

6. SINGAPORE

6.1 Water Resources Management Policies and Actions

In Singapore, the Singapore Green Plan (SGP), released in 1992, mapped out the strategic directions to preserve, protect and enhance the environment.⁶⁰ In 2002, it has been revised to the new plan, Singapore Green Plan 2012 (SGP2012), which is the blueprint towards environmental sustainability for the next decade.⁶¹ To ensure SGP2012 is being relevant and up-to-date, the Ministry of the Environment and Water Resources has updated the SGP2012 after eight months of extensive consultation.⁶² The SGP2012 covers six areas, namely, clean air and climate change, water, waste management, conserving nature, public health, and international environmental relations. It sets out targets for water resources management up to 2012, which include:⁶³

- Increase catchment areas from 50% to 67% of Singapore's and surface
- Increase supply of water from non-conventional sources such as desalination and water reclamation, to at least 25% of Singapore's water demand
- Ensure that water quality continues to meet international standards
- Reduce per capita domestic water consumption to 155 litres/day by 2012
- Partner the 3P sectors (i.e. the Public, People and Private sectors) to generate greater awareness of the importance of conserving, value and enjoying water and develop a sense of shared ownership of the country's water resources.

The SGP2012 states the vision of "Water for All: Conserve, Value, Enjoy"⁶⁴, which can be summarised as follows:

- Water for all
 - Diversify water supply through the "Four National Taps" strategy
 - Promote greater research and development (R&D) efforts in water and used water technologies and other areas
 - Ensure potable water quality continues to meet international standards
- Conserve
 - Promote the use of water-efficient household fittings and appliances
 - Continue to work with the various non-domestic sectors to reduce water consumption
- Value
 - Encourage the community to change their water behaviour and habits, and to educate them on the implications of living in water catchment areas
 - Inculcate amongst young Singaporeans the mindset of valuing water resources
- Enjoy

⁶⁰Extracted from the website of the National Environment Agency, <http://app.nea.gov.sg/cms/htdocs/article.asp?pid=750>

⁶¹ Referenced to the website of the Singapore Green Plan 2012, <http://www.mewr.gov.sg/sgp2012/about.htm>

⁶² Reference to the website of the Singapore Green Plan 2012, <http://www.mewr.gov.sg/sgp2012/index.html>

⁶³ Full document for "SGP2012 (2006 Edition)" can be obtained at http://www.mewr.gov.sg/sgp2012/files/sgp2012_2006edition.zip. Extracted from the "SGP2012 (2006 Edition)", page 37

⁶⁴ Full document for "SGP2012 (2006 Edition)" can be obtained at http://www.mewr.gov.sg/sgp2012/files/sgp2012_2006edition.zip

- Encourage the users of water resources to take ownership of and enjoy the water resources, through recreational and sporting activities held in reservoirs and waterways.

Singapore has done very well in diversifying its water resources under its “Four National Taps Strategy”. With its “Four National Taps” strategy in full flow, it will have enough water to meet its future needs. Details of the strategy are summarised as follows:⁶⁵

- (i) Supply of water from local catchments: This consists of an integrated system of 14 reservoirs and an extensive drainage system to channel storm water into the reservoirs. The Marina Barrage, when completed in late 2007, will turn Marina Basin into Singapore’s 15th reservoir with a catchment area of about 10,000 ha (or one-sixth of Singapore’s and area). Dams will also be constructed across Sungei Punggol and Sungei Serangoon and when completed in 2009, will create a new catchment area of over 5,000 ha. Imported water from Johor also supplements Singapore’s water needs
- (ii) NEWater or high-grade reclaimed water: Through advanced membrane technologies, treated effluent from water reclamation plants is processed to produce high-grade reclaimed water of drinkable quality. NEWater is supplied from three plants with a combined capacity of 21 million gallons per day. A fourth plant at Ulu Pandan, when completed at the end of 2006, will double the current supply.
- (iii) Desalinated Water: The first desalination plant at Tuas started operations in September 2005 and can supply a maximum of 30 million gallons per day of drinking water.

