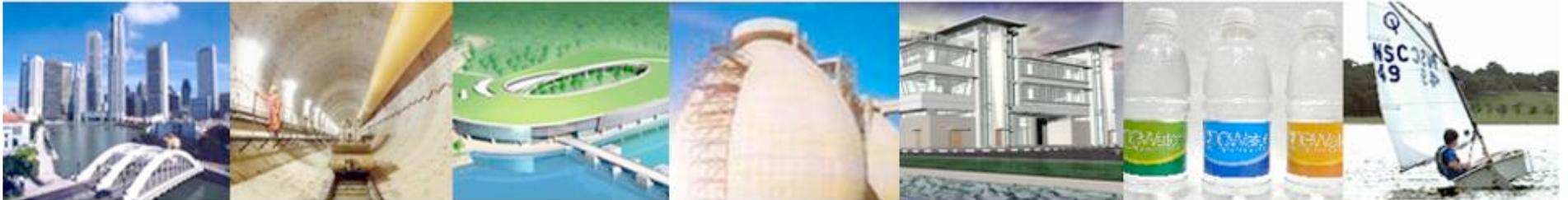


Water for All Conserve, Value, Enjoy

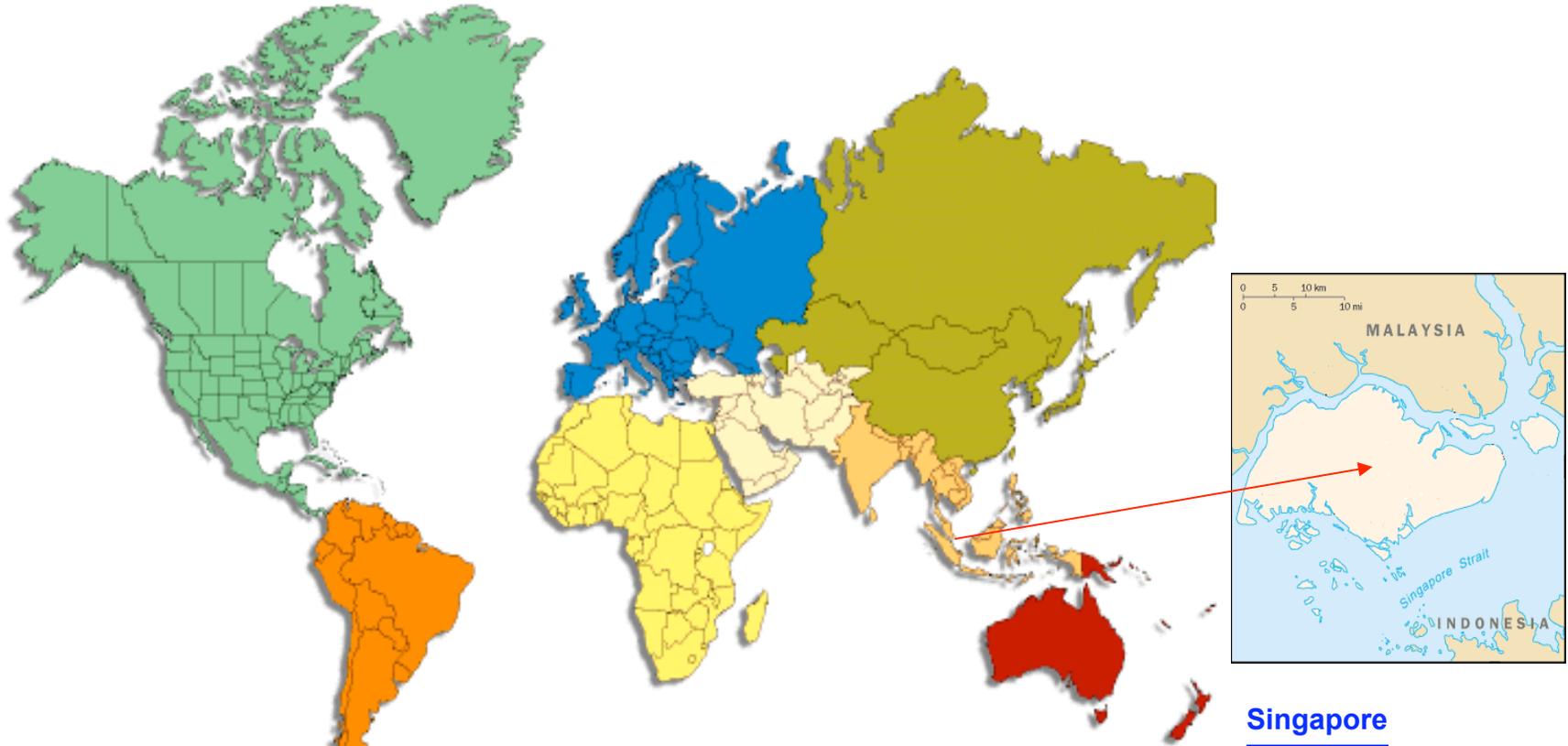


Climate Change Impact on Water: Singapore's Approach

Khoo Teng Chye
Chief Executive

PUB, the national water agency of Singapore

Singapore: Our Unique Circumstances



Land Area

~710 km²

Population

4.99 mil

