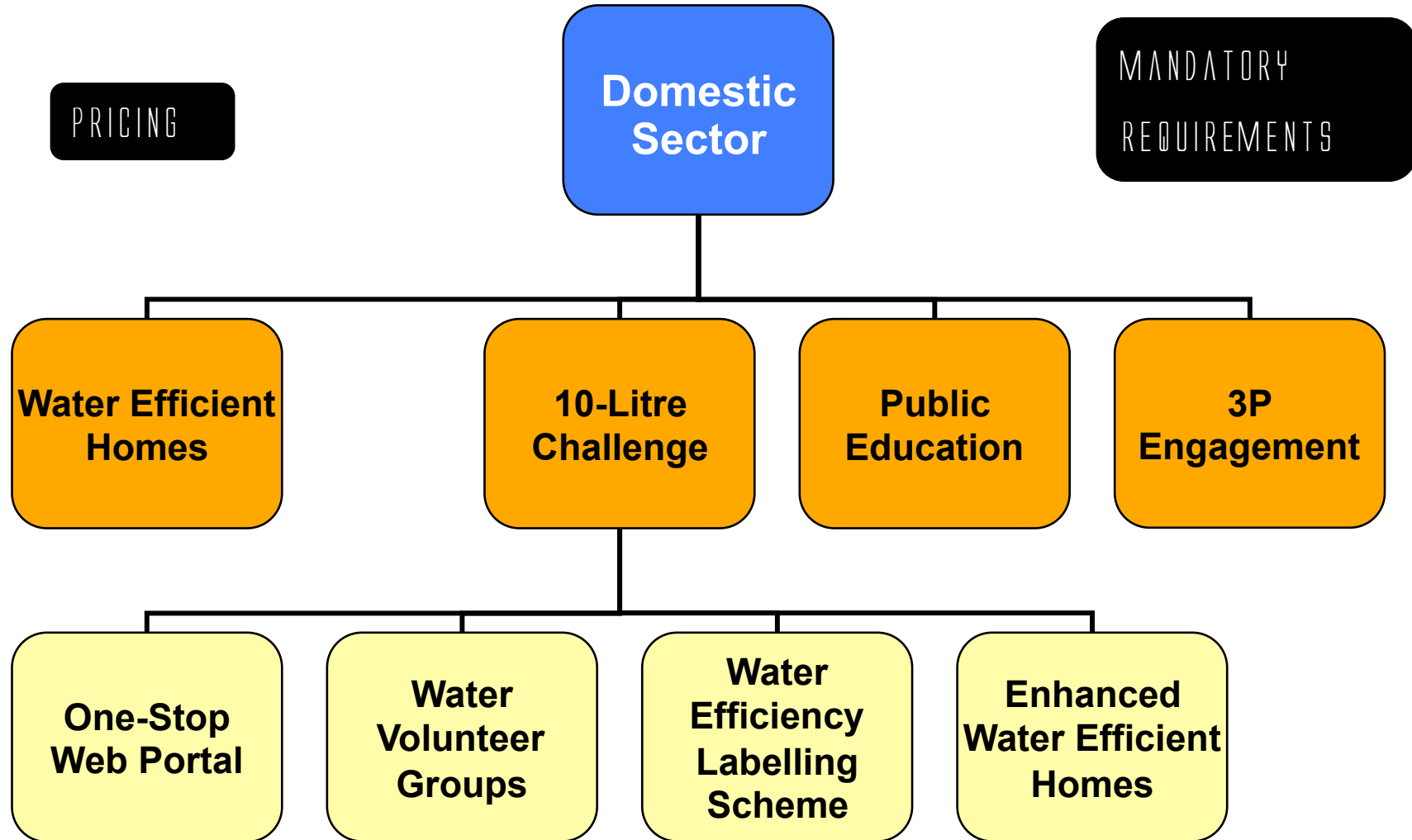


Dual flush LCFC  
(4.5L & 3L or lesser)

WITH EFFECT FROM JUL 2009, DUAL FLUSH LOW CAPACITY FLUSHING CISTERNS SHALL BE INSTALLED IN ALL NEW **domestic** PREMISES AND **domestic** PREMISES UNDERGOING RENOVATION.