Action Programmes related to water resources management under SGP2012⁶⁶

To implement the SGP2012, several programmes have been introduced, which include:

- Water Efficient Homes (WEH) Programme
While water supply has been secured with the four national taps, people have to manage the demand of water. WEH has been initiated to help residents save water at home and cut down on their water bills. As part of the programme, do-it-yourself (DIY) water saving kits consisting of thimbles (to reduce water flow from taps), cistern water saving bags, leaflets on installation procedures and water conservation tips were distributed to residents for free.⁶⁷ Among one in three households installs the water saving devices can save up to 5% of their monthly water expenses.⁶⁸
- Water Efficient Buildings (WEB) Waters Programme
WEB is another new water conservation initiative that offers cost effective solutions and guidelines for non-domestic customers to lower water consumption thus enjoy reduce the cost. Non-domestic customers (e.g. industrial and commercial buildings) can simply apply the 3Rs (Review, Reduce and Repair) of water

⁶⁵ Extracted from the “SGP2012 (2006 Edition), page 28

⁶⁶ More information can be found in the “SGP2012 (2006 Edition), page 30-31

⁶⁷ Referenced to the website of the Public Utilities Board,

<http://www.pub.gov.sg/conservation/ConservWaterEffHomes.aspx?l1=3&l2=16>

⁶⁸ Reference to the “SGP2012 (2006 Edition), page 30

- conservation in managing and using water.⁶⁹
- Active, Beautiful and Clean (ABC) Waters Programme
More information can be found in section 6.5.

⁶⁹ Referenced to the website of the Public Utilities Board,
<http://www.pub.gov.sg/conservation/ConservWaterEffBuildings.aspx?l1=3&l2=17>

6.2 Environmental Evaluation/SEA in Singapore

In Singapore, a legislative framework for the control of environmental pollution is provided by the Environmental Pollution Control Act (EPCA)⁷⁰, which came into operation on 1 April 1999 and amended and renamed as the Environmental Protection of Management Act (EPMA) in June 2007. It consolidates those previous separate laws on air, water and noise pollution and hazardous substances control.⁷¹ Environmental Impact Assessment (EIA) is also implemented through the requirements stipulated in the EPCA.⁷² However, no formal provision or administrative framework has been made for a national system of SEA for policies, plans or programmes.

In Singapore, while the EPMA is one of the instruments of policy to implement EIA, SEA has not been integrated into one of requirements during decision making on developing any policy, plan and programme.



ABC Waters Programme⁷³



Changi Water Reclamation Plant⁷⁴

⁷⁰ Details of the Act can be found at

http://siteresources.worldbank.org/INTEAPREGTOPENVIRONMENT/Resources/SINGAPORE_EPCA_2002.doc

⁷¹ Referenced to the web site under Energetic Materials Research Centre of the Nanyang Technological University, a section of Environmental Pollution Control Act,

<http://www.ntu.edu.sg/emrc/Environment%20S&H/Legislation%20Materials/Legislation.htm#E>

⁷² Referenced to "Environmental Impact Assessment Regulations and Strategic Environmental Assessment Requirements – Practices and Lessons Learned in East and Southeast Asia" by the Environment and Social Development Unit (EASES), April 2006,

<http://siteresources.worldbank.org/INTEAPREGTOPENVIRONMENT/Resources/EIA&SEA-regional-review.pdf>, pages 59-61 – Annex 10 Singapore

⁷³ Source: http://pub.gov.sg/annualreport2005/Feature_abcs_of_water1.html

⁷⁴ Source: http://www.mof.gov.sg/budget_2007/expenditure_overview/mewr.html

6.3 Environmental Evaluation/SEA on Water Resources Management in Singapore

In Singapore, there is no formal provision or administrative framework for a national system of SEA for policies, plans or programmes that related to water resources management. There is only the EPMA which is one of the instruments of policy to implement EIA. Details should refer to section 6.2.

The government is adopting a more comprehensive approach for environment management in developments projects, especially the coastal developments, to conduct EIA and studies on biodiversity, hydraulic modelling and water quality prior to commencing the development work.⁷⁵

A summary table for both the water resources management policies and actions and SEA status in Singapore is presented in **Exhibit SG-1**:

Exhibit SG-1 Summary of Water Resources Management (WRM) Policies and Actions and SEA status in Singapore	
(a) WRM Policies and Actions	
WRM Policies and Actions	Policies <ul style="list-style-type: none"> ● Singapore Green Plan 2012 (SGP2012) Actions <ul style="list-style-type: none"> ● Water Efficient Homes (WEH) Programme ● Water Efficient Buildings (WEB) Waters Programme ● Active, Beautiful and Clean (ABC) Waters Programme
Guidance/Legislations in WRM	Four National Taps Strategy
(b) Environmental Evaluations / SEA Status in WRM Policies and Actions	
Type of Assessment	N/A (No formal provision or administrative framework for a national system of SEA for policies, plans or programmes)
Requirement Mechanisms	
Legislation for Environmental Evaluation / SEA	
Applications	

⁷⁵ Extracted from the "SGP2012 (2006 Edition), page 34

6.4 Analysis and Conclusions

WRM Policies

In Singapore, the Singapore Green Plan 2012 (SGP2012) is the blueprint towards environmental sustainability for the next decade. It sets out targets for water resources management up to 2012, which covers areas in catchment areas, water supply, water quality, and public awareness in water conservation.