Average Annual Rainfall

2,400 mm

Average Water Demand

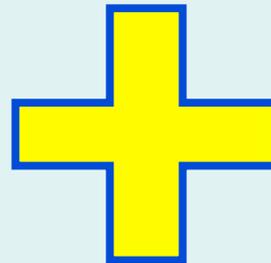
1.6 mil m³/day

Integrated Water Resources Management

4 National Taps



Local catchment
Imported water
NEWater
Desalinated water
“Water for All”



3P Approach



“Conserve Water”

“Value Our Water”

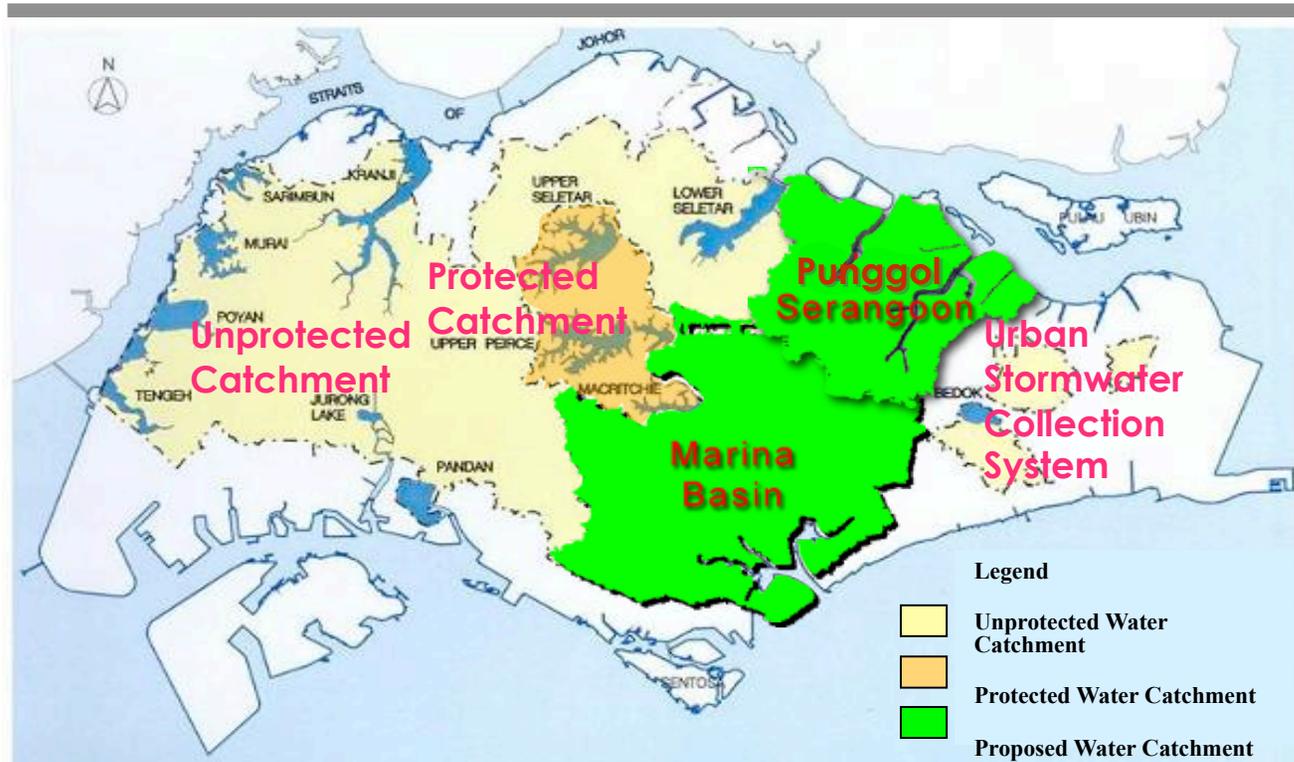
“Enjoy Our Waters”

