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**SUSTAINABLE
DEVELOPMENT –
“THE SINGAPORE WAY”**

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Singapore is a city but also a state. We have to locate our homes, offices, industries, public infrastructure and parks all within only 700 square kilometres of land. With one of the highest population densities in the world, we have to plan the growth of our city carefully to ensure that we can continue to grow the economy and provide a good environment for Singaporeans now and for the future.

THE SINGAPORE WAY

Singapore will continue to follow three key principles in our development.

Long-Term, Integrated Planning

We will continue to plan our land use and infrastructure needs over the horizon of a few decades. We will also continue to consider environmental, economic and social objectives holistically when we plan.

Pragmatic, Cost-effective Approach

We pursue growth and a good environment together, not one at the expense of the other. We need economic growth to provide good jobs for our people and to give us the means to build a liveable city. Yet we do not pursue this growth at all costs. We also put in place stringent environmental regulations and a process to plan and manage land use to guide our development. In addition, we invest in environmental infrastructure and consistently clean our waterways and green our city.

We try to select the most cost-effective method to achieve these sustainable development goals. But we will adopt measures that may incur costs in the short-term, if these measures help us achieve our goals in the long-term.

Flexibility

We are not rigid in our approach, and will adapt our policies and measures over time as our circumstances change.

Some technologies may be very costly today so we will not implement them in a big way now.

However, technology will improve over time, and one day, these technologies could help us achieve more and at a lower cost. Therefore, we will continue to selectively test leading edge technologies now so that we have the expertise to implement them on a larger scale in the future when they become cost effective.

WHAT WE HAVE DONE SO FAR

Forty years ago, Singapore faced overcrowding in the city, poor living conditions and a severe lack of infrastructure. Today, Singapore is home to close to 5 million people. We have enough water and energy to meet our industrial, commercial and residential needs. There is an integrated public transport system with smooth-flowing roads. Our residents live in a vibrant city with clean air, lush greenery and flowing waterways for all to enjoy.

This transformation did not come about by chance. It was achieved through a multi-pronged effort to guide development, and with the broad support of people and businesses.

Land Use Planning

Our holistic approach to development starts with land use planning.

The Concept Plan is Singapore's long-term strategic land use and transportation plan. It guides Singapore's development over a timeframe of a few decades. Agencies involved in economic, social, environmental and infrastructural development jointly drew up this Plan and review it every ten years. This approach allows us to weigh different

development objectives and ensure that we have enough land to support future economic and population growth, as well as to retain a high quality living environment. The first Concept Plan was developed in 1971 and guided the development of key infrastructure projects such as the Singapore Changi International Airport as well as the Mass Rapid Transit System (MRT).

The Master Plan translates the broad, long-term strategies of the Concept Plan into detailed plans. It guides Singapore's development in the medium-term, over a period of 10 to 15 years. The Urban Redevelopment Authority (URA) reviews the Master Plan once every 5 years in consultation with the stakeholders in the people, public and private sectors.

The URA follows a few principles in land use planning to ensure that Singapore can continue to grow despite its small size:

- Develop a compact city to conserve land and optimise the provision of infrastructure.
- Promote the use of public transport by providing an extensive rail network and intensifying land use around rail stations.
- Decentralise commercial centres to reduce the need to travel and reduce peak hour traffic congestion caused by traffic flowing in and out of the city centre.
- Provide a quality living environment by offering a wide variety of housing choices and comprehensive amenities within each new town to serve residents' needs.
- Retain Singapore's natural and built heritage by safeguarding Nature Reserves and Nature Areas and selectively conserving buildings with outstanding architecture and historical significance.

Pollution Control

Singapore has clear and rigorous environmental regulations and city planning guidelines to manage pollution from industries and minimise the negative impact on the quality of life in Singapore. For instance, we locate heavy industries mainly in Jurong Island and Tuas, as far away from residential areas as possible. We also allow a proposed industrial development only if it can comply with pollution control standards and if it can safely dispose of the waste it generates. We complement these standards with strict monitoring and enforcement.