Compared to Singapore, Hong Kong's two main sources of water are from rainfall from natural catchment and supply from Guangdong. It is Water Supplies Department's (WSD) scope of work to cover the whole process from the collection of natural yield from rainfall, the reception of raw water from Guangdong to the provision of a supply with a quality of accepted international standards to the users' taps. WSD also supplies sea water for flushing purposes to over 80% of the population. For protection against flooding, sewage collection, treatment and disposal, it is under Drainage Services Department's (DSD) jurisdiction.

For the sustainable development of Hong Kong, WSD has initiated a *Total Water Management programme* comprising key elements of new water resources, water reclamation, water conservation and water resources protection and management was initiated for better utilization of the different water resources.

EE/SEA

Regarding the SEA/EE system in Singapore, it has not been integrated into one of requirements during decision making on developing any policy, plan and programme.

While the SEA/EE system in Singapore is under development stage, there are both statutory and non-statutory systems for PPP projects in Hong Kong. It may be a logical next step to consider:

- Combining the administrative requirements into the statutory system; and
- Providing further specific SEA requirements under the category of water resources management

6.5 Examples of Water Resources Management Policies / Actions or their Environmental Evaluation/SEA

Example SG-1	Deep Tunnel Sewerage System (DTSS) ^{76, 77}
Description of the System	<p>This system was considered as a long term solution to meet the needs for used water collection, treatment and disposal to serve the development of Singapore through the 21st Century.</p> <p><u>General idea of the system</u> Two cross-island tunnels and network of link sewers will intercept used water from the existing sewerage reticulation system to 2 centralised water reclamation plants to be located at Changi and Tuas reclamation areas. Existing pumping installations and water reclamation plants will be gradually replaced and some 290 ha of land at these existing facilities will be freed for residential and other developments. The System is being implemented in 2 phases.</p>
Phase I of the System	<p>Under Phase I, the North Tunnel, Influent Pumping Station and outfall system at Changi will be constructed and put into operation by end 2005. Effluent from 3 of the existing water reclamation plants will be re-routed into the North Tunnel and be diverted from the Straits of Johor to be discharged into the Straits of Singapore. Once the Changi East Water Reclamation Plant is completed and commissioned by end 2007, used water from the existing water reclamation plants will also be progressively diverted into the North Tunnel and be conveyed to the Plant for treatment. Exhibit SG-2 shows the location map.</p>
Phase II of the System	<p>The Phase II of DTSS has been scheduled for commission by 2015. The South Tunnel, link sewer network, another water reclamation plants and outfall system at Tuas will be constructed. The Changi Water Reclamation Plant will also be expanded by then. Used water from the existing water reclamation plants would be further diverted to the Changi East and Jurong Island water reclamation plants. By Year 2045, all the existing water reclamation plants and sewage pumping stations are expected to be completely phased out.</p>
Benefits of the System	<p>In order to meet the country's need for the 21st Century, through this system, the treated effluent from the new water reclamation will then be discharged through deep sea outfalls into the Straits of Singapore. And those existing water reclamation plants and pumping stations, located all over the island, will be phased out finally.</p>

⁷⁶ Referenced to the website of the Public Utilities Board,
http://www.pub.gov.sg/our_services/UsedWaterDTSS.aspx?l1=2&l2=9&l3=1

⁷⁷ Referenced to the website of the Public Utilities Board,
http://www.pub.gov.sg/our_services/UsedWaterHistory.aspx

Example SG-2	Active, Beautiful and Clean (ABC) Waters Programme⁷⁸
Description of the Programme	<p>To get every Singaporean to conserve, value and enjoy water, the Public Utilities Board has launched the ABC Waters Programme with the following objectives:</p> <ul style="list-style-type: none"> • Turning reservoirs and waterways into clean and vibrant lifestyle attractions where the public can participate in recreational activities – The community will then be drawn to the water and in the process, learn to treasure it • Integrating all activities – The community will then be drawn to the water and in the process, learn to treasure it • Integrating all activities in the catchments, reservoirs and waterways under the ABC Waters programme to achieve better synergy (such as the co-ordination of future water activities in the Marina Basin). <p>Under the programme, new initiatives such as the beautifying of waterways will be implemented to encourage activities in and around the waters. These initiatives will complement the existing programmes.</p>

Exhibit SG-2 DTSS Phase I - Link Sewers, North and Spur Tunnel Changi WRP and Outfall⁷⁹



⁷⁸ Extracted from the "SGP2012 (2006 Edition), page 31

⁷⁹ Extracted from http://www.pub.gov.sg/our_services/UsedWaterDTSS.aspx?l1=2&l2=9&l3=1