“Conserve, Value, Enjoy”

Water for All: Conserve, Value, Enjoy



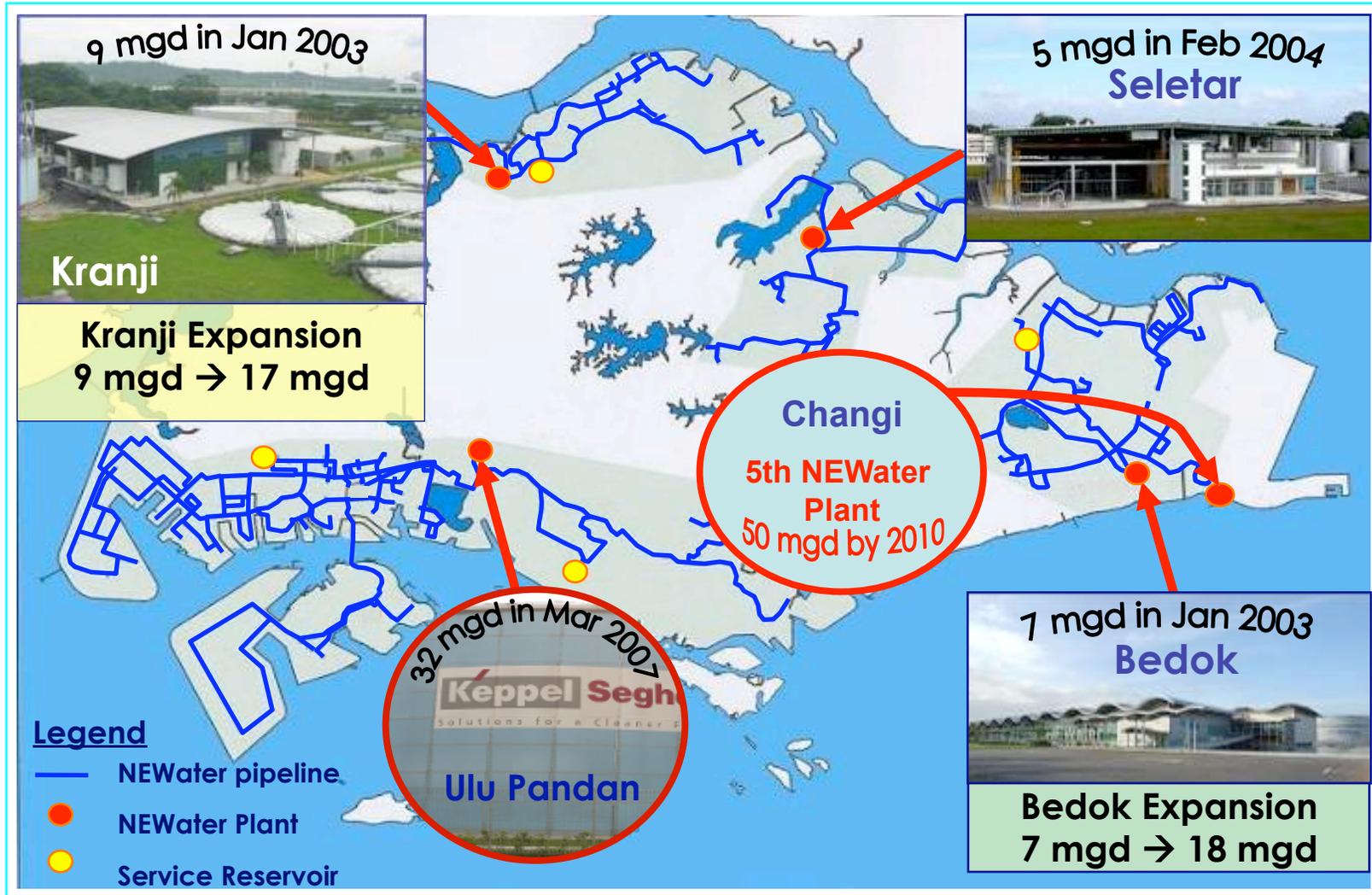
Local Catchment Water



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

NEWater

NEWater independent of the vagaries of weather



Desalinated Water

- To diversify our water resources and ride out the vagaries of weather
- SingSpring Pte. Ltd., under a 20 year DBOO arrangement with PUB
- Supply of 30 mgd for 20 years
- Opened in Sep 05