# Voluntary

## Water Conservation Framework for Domestic Sector



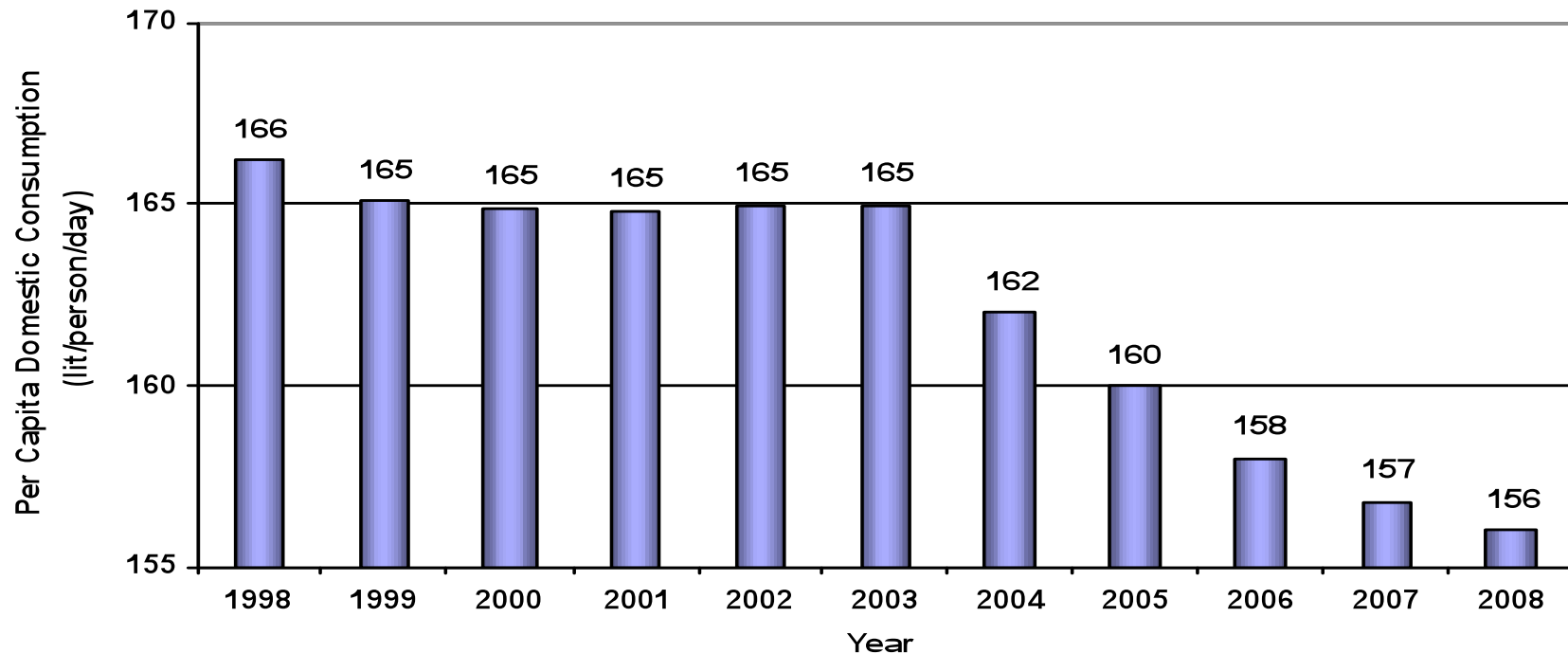
# Domestic Water Efficient Homes Programme (WEH)

- Launched in Feb 2003
- 3Ps – community driven programme
  - Grassroots leaders distribute FOC Water Saving Kits
  - DIY and adopt good water saving habits (e.g. washing machines, shorter shower)
- Mobile exhibitions at grassroots events
- Door to door visit to assist in installation of WSDs
- Can save up to 5% of monthly water consumption
- By 2006 - all 84 constituencies launched
- More than 910,000 water saving kits distributed & about 40% households installed