Singapore also has a comprehensive approach to controlling water pollution. First, we control pollution at source. PUB, Singapore's national water agency, repairs and upgrades old sewers to prevent them from leaking and contaminating our waters. PUB also works with contractors to make sure their construction sites do not discharge silt into drains, and educates industrial and commercial operators on proper housekeeping so that their factories and shops do not pollute our waters. In addition, it installs float-booms and gratings to prevent litter from entering the main waterways.

Second, PUB improves the flow of water in our reservoirs and waterways to improve water quality and promote aquatic life. It has a system to circulate the waters in the main tributaries within the Marina Catchment to reduce algae and odours caused by stagnant water. PUB will also implement systems to keep the water in reservoirs well mixed and aerated.

Third, through public education programmes, PUB encourages the public to play an active role in caring for our waterways and reservoirs and keeping them clean.



Singapore taps on high quality recycled water called "NEWater" to expand its water supply

Water Management

By 2011, about two-thirds of Singapore's land area will be used as water catchment, to collect and store rain water. However, Singapore's small land area means that our catchment size is ultimately limited. Hence, we "recycle" water to meet our needs.

We produce NEWater by purifying treated used water using cutting-edge membrane filtration technologies, to make water that is exceptionally clean and safe to drink. In fact, NEWater is greatly demanded by non-domestic customers, such as wafer fabrication plants, that require highly purified water. By 2011, with the completion of our fifth plant at

Changi, NEWater will be able to meet up to 30% of Singapore's total water needs, up from the current 15%.

In addition to water from local catchments, imported water and NEWater, Singapore has introduced desalination to turn seawater into fresh, drinking water.

Singapore also has high standards of sanitation and used water management. Singapore is 100% sewered and we have invested in a Deep Tunnel Sewerage System (DTSS) to meet our long-term needs. The DTSS also helps in the large-scale collection of used water for recycling into high grade NEWater.



Non-incinerable waste and ash from waste incineration are disposed offshore at the Semakau landfill

Waste Management

Singapore has developed an integrated waste management system that collects and disposes of waste effectively.

We collect refuse daily from homes to ensure a high standard of public cleanliness and hygiene. We incinerate all waste that can be burnt, in efficient waste-to-energy plants which meet stringent emission standards. This allows us to save on land needed for landfill, and also meet 2% to 3% of Singapore's electricity needs.

We use our only landfill, the Semakau landfill, to dispose of the ash from waste incineration as well as non-incinerable waste like construction debris. Semakau landfill is located at sea, about 8km from mainland Singapore. The landfill is expected to last 40 years at the current rate of usage,

and will become part of our future land-stock when completely filled. During its construction, we made efforts to conserve biodiversity. As a result, there is a rich variety of flora and fauna on the island. Semakau Landfill was even lauded in *New Scientist* in April 2007 as the "Garbage of Eden" – a showcase of an environmentally friendly system of waste management.

To reduce the need for incineration and landfill, we have promoted recycling and the reduction of waste. Under the National Recycling Programme (NRP), we provide centralised recycling bins and the door-to-door collection of recyclables every fortnight in public housing and private landed housing estates. The National Environment Agency (NEA) has also launched a voluntary Singapore Packaging Agreement to reduce packaging waste, starting with the food and beverage industry. This will be gradually extended to other industries.

Energy Policy

Singapore does not subsidise energy so as not to encourage over-consumption. Instead, we restructured the electricity industry to introduce greater market competition. This has encouraged the industry to look for innovative solutions and use new technologies to generate power more efficiently. As a result of competition, electricity is increasingly produced from natural gas-fired combined cycle power plants, as these are more efficient and cost-effective than oil-fired steam plants.

The government has also launched the national energy efficiency plan, E² Singapore, to encourage industry, buildings, transport and households to use energy more efficiently. The plan includes initiatives to raise public awareness of energy efficiency, to promote energy saving technologies and systems, and to set standards for household appliances which use a lot of energy.