3P Approach



Water Volunteer

- 52 WVGs formed in 30 constituencies since Mar 06
- WVGs in another 25 constituencies in 2007

Water Efficiency Labeling Scheme



50 models of fittings labelled under WELS since end Oct 06

Dual Flush LCFCs



Pilot project in selected HDB MUP to be carried in second half of 2007

Web Portal



76300 hits since Mar 06

Water Detectives



Water Detectives Programme
Launched in 103 out of 177 primary schools
Reaches out to 110,000 students

ABC Waters Programme

A. ACTIVE

New recreational spaces

B. BEAUTIFUL

Integration of waters with urban landscape

C. CLEAN

Improved water quality



“... Turn Singapore into a city of gardens and water”

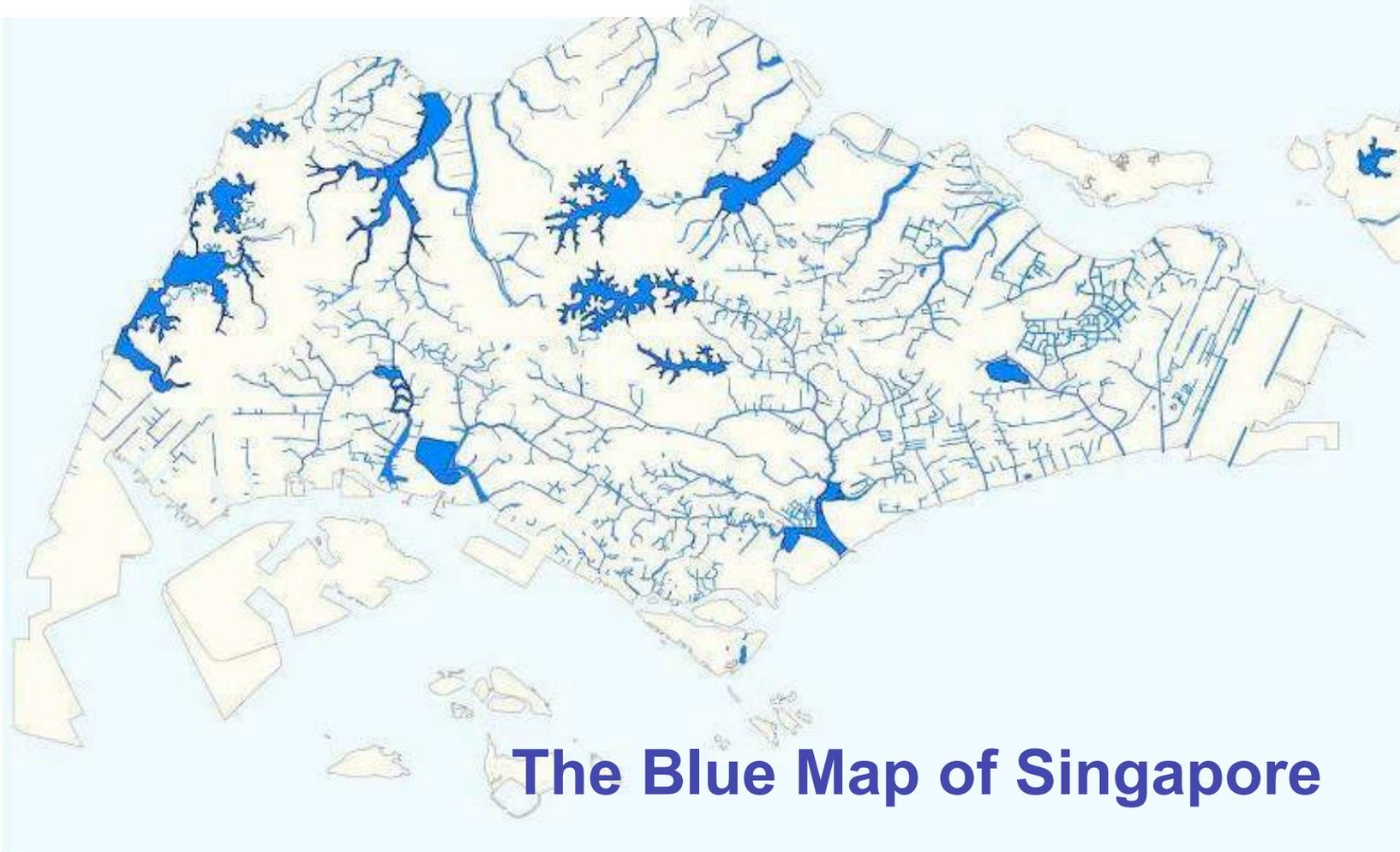
**Prime Minister Lee Hsien Loong,
At ABC Waters Public Exhibition Opening
(Feb 07)**