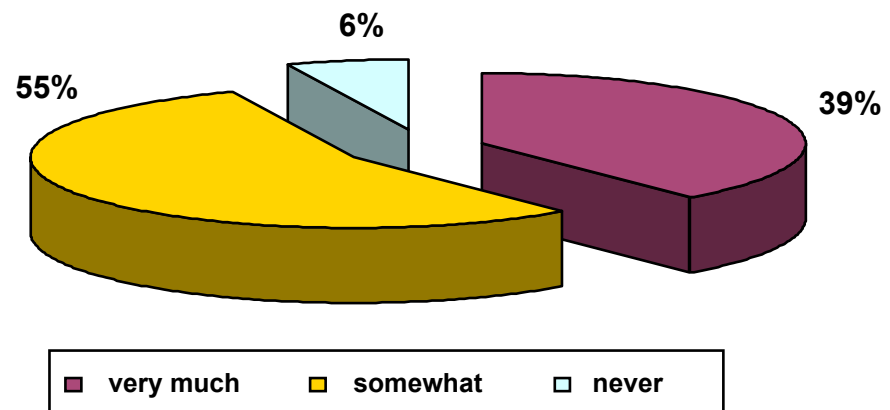
# Water Conservation

**Per Capita Domestic Consumption (1998-2008)**



## Public Surveys

*Encouraged Me to Conserve Water*



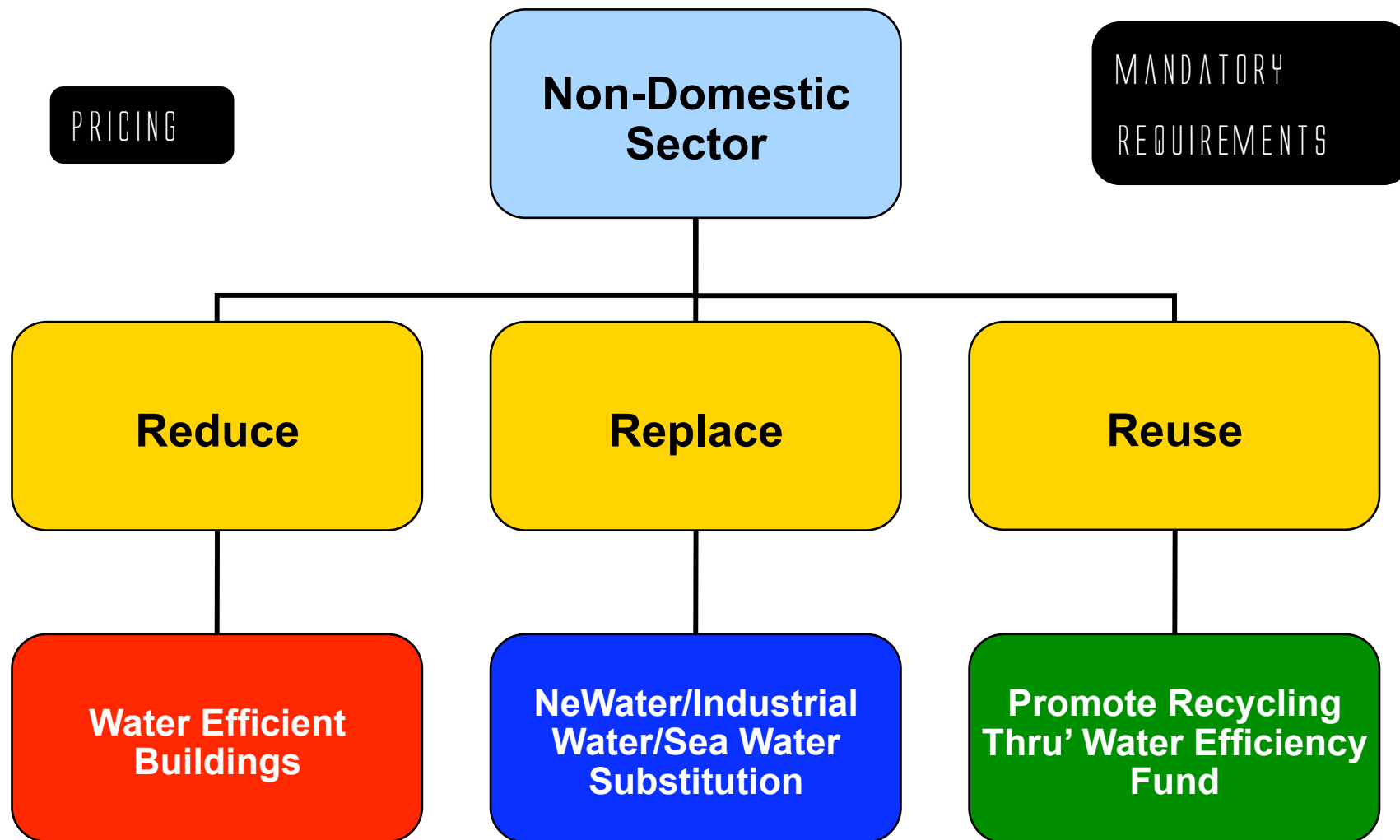
Water for All: Conserve, Value, Enjoy





# Voluntary

## Water Conservation Framework for Non-Domestic Sector



# Singapore International **Water** Week 2010

*Sustainable Cities – Clean and Affordable Water*



# About Singapore International Water Week

THE **global platform for water solutions**

- BRINGS TOGETHER **policymakers, industry leaders, experts and practitioners**
- ADDRESS CHALLENGES, SHOWCASE TECHNOLOGIES, DISCOVER OPPORTUNITIES  
CELEBRATE ACHIEVEMENTS

## Key programmes :

1. WATER LEADERS SUMMIT
2. WATER CONVENTION
3. WATER EXPO
4. BUSINESS FORUMS
5. LEE KUAN YEW WATER PRIZE



**Organised by :** SINGAPORE INTERNATIONAL WATER WEEK PTE LTD, A COMPANY SET UP BY  
PUB AND MINISTRY OF THE ENVIRONMENT AND WATER RESOURCES

Water for All: Conserve, Value, Enjoy



# Singapore International Water Week 2009

- **More than 10,000 attendees from 82 countries** INCLUDING THE CROWN PRINCE OF ORANGE, MINISTERS FROM MIDDLE-EAST, AUSTRALIA, CHINA, BRUNEI, INDIA, PRESIDENT ADB, VP WORLD BANK, PRESIDENT / CHAIRMAN /CEOS OF WATER COMPANIES