Transport Management

Singapore plans for sufficient transport capacity as it develops. As we have limited land for roads, we locate commercial activities closer to homes, and build self-contained residential communities to reduce the need to travel. We have also invested in a comprehensive and robust public transport system.

Singapore was the first in the world to charge cars for driving into the city when we introduced the Area Licensing Scheme (ALS) in 1975 to reduce traffic congestion in the city. The scheme was then extended to major expressways with the Road Pricing Scheme (RPS). In 1998, the Electronic Road Pricing (ERP) system replaced the manual ALS and RPS. Under the ERP system,



Singapore was the first in the world to introduce congestion charging in the city in 1975, which evolved into the current Electronic Road Pricing system

motorists pay each time they drive into a congestion prone area. The ERP also allows us to vary charges according to traffic conditions. In this way, we can reduce traffic congestion and optimise the use of our roads by spreading traffic across the network. The Vehicle Quota System (VQS), introduced in 1990, also helps to regulate the increase in the number of vehicles.

City Greening

From our early days of nation building, we set out to build Singapore into a Garden City.

We set aside land for parks and built park connectors to link our parks and nature areas. We have also conserved unique areas of biodiversity and selected nature areas.

Noise Management

In such a densely built-up city like Singapore, some noise is inevitable since construction work and traffic flow take place close to homes. However, we have measures to ensure that noise levels remain acceptable to safeguard our quality of life.

For instance, NEA enforces noise limits to control how much noise construction sites can make. To reduce the impact of traffic noise, we ensure a minimum distance from buildings to major roads and MRT tracks. We also set limits on noise from the exhaust of individual vehicles. Our noise limits are reviewed regularly, taking into account feedback from the public and industry, as well as international best practice.

WHERE WE ARE TODAY

High Quality Living Environment

Singapore has a vibrant, attractive, safe and liveable environment for our people, and we are gaining international recognition for this. Mercer Human Resource Consulting ranked Singapore 1st in Asia and 8th in the Asia Pacific region in terms of quality of life, in their 2007/2008 Quality of Living Survey. Singapore also gained positive exposure in international magazine rankings of liveable cities, like Monocle Magazine's yearly ranking of liveable cities, and Ethisphere's 2020 Global Sustainability Centres.

Clean Air

Singapore's air quality compares well with major cities, with our PSI¹ being in the "good" range for 96% of the days in 2008. We achieved this

despite being a small and densely-populated city-state with clusters of heavy industry.

Sustainable Water Resources

In four decades, Singapore overcame water shortages despite the lack of natural water resources. We now have four different sources, our "Four National Taps", to provide us with a stable and sustainable water supply. These are water from local catchment areas, imported water, NEWater and desalinated water.

Singapore's achievements in integrated water management and NEWater have won us numerous international accolades, including the renowned Stockholm Industry Water Awards in 2007.