Water for All: Conserve, Value, Enjoy



ABC

Active, Beautiful, Clean
Waters for All



The Blue Map of Singapore

Water for All: Conserve, Value, Enjoy



ABC Waters Programme

- Long term blueprint to transform Singapore's pervasive network of drains, canals and reservoirs into beautiful and clean streams, rivers and lakes
- One of the first cities in the world to have such a city-wide plan to develop the waterways & water bodies in a systematic way



Kallang River Bishan Park

Kolam Ayer ABC Waterfront

After



Before



Water for All: Conserve, Value, Enjoy



Sengkang Floating Island

After



Before



Water for All: Conserve, Value, Enjoy



Valuing, Enjoying Our Waters

Our Waters Programme

80 adopters so far



Weddings at Reservoirs



Water Mark Award

Accepting Nominations Now



Activities in Reservoirs and Canals



NEWater Visitor Centre

More than 700,000 visitors since its opening

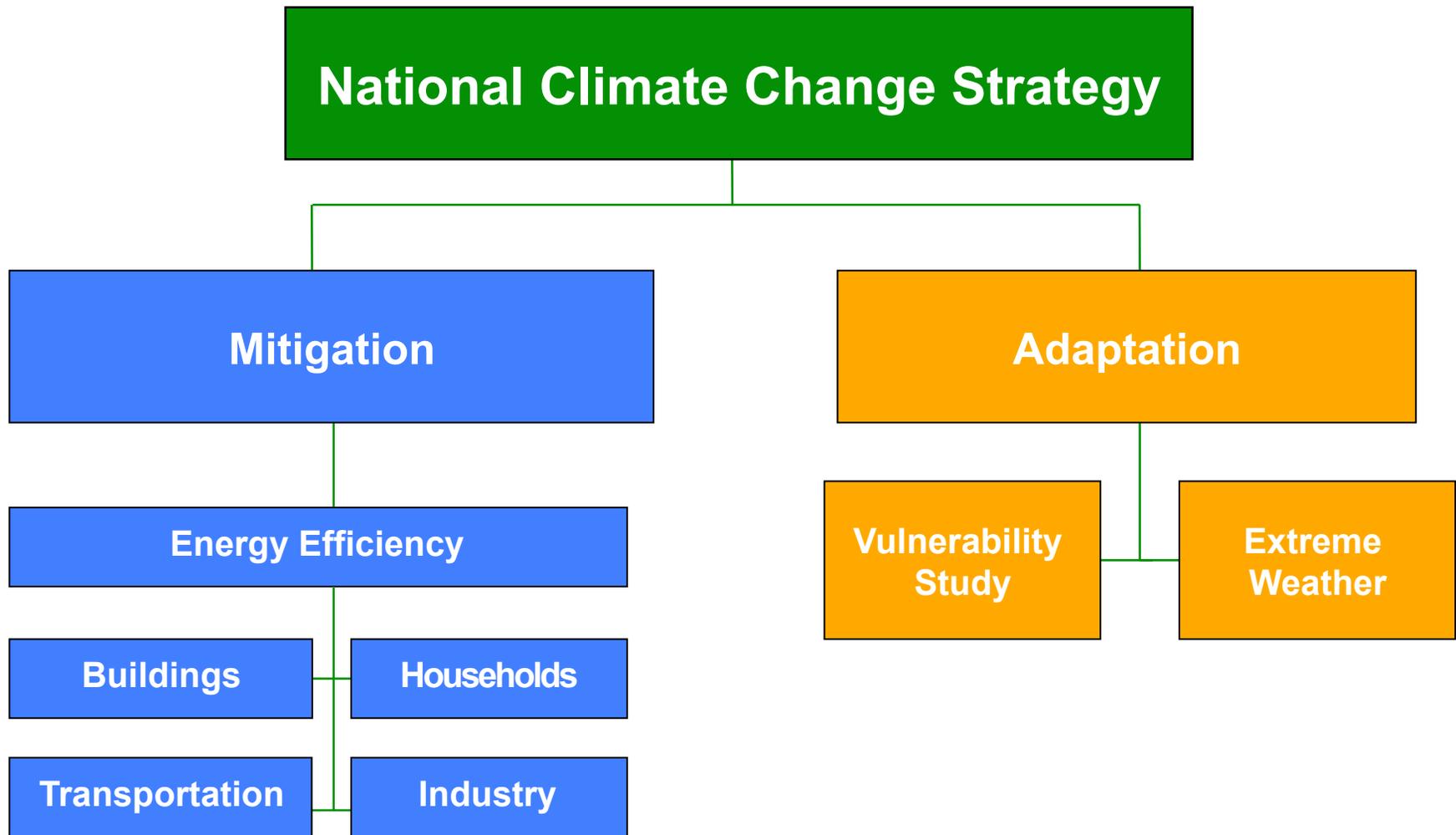


Key Impacts of Climate Change on Singapore

Summary of AR4 Projections for Southeast Asia (A1B Scenario):

- Annual precipitation for Southeast Asia will increase
 - **Water Supply**
- Temperature rise likely similar to global mean temperature rise
 - **Increase in extreme weather occurrences**
- Sea level rise likely to be close to global mean
 - **Sea Level Rise**

Singapore's National Climate Change Strategy



PUB's Four-Pronged Approach to Adapt to CC

**Sustainable and Resilient
Water Supply**



Partnership



***Four-Pronged
Approach to Adapt
to Climate Change***

**Adapting to Sea Level
Rise & More Rainfall**



**Investment in R&D,
Technology & Innovation**

Sustainable & Resilient Water Supply

Independent of the vagaries of weather

NEWater



Variable Salinity Plant



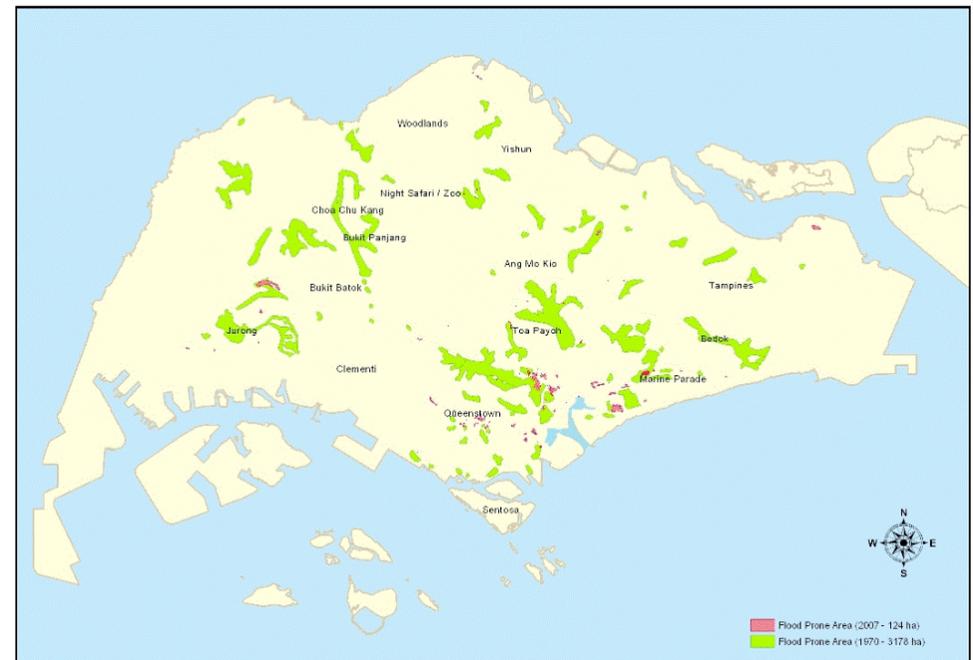
Desalination

Water for All: Conserve, Value, Enjoy



Adapting to More Rainfall

- Drainage infrastructure and improvement programmes to reduce flood prone areas:
 - 3200 ha 1970s
 - 124 ha 2007
 - 79 ha 2009
- Raising low-lying areas in conjunction with development proposals
- Review of drainage design criteria



Water for All: Conserve, Value, Enjoy



Marina Barrage: 3-in-1 Reservoir

Creating a Reservoir in the City



Water for All: Conserve, Value, Enjoy





Water for All: Conserve, Value, Enjoy



Adapting to Sea Level Rise

1960 Singapore Coastline



1990 Singapore Coastline



Current & Future Singapore Coastline



Land Reclamation

1.25 m above highest tide (minimum)

0.59 m (max. forecast by AR4)

Highest Tide

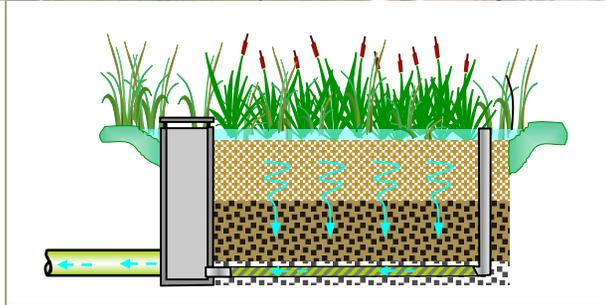
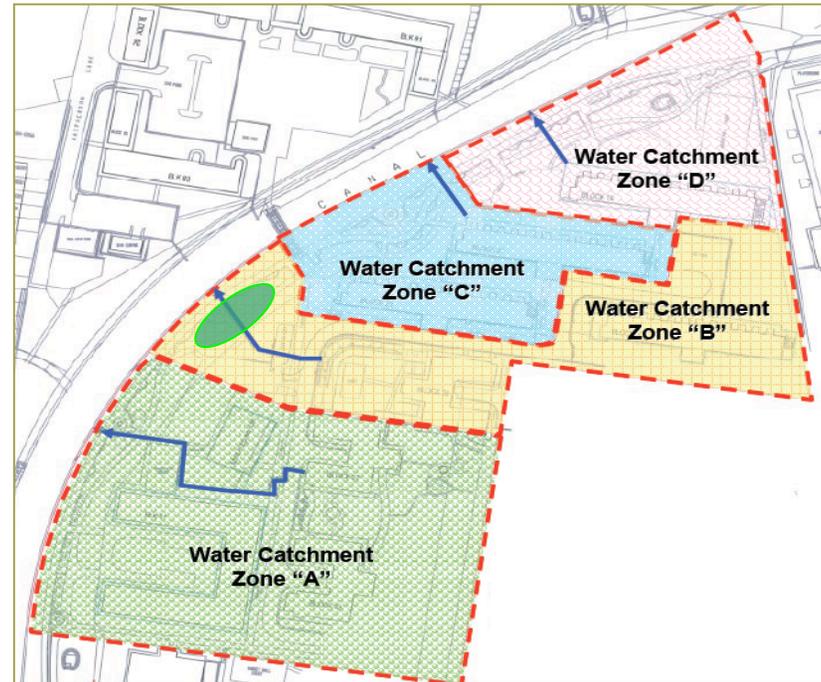
Water for All: Conserve, Value, Enjoy





RAIN GARDEN

BALAM ESTATE



⌘ Benefits

⌘ Thriving ecosystem

⌘ Reduce hydrological impact of urban catchment

⌘ Improve water quality



Water for All: Conserve, Value, Enjoy

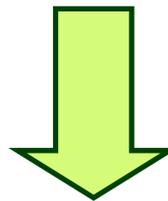


Investment in R&D, Technology & Innovation

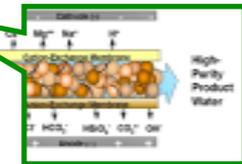
Current ~3.5 kWh/m³



Short-term < 1.5 kWh/m³



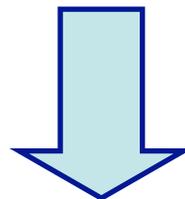
Memstill (with waste heat);
Electrochemical Desalting;



Long-term

• Process: 0.75 kWh/m³

• System < 0.75 kWh/m³
(with optimisation and energy recovery)



Breakthrough R&D



Biomimetics???

Pledge to Cut Carbon Emissions

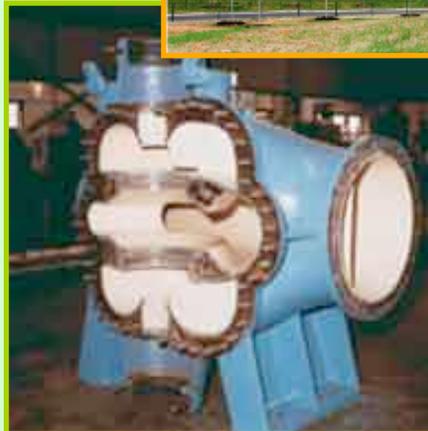
- Singapore has pledged to reduce emissions growth by 16% below “business as usual” levels by 2020

PUB's Mitigation Efforts



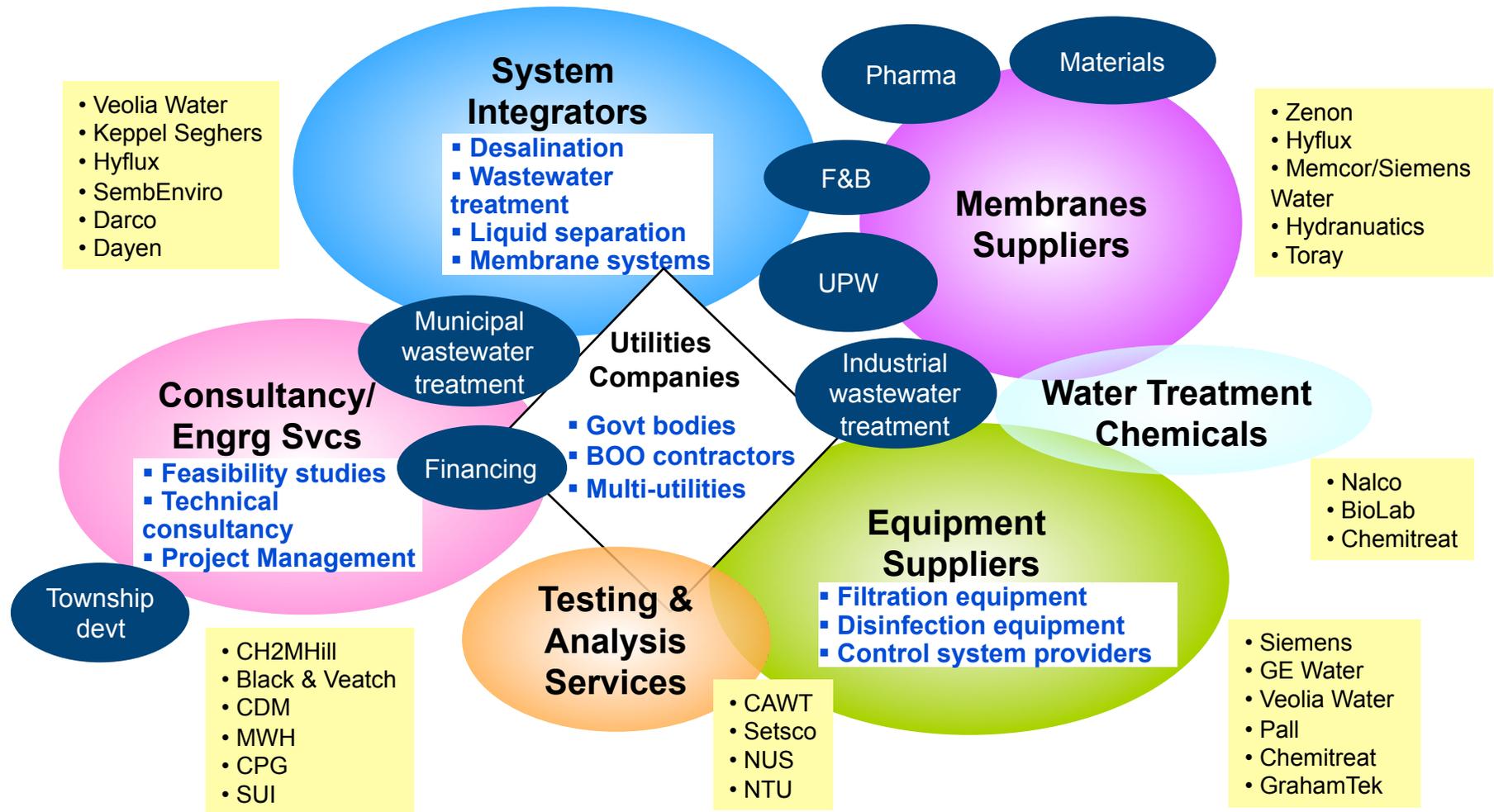
Biogas used to generate electricity/ heat

Improving Energy Efficiency



Incineration of sludge

A Vibrant Singapore Water Industry



Partnership - SIWW

28 June 2010 – 2 July 2010

**Theme -
“Sustainable Cities – Clean and Affordable Water”**

Featuring:

- Lee Kuan Yew Water Prize
- Water Leaders Summit
- Water Convention
- Water Expo
- Business Forums

Continued with its success formula, SIWW 2010 include three high-profile events:

- Asia Pacific Water Ministers Forum
- 14th United Nations Secretary-General Advisory Board for Water and Sanitation
- 2nd World Cities Summit



Marina Barrage, Singapore