- **12,000 m2 of covered exhibition space with more than 400 exhibiting companies from 41 countries** INCLUDING SIEMENS, CH2MHILL, B V, CDM, VEOLIA, SUEZ
- 28 NEW PRODUCTS LAUNCHED FOR THE VERY FIRST TIME IN ASIA OR THE WORLD
- **S\$2.2 billion worth of business deals** INKED DURING THE WEEK
- **76 co-located events** INCLUDING 7TH MINISTERS FORUM ON INFRASTRUCTURE DEVELOPMENT IN THE ASIA PACIFIC REGION, 6TH INTERNATIONAL WATER ASSOCIATION LEADING EDGE CONFERENCE
- **911 media stories were generated** FROM SEP 2008 TO JULY 2009



# Singapore International Water Week 2010

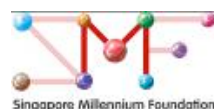
**Date: 28 June 2010 – 2 July 2010**

**Theme : Sustainable Water Solutions for Cities : *Sustainable Cities – Clean & Affordable Water***

**Expecting 12,000 participants from all over the world**

## Our Partners

**Lee Kuan Yew Water Prize Sponsor :**



**Strategic Partners :**



**Founding Sponsors :**



Water for All: Conserve, Value, Enjoy





**Singapore  
International  
Water Week**

[www.siww.com.sg](http://www.siww.com.sg)



THANK YOU

Marina Barrage



TNP BIG WALK 2008 AT MARINA BARRAGE  
(2 NOV 08)



Water for All: Conserve, Value, Enjoy