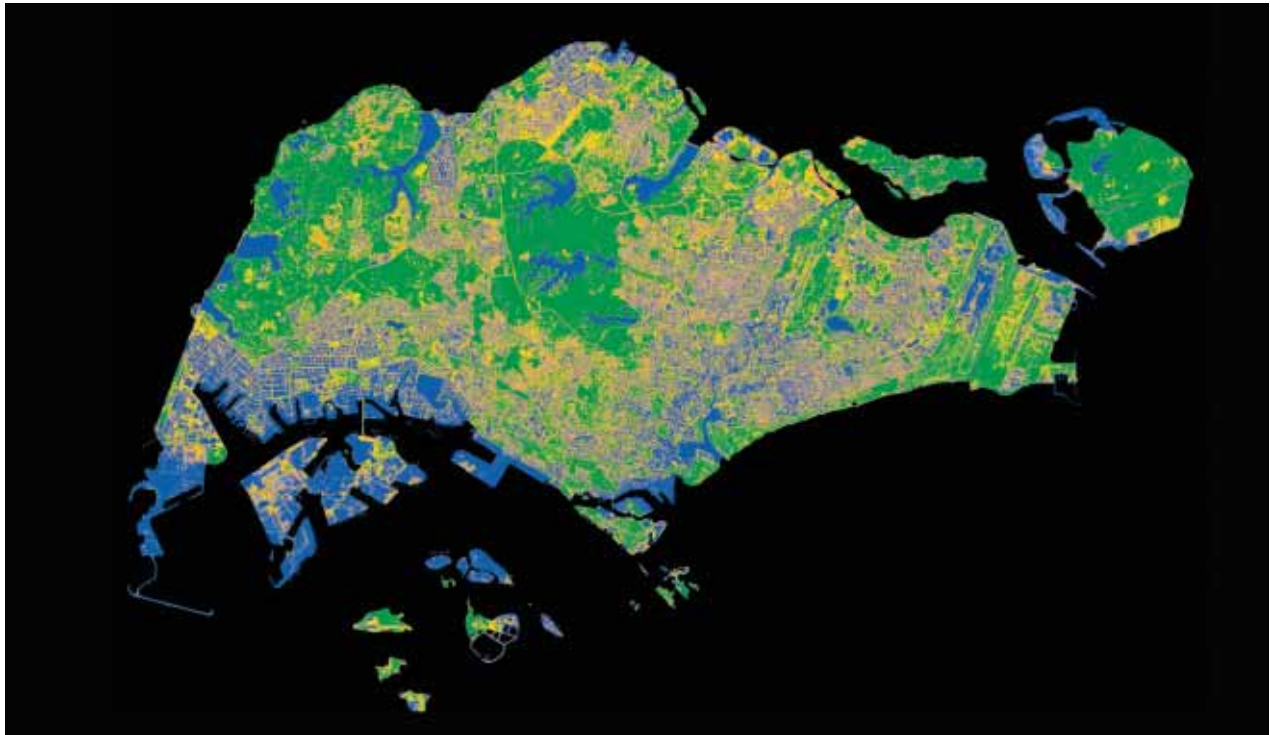
Waste

Over the last decade, Singapore's domestic waste disposed per capita has been falling despite continued growth. We reached a recycling rate of 56% in 2008. However, we can further increase recycling, especially for waste streams with low recycling rates such as food and plastic wastes.

Energy

Singapore's energy intensity, or energy consumption per dollar GDP, improved by 15% between 1990 and 2005. Between 2000 and 2007, electricity produced by natural gas increased from 19% to 79% of the total

¹ The Pollutant Standards Index (PSI) was developed by the United States Environmental Protection Agency (USEPA). It takes into account the ambient concentrations of key air pollutants and translates them into an overall index ranging from 0 to 500. PSI levels of 0 to 50 are considered good, and levels from 51 to 100 are moderate. Index levels above 100 are considered unhealthy.



Between 1986 and 2007, the green cover in Singapore grew from 36% to 47% despite a 68% growth in population

electricity produced, and overall generation efficiency rose from 37% to 44%.

Transport

Despite being the world's second most densely-populated country, our city's transport system is consistently ranked among one of the top three in the world², with 71% of journeys being completed under an hour.

Greenery / Urban Biodiversity

10% of Singapore's land is committed as green space, of which about half are gazetted nature reserves. If we add to this our extensive roadside greenery and island-wide Park Connector network, close to half of Singapore is covered by greenery. Our city is

home to 2,900 species of plants, 360 species of birds and 250 species of hard corals. The Sungei Buloh Wetland Reserve is an accredited member of the East Asian-Australasian Flyway in recognition of its role as an internationally significant stop-over point for migratory shorebirds.

NEXT STEPS

Singaporeans can be proud of the progress we have made on sustainable development. We must now consider what our strategies and policy responses should be for the next lap of Singapore's development. The next chapter identifies the challenges to sustainable development that will shape our response.

² International Association of Public Transport (UITP) 2006 "Mobility in cities" report